L Water Framework Directive (WFD) Compliance Assessment

L.1 Introduction

L.1.1 Project overview

Haven Leisure Ltd. is seeking permissions to modernise and upgrade their Hafan y Môr Holiday Park, situated on the south coast of the Llŷn peninsula approximately 5 km east of Pwllheli, Gwynedd (Figure L.1). They have developed a proposed '2030 vision masterplan' which will involve extending and improving the park, as well as ensuring that it has appropriate long-term coastal erosion protection.

The Proposed Development includes landside areas and also works below the Mean High Water Spring (MHWS) elevation (i.e. the intertidal zone). Therefore, the work falls under the jurisdiction of the Town and Country Planning Act 1990 and the Marine and Coastal Access Act 2009. Haven Leisure Ltd. will therefore be submitting for planning permission and a marine licence application to Gwynedd Council and Natural Resources Wales (NRW), respectively.

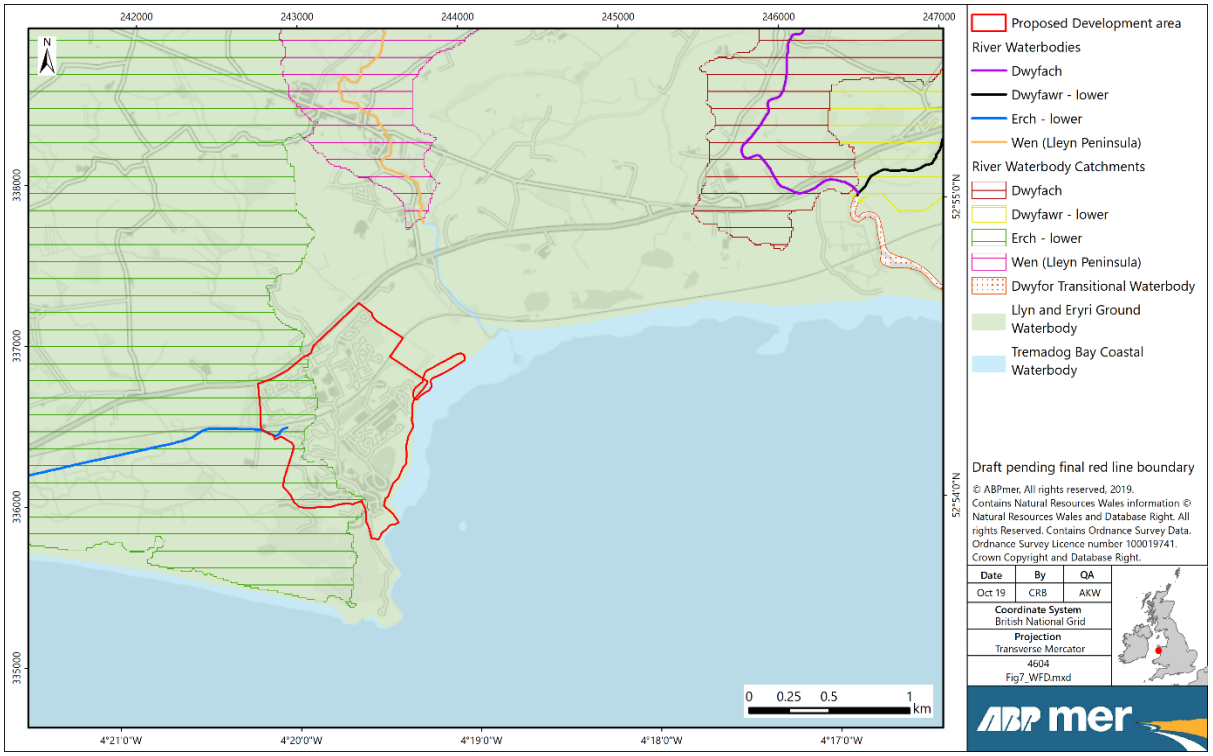


Figure L.1. Water bodies in the vicinity of the Proposed Development at Hafan y Môr

Scoping Opinions prepared by Gwynedd Council (C18/1060/40/SO) and NRW (SC1814) for the Proposed Development confirmed that the planning permission and marine licence applications should include consideration of the Water Framework Directive (WFD). Therefore, a WFD compliance assessment has been undertaken to determine whether the Proposed Development at Hafan y Môr complies with the objectives of the WFD. This information, together with the Environmental Statement, will be submitted to Gwynedd Council and NRW as part of the planning permission and marine licensing processes.

L.1.2 Water Framework Directive (WFD)

The WFD (2000/60/EC) came into force in 2000 and establishes a framework for the management and protection of Europe's water resources. It was implemented in England and Wales through the Water Environment (WFD) (England and Wales) Regulations 2003 (the Water Framework Regulations). These Regulations were revoked in April 2017 by the Water Environment (WFD) (England and Wales) Regulations 2017. The overall objective of the WFD is to achieve good status (GS) in all inland, transitional, coastal and ground waters by 2015, unless alternative objectives are set and there are appropriate reasons for time limited derogation.

The WFD divides rivers, lakes, lagoons, estuaries, coastal waters (out to one nautical mile from the low water mark), man-made docks and canals into a series of discrete surface water bodies. It sets ecological as well as chemical targets (objectives) for each surface water body. For a surface water body to be at overall GS, the water body must be achieving good ecological status (GES) and good chemical status (GCS). Ecological status is measured on a scale of high, good, moderate, poor or bad, while chemical status is measured as good or fail (i.e. failing to achieve good).

Each surface water body has a hydromorphological designation that describes how modified a water body is from its natural state. Water bodies are either undesignated (i.e. natural, unchanged), designated as a heavily modified water body (HMWB) or designated as an artificial water body (AWB). HMWBs are defined as bodies of water which, as a result of physical alteration by human use activities (such as flood protection and navigation) are substantially changed in character and cannot therefore meet GES. AWBs are artificially created through human activity. The default target for HMWBs and AWBs under the WFD is to achieve good ecological potential (GEP), a status recognising the importance of their human use while ensuring ecology is protected as far as possible.

The ecological status/potential of surface waters is classified using information on the biological (e.g. fish, benthic invertebrates, phytoplankton, angiosperms and macroalgae), physico-chemical (e.g. dissolved oxygen and dissolved inorganic nitrogen) and hydromorphological (e.g. hydrological regime) quality of the water body, as well as several specific pollutants (e.g. copper and zinc). Compliance with chemical status objectives is assessed in relation to environmental quality standards (EQS) for a specified list of 'priority' and 'priority hazardous' substances. These substances were first established by the Priority Substances Directive (PSD) (2008/105/EC) which entered into force in 2009.

The PSD sets objectives, amongst other things, for the reduction of these substances through the cessation of discharges or emissions. As required by the WFD and PSD, a proposal to revise the list of priority (hazardous) substances was submitted in 2012. Subsequently, an updated PSD (2013/39/EU) was published in 2013, identifying new priority substances, setting EQSs for those newly identified substances, revising the EQS for some existing substances in line with scientific progress and setting biota EQSs for some existing and newly identified priority substances. The updated PSD is explained in the WFD (Standards and Classification) Directions (England and Wales) 2015.

In addition to surface water bodies, the WFD also incorporates groundwater water bodies. Groundwaters are assessed against different criteria compared to surface water bodies since they do not support ecological communities (i.e. it is not appropriate to consider ecological status of a groundwater). Therefore, groundwater water bodies are classified as good or poor quantitative status in terms of their quantity (groundwater levels and flow directions) and quality (pollutant concentrations and conductivity), along with chemical (groundwater) status.

River Basin Management Plans (RBMPs) are a requirement of the WFD, setting out measures for each river basin district to maintain and improve quality in surface and groundwater water bodies where necessary. In 2009, the Environment Agency published the first cycle (2009 to 2015) of RBMPs for

England and Wales, reporting the status and objectives of each individual water body. Natural Resources Wales (NRW) subsequently published updated RBMPs for Wales as part of the second cycle (2015 to 2021), as well as providing water body classification results from 2015 and cycle 2 interim classifications via the Water Watch Wales website[1]. The Proposed Development area lies within the Western Wales River Basin District, specifically within the Llŷn and Eryri management catchment, which is reported in the Western Wales RBMP (NRW, 2015).

Consideration of WFD requirements is necessary for developments which have the potential to cause deterioration in ecological, quantitative and/or chemical status of a water body or to compromise improvements which might otherwise lead to a water body meeting its WFD objectives. Therefore, it is necessary to consider the potential for the Proposed Development at Hafan y Môr to impact WFD water bodies, specifically referring to the following environmental objectives of the WFD:

- Prevent deterioration in status of all surface water bodies (Article 4.1 (a)(i));
- Protect, enhance and restore all surface water bodies with the aim of achieving good surface water status by 2015 or later assuming grounds for time limited derogation (Article 4.1 (a)(ii));
- Protect and enhance all HMWBs/AWBs, with the aim of achieving GEP and GCS by 2015 or later assuming grounds for time limited derogation (Article 4.1 (a)(iii));
- Reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances (Article 4.1 (a)(iv));
- Prevent or limit the input of pollutants into groundwater and prevent deterioration of the status of all groundwater water bodies (Article 4.1 (b)(i));
- Protect, enhance and restore all groundwater water bodies and ensure a balance between abstraction and recharge of groundwater (Article 4.1 (b)(ii));
- Ensure the achievement of objectives in other water bodies is not compromised (Article 4.8); and
- Ensure compliance with other community environmental legislation (Article 4.9).

In 2016, the Environment Agency published guidance for England, referred to as 'Clearing the Waters for All', regarding how to assess the impact of activities in transitional and coastal waters for the WFD, setting out the following three stages[2]:

- **Screening**: excludes any activities that do not need to go through the scoping or impact assessment stages;
- **Scoping**: identifies the receptors and quality elements that are potentially at risk from an activity and need further detailed assessment; and
- **Impact assessment**: considers the potential impacts of an activity on bodies of surface and ground water, identifies ways to avoid or minimise impacts, and indicates if an activity may cause deterioration or jeopardise the water body achieving GS.

Alongside its Scoping Opinion, NRW also provided a copy of its internal guidance for assessing activities and projects for compliance with the WFD, referred to as Operational Guidance Note 72 (OGN 72; NRW, 2018). While OGN 72 is primarily designed to support NRW staff in reviewing internal and external activities and projects (to determine marine licence applications and in its role as an advisor), this guidance broadly follows the same three stages noted above. Therefore, in preparing this WFD compliance assessment, reference has been made to both the Environment Agency's 'Clearing the Waters for All' and NRW's OGN 72 guidance.

1 http://waterwatchwales.naturalresourceswales.gov.uk (Accessed September 2019).
2 https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters (Accessed October 2019).

L.2 Screening

L.2.1 Project description

The key components of the Proposed Development are as follows:

- The demolition of 56 existing two storey apartments;
- The addition of 165 static caravan pitches (a net increase of 40 units from the total approved in 2011[3]);
- The creation of an at-grade car park;
- The construction and operation of a new 950 m^2 beach café (650 m^2 at ground floor and 300 m^2 at first floor) as well as a children's play area;
- Selected new and improved landscaping measures;
- Changing 120 m of existing linear coastal rock revetment to groynes with sand/gravel; and
- Introducing a further 210 m of coastal protection made up of rock armour breakwaters with intervening areas of beach (sand/gravel) recharge.

Much of the Proposed Development work will take place on the eastern side of the existing park area which is within Haven Leisure Ltd.'s landholdings and includes an area of grassland and the site of a previous sewage treatment plant (STP) which has been demolished. The area vacated by the previous STP and the park extension will be protected by the proposed coastal defences. The land parcels allocated for the park and coastal defence development are shown in the masterplan (Appendix A).

Landside works

The proposals for each parcel of land (see the masterplan in Appendix A) that comprise the landside element of the Proposed Development are as follows:

- **Parcel B - Lakeside West**: Currently an unmanaged woodland with an access road that runs through towards Forest Lodge. It is proposed to site up to 27 static caravan pitches in this area.
- **Parcel C - Secondary Sales Area**: Currently hardstanding and used for the sale of second-hand caravans and for storage purposes. It is proposed to site up to 8 static caravan pitches in this area.
- **Parcel E – Boating Lake Site**: Currently a car parking area. It is proposed to develop up to 3 new static caravan pitches and staff accommodation with associated internal access road, car parking and landscaping.
- **Parcel F – Beachside and Old Chalet Site**: Currently occupied by four, two-storey apartment blocks with grass areas and trees located in-between the blocks. It is proposed to develop 26 new static caravan pitches with associated internal access road and landscaping.
- **Parcel G – West of New STP:** Currently comprises two fields, separated by established planting, with an access road running through to the new STP. It is proposed to site 84 static caravan bases with associated access and landscaping[4]. A wildflower grassland corridor within a buffer zone of at least 10 m will also be provided to mitigate impacts on semi-improved meadow grassland and to allow the movement of species.

[3] Taking the park as a whole (and what is currently existing), the masterplan would result in a 3.25 % increase in unit numbers at the Park overall.

[4] Planning permission exists for the development of 71 static caravan pitches on the north-western extent of Parcel G and Parcel I (ref C10D/0141/40/LL).

- **Parcel H – Site of Old STP**: Currently vacant following the demolition of the old STP[5] that was located on the beachfront, overlooking the Wales Coast Path. An access road runs through the site. A tree belt also exists along the southern part of the western boundary and along the eastern boundary. It is proposed to erect a new beach café with terrace, a play area and a car park. Landscaping will be introduced around the built form and a landscaped green corridor is to be retained along the stream that runs along the north-eastern boundary. The Wales Coast Path will be protected and enhanced.
- **Parcel I – Site North of Old STP**: The north-west to north-east boundaries of this parcel comprise a tree belt with a stream. The parcel is bound to the north by Harlech View and the south by Cardigan Bay View. To the east is the vacant site of the previous STP. It is proposed to develop 17 new static pitches in this parcel with associated internal access roads, car parking spaces for each pitch, soft landscaping and associated infrastructure.

The full details of the construction methods for the landside works (including quantities of materials for construction) will be finalised once the detailed design of the Proposed Development has been developed. A comprehensive landscaping scheme is also proposed to ensure adequate screening from viewpoints such as the railway and the Wales Coast Path.

The proposed surface water drainage strategy embraces the new Sustainable Drainage Systems (SuDs) legislation, exploring means of disposal in hierarchical order. Surface water will be discharged to the sea at land Parcels E, F, G, H and I with overflow areas incorporated to allow flows during more infrequent events to discharge freely into Watercourse B, located within the site. Within Parcels B and C, surface water will be discharged to the existing lakes, where it will be stored before being discharged via an outfall to the sea.

All land parcels include sustainable surface SuDs features such as filters drains/bioretention areas and associated planting and therefore offers significant betterment in terms of reducing flood risk in comparison to the existing scenario.

It is proposed that all foul drainage from the new development areas will be conveyed via totally separate networks of pipework by gravity and a system of pumping stations and pumped mains to connect into the existing private system.

Coastal defences

The proposals for the parcel of land (see the masterplan in Appendix A) that comprises the coastal defence element of the Proposed Development are as follows:

- **Parcel J - Coastal defences**: Existing habitats within this land parcel predominantly include sand and shingle on the upper intertidal and semi–improved neutral grassland on the landside. Currently there is an existing linear rock revetment over a 120 m stretch of the western section of the upper shoreline. There is no existing protection over the remaining 200 m of the shoreline which comprises a stretch of upper-shore barren shingle, with some rock and demolition material providing a low level of coastal erosion protection. The proposed coastal defences involve removing the existing linear rock revetment and rock/demolition material on the upper shore and constructing a combination of 'fish-tail' shaped rock-armour groynes (breakwaters) and intervening 'beach' areas. These proposals are detailed further below.

[5] Full planning permission (C17/0739/40/LL) was granted on 21 September 2017 for the demolition of the STP and the construction of a new plant to the north west of the site.

The proposed breakwaters will be aligned to create a stable coastline orientation and the beaches between them will be created by recharging with imported sand and gravel of a similar grade to the current beach. The proposed design of the coastal defences will ensure that the new defence line is not 'fixed' and that resilience and adaptability to climate change is built into the design. This is because the materials used to form the coastal defences can be dismantled and moved to new configurations of place and elevation in response to future sea level rise if required.

An approximately 10 m wide coastal strip landward of the coastal defences will remain undeveloped. This will provide a flexible contingency zone for any storm events and to deal with the inherent uncertainty of the natural future evolution of the shoreline in this area. It also provides the facility to adaptively set the Proposed Development back further if rates of sea level rise exceed the present range limit forecasts. In addition, this undeveloped area will provide a wildlife corridor of wildflower grassland that links to surrounding habitats to achieve and/or maintain habitat connectivity as well as providing space for maintenance access. The Wales Coast footpath will also be situated in this area as an unsurfaced, grassed path.

Although such rock-armour breakwaters and intervening beach recharge methods have often been used for coastal defence at many other locations in the UK, the proposed coastal defences at Hafan y Môr are novel because the rock-armour breakwaters will be placed 30 m back from the existing MHWS elevation in a way that will result in a net landward realignment of part of the coastal margin. This approach will provide shoreline stability within the upper beach and protect Hafan y Môr Holiday Park from coastal erosion but, crucially, will also allow these defence features to adjust in response to sea level rise in the future. It will also minimise the extent to which the design footprint will extend into intertidal habitat and overlap with Pen Llŷn a`r Sarnau Special Area of Conservation (SAC) and Glanllynnau a Glannau Pen-Y-Chain I Gricieth Site of Special Scientific Interest (SSSI). In order to achieve this design and to form a shallow beach profile, the existing landform will need to be excavated so that the breakwaters and the intervening beach areas will be partially sunk into the ground.

The coastal defences will require the overall importation of around 18,000 m^3 of sand, gravel and rock armour by road from regional sources. Final quantities of materials for construction will be confirmed once the detailed design of the Proposed Development has been developed. The imported rock is likely to be limestone that is derived from a local source at Minffordd quarry (near Porthmadog) and the gravel will most probably be from the Cefn Graianog quarry (near Penygroes). The sand will be of marine origin and is likely to be taken from the consented Hilbre Swash extraction site at the mouth of the Dee Estuary. Any sediment (mainly upper-shore sand) of marine origin within the footprint of the work that needs to be excavated during construction will be reused within the coastal zone and not removed from the site.

Rock, aggregate and plant machinery will be delivered to site via lorries using the existing road network and routes through the Haven Leisure Ltd. site and avoiding the Afon Wen. It is not envisaged that any material will be delivered by sea. It is anticipated that 10,000 tonnes of rock armour will be needed and that, to import this, there will need to be around 500 wagon return journeys to and from the selected local quarry (around 12 miles away) over 10 working days. A similar scale and duration of wagon movement is anticipated for the delivery of the beach materials. Details about the number of vehicles and the number of their movements will be finalised during the pre-construction and procurement processes.

At the construction site, two tracked extraction vehicles and dumper trucks will be used for the demolition of the existing rock revetment and construction of the new breakwaters. The details of the cut and fill requirements for the coastal defences will be finalised as part of the final design of the Proposed Development. It is estimated that approximately 15,000 to 20,000 m^3 of sediment excavated

in preparation for installing the breakwaters will be used as part of the on-site landscaping and will not be taken off site or to landfill.

Following completion of the work there will be a need for on-going site maintenance during operation. The sand recharge areas are likely to require regular litter collection and surface management to deal with sediment consolidation, compaction or surface vegetation/algal growth. Some relocation of boulders within the structure and sand may be needed on occasion (e.g. following a storm). There is also expected to be a loss of sand from the recharge zones over time and these areas will need to be topped up with imported sand on occasion.

L.2.2 Potentially affected water bodies

To determine which water bodies would potentially be affected by the Proposed Development, all surface and groundwater water bodies in the vicinity (<2 km) of the Proposed Development at Hafan y Môr, including surface water drainage, coastal defence works and beach recharge areas, were recorded (Figure L.1). The following water bodies were initially screened in:

- Tremadog Bay coastal water body (ID: GB651009350000);
- Erch – lower river water body (ID: GB110065053570);
- Wen (Lleyn Peninsula) river water body (ID: GB110065053680); and
- Llŷn and Eryri groundwater water body (ID: GB41002G204600).

It is considered unlikely that the Proposed Development will cause a significant non-temporary effect on the Wen (Lleyn Peninsula) river water body (GB110065053680), or cause deterioration in status at the water body level. This is based on the location of this riverine water body being approximately 1 km upstream of the mean high water mark (and thus unlikely hydrological connectivity, including the water body catchment) and the scale of the Proposed Development. Therefore, this water body has been screened out of the assessment and will not be discussed further.

In the centre of the Hafan y Môr Holiday Park is the boating lake, which provides leisure activities. The boating lake forms part of the existing surface water drainage system and has two overflow outfalls at the western and eastern edge of the waterbody. The two outfalls form two watercourses flowing through the site, referred to as Watercourse A and Watercourse B for the purposes of this assessment (see Figure L.2; Weetwood, 2019). These two watercourses are not classified as water bodies under the WFD.

Watercourse A is predominately culverted through the site and outfalls into the Erch – lower river water body to the west of the Proposed Development and the Afon Ddu offsite (which is classified as a main river; Weetwood, 2019). The catchment of the Erch – lower river water body covers a large section of the Hafan y Môr Holiday Park, including the landside works. It should be noted that the Erch – lower river water body itself (i.e. the river channel) does not overlap the Proposed Development and thus potential effects to this water body would be indirect through changes to the drainage of Watercourse A. Watercourse B, which drains east from the boating lake, is predominately open channel and outfalls directly into the sea, and thus the Tremadog Bay coastal water body. There is also a fishing lake situated in the southern section of the Hafan y Môr Holiday Park, which has a reservoir style overflow, which outfalls directly to the Tremadog Bay coastal water body (Weetwood, 2019). Furthermore, the coastal defence works of the Proposed Development directly overlap the Tremadog Bay coastal water body. The Llŷn and Eryri groundwater water body covers the entire Llŷn and Eryri management catchment and, therefore, all landside works directly overlap this groundwater.

In summary, the following three surface and groundwater water bodies have been screened into the assessment:

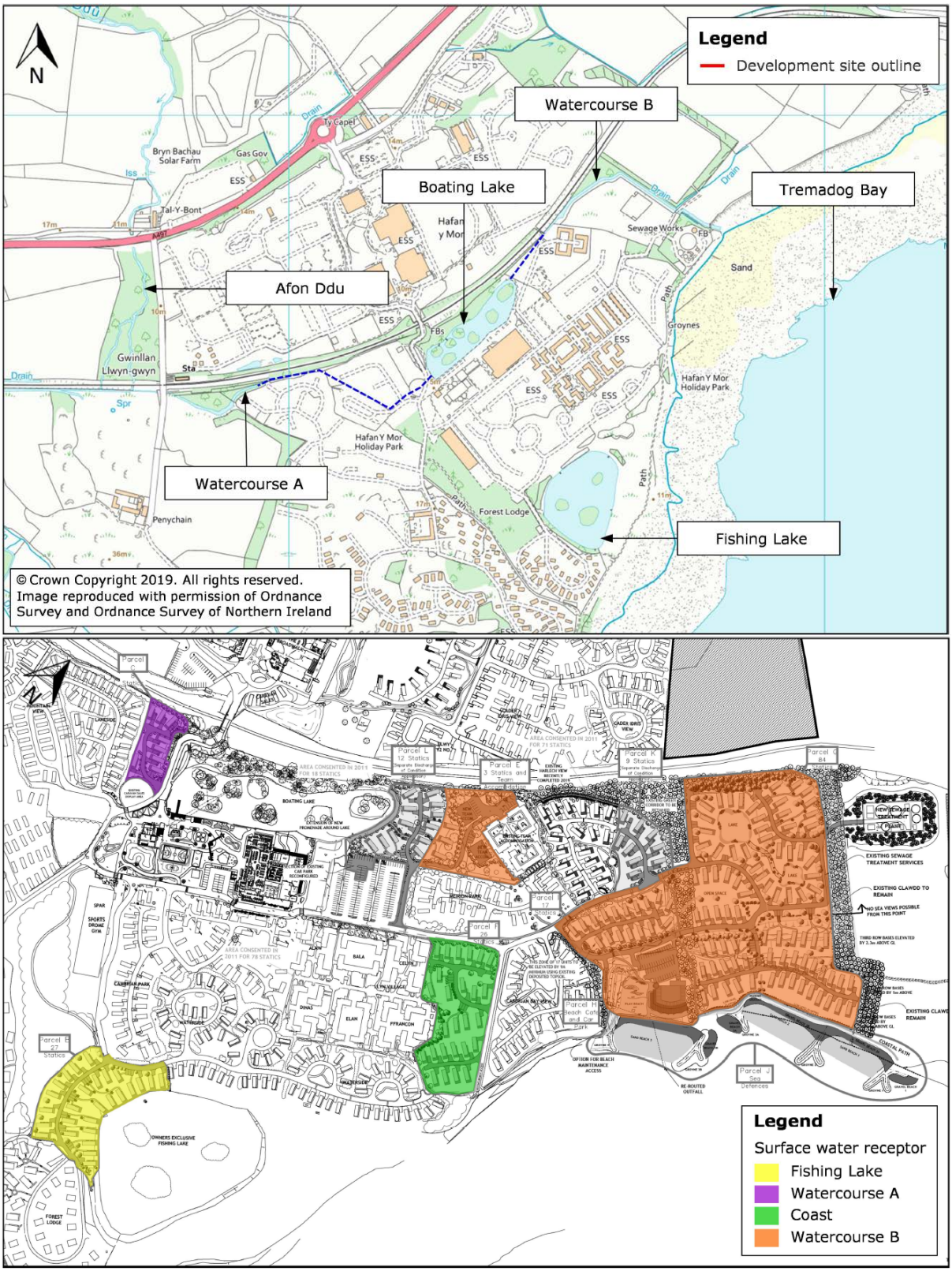
- Tremadog Bay coastal water body;
- Erch – lower river water body; and
- Llŷn and Eryri groundwater water body.

Table L.1, Table L.2 and Table L.3 provide summaries of the Tremadog Bay coastal water body, Erch – lower river water body and Llŷn and Eryri groundwater water body, respectively. This includes the current water body status (overall, ecological/quantitative and chemical) and, where known, parameters failing to achieve good status.

The Tremadog Bay coastal water body currently (2018) has an overall good status, based on GES and GCS (Table L.1). The overall, ecological and chemical status is determined by the "one-out, all-out" principle, whereby the poorest individual parameter classification defines the assessment level. Therefore, if any parameter is assessed as less than good (e.g. moderate), then the status for that water body is reported at that level. An overall good status confirms that each individual parameter measured within the Tremadog Bay coastal water body is currently achieving (at least) the standard required to report GS. Alien species is reported as the driving ecological quality element for this water body which, despite being at GES, suggests potential for the introduction or spread of invasive non-native species (INNS) should be a key consideration of this assessment.

The Erch – lower river water body currently (2018) has an overall moderate status, based on moderate ecological status and GCS (not assessed; Table L.2). Moderate ecological status is due to the biological quality elements 'Macrophytes' and 'Phytobenthos', summarised through the driving ecological quality element as 'Macrophytes and Phytobenthos Combined'. The Llŷn and Eryri groundwater water body currently (2015) has an overall poor status, based on good quantitative status and poor chemical (groundwater) status (Table L.3).

Comparison of the Cycle 1 (2009) and Cycle 2 (2015) classifications, as well as the latest interim classification (2018; available for surface water bodies only), for the 'Erch – lower' river water body shows that overall status has deteriorated from good (2009) to moderate (2015 and 2018). However, additional parameters have been classified in 2015 and 2018 compared with 2009 and, therefore, the current moderate ecological status is likely to have been applicable previously. The overall status of the Tremadog Bay coastal water body and Llŷn and Eryri groundwater water body have remained good and poor, respectively (i.e. no improvement or deterioration).



Source: Weetwood, 2019

Figure L.2. Watercourses, drainage catchments and surface water receptors within the Proposed Development at Hafan y Môr

Table L.1. Tremadog Bay coastal water body summary

Water Body Area	239.42 km² (surface area)
Hydromorphological Designation (Reasons for Designation)	Not designated as HMWB/AWB
Protected Area Designations	Bathing Water Directive; Natura 2000 (Habitats and Birds Directives)
Overall Status (2018)	Good
Ecological Status	Good
Chemical Status	Good
Parameters not at Good Status	N/A
Driving Ecological Quality Element	Alien species
Higher Sensitivity Habitats	Polychaete reef; Mussel beds (*Modiolus modiolus*, *Mytilus edulis* and others); Subtidal kelp beds; Subtidal seagrass beds
Lower Sensitivity Habitats	Rocky shore; Intertidal soft sediment; Subtidal soft Sediment; Gravel and cobbles; Subtidal rocky reef
Macroalgae Status	Unknown
History of Harmful Algae	No

Table L.2. Erch – lower river water body summary

Water Body Area	22.64 km² (catchment surface area); 11.2 km (length)
Hydromorphological Designation (Reasons for Designation)	Not designated as HMWB/AWB
Protected Area Designations	N/A
Overall Status (2018)	Moderate
Ecological Status	Moderate
Chemical Status	Good
Parameters not at Good Status	Macrophytes; Phytobenthos
Driving Ecological Quality Element	Macrophytes and Phytobenthos Combined
Phytoplankton Status	Moderate (Phytobenthos - diatoms)
History of Harmful Algae	No

Table L.3. Llŷn and Eryri groundwater water body summary

Water Body Area	1,317.20 km² (catchment area)
Overall Status (2015)	Poor
Quantitative Status	Good
Chemical (Groundwater) Status	Poor

L.2.3 Protected areas

The WFD requires that activities are also in compliance with other relevant legislation, such as the Habitats Directive (92/43/EEC as amended), Birds Directive (2009/147/EC), Bathing Water Directive (2006/7/EC), Nitrates Directive (91/676/EEC), Urban Waste Water Treatment Directive (91/271/EEC) and the provisions of the Shellfish Waters Directive (2006/113/EC) (now repealed and integrated into WFD).

Nature conservation designations

Article 3 of the Habitats Directive (92/43/EEC as amended) requires the establishment of a European network of important high-quality conservation sites known as Special Areas of Conservation (SAC) that

will contribute to conserving habitats and species identified in Annexes I and II of the Directive. The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds). In accordance with Article 4 of the Birds Directive (2009/147/EC), Special Protection Areas (SPA) are strictly protected sites classified for rare and vulnerable birds (Annex I of the Directive), and for regularly occurring migratory species. Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

There are two international nature conservation designated sites located within 2 km of the Proposed Development at Hafan y Môr, namely the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC and the Northern Cardigan Bay/Gogledd Bae Ceredigion SPA (Figure L.3). The Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC directly overlaps the proposed coastal defence works, while the Northern Cardigan Bay/ Gogledd Bae Ceredigion SPA is located offshore at approximately 1.8 km to the southeast of Hafan y Môr.

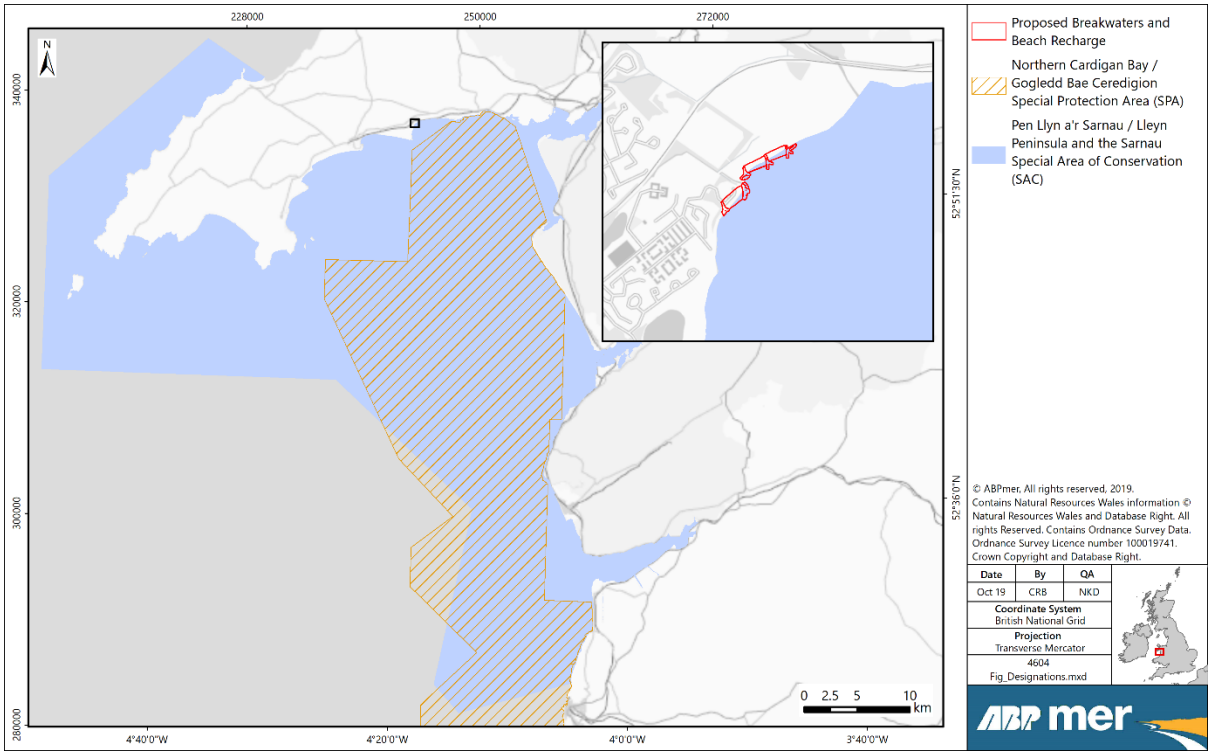


Figure L.3. Nature conservation designated sites in the vicinity of the Proposed Development at Hafan y Môr, specifically the proposed coastal defence works

Bathing Water Directive

The revised Bathing Water Directive (2006/7/EC) was adopted in 2006, updating the microbiological and physico-chemical standards set by the original Bathing Water Directive (76/160/EEC) and the process used to measure/monitor water quality at identified bathing waters. The revised Bathing Water Directive focuses on fewer microbiological indicators, whilst setting higher standards, compared to those of the original Bathing Water Directive. Bathing waters under the revised Bathing Water Directive are classified as excellent, good, sufficient or poor according to the levels of certain types of bacteria (intestinal enterococci and *Escherichia coli*) in samples obtained during the bathing season (May to September).

The original Bathing Water Directive was repealed at the end of 2014 and monitoring of bathing water quality has been reported against revised Bathing Water Directive indicators since 2015. The new classification system considers all samples obtained during the previous four years and, therefore, data has been collected for revised Bathing Water Directive indicators since 2012. The UK Government's target is to achieve 'sufficient' for all bathing waters by 2015, as described under the Bathing Water Regulations 2013 which transposes the revised Bathing Water Directive into UK law.

There are no designated bathing waters within 2 km of the Proposed Development at Hafan y Môr. The nearest bathing waters are Criccieth, located approximately 6 km to the east, and Glan Don Beach and Pwllheli, both approximately 6 km to the west (Figure L.4).

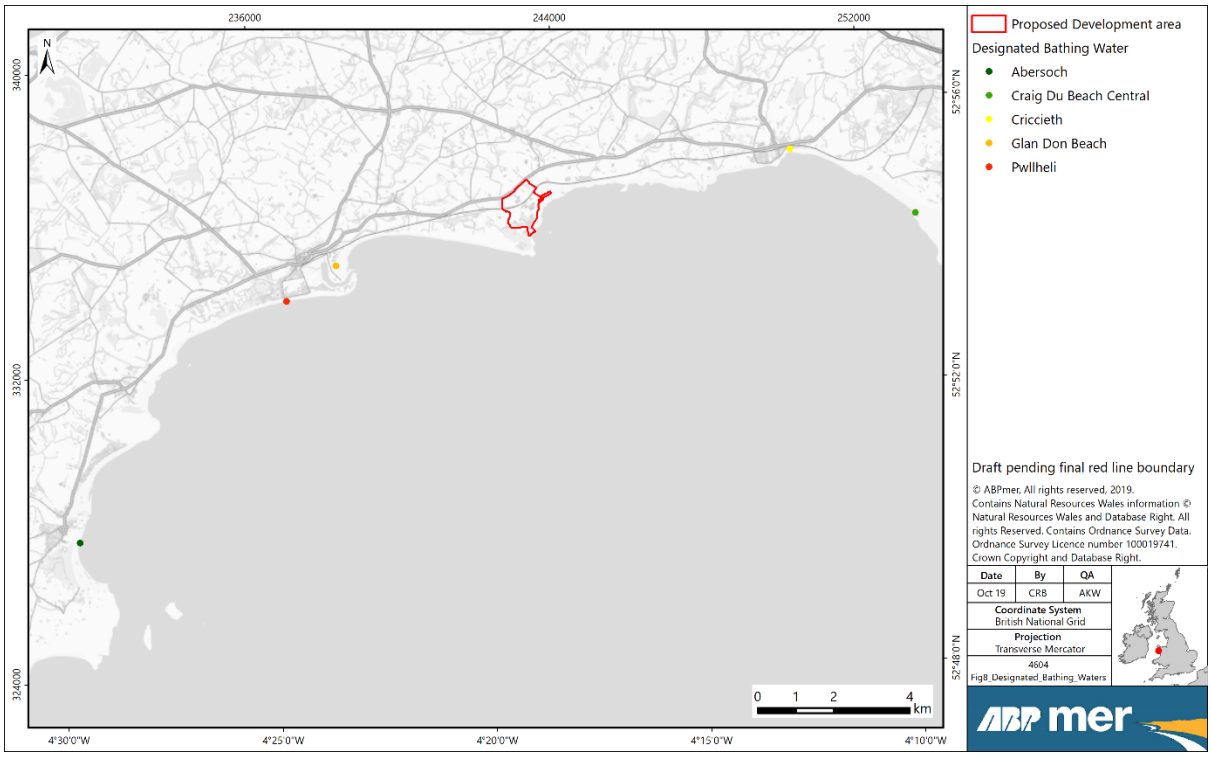


Figure L.4. Bathing waters in the vicinity of the Proposed Development at Hafan y Môr

Shellfish Waters Directive

The Shellfish Waters Directive (2006/113/EC) was repealed in December 2013 and subsumed within the WFD. However, the Shellfish Water Protected Areas (England and Wales) Directions 2016 require NRW (in Wales) to endeavour to observe a microbial standard in all 'Shellfish Water Protected Areas'. The microbial standard is 300 or fewer colony forming units of *E. coli* per 100 ml of shellfish flesh and intravalvular liquid. The Directions also requires NRW to assess compliance against this standard to monitor microbial pollution (75% of samples taken within any period of 12 months below the microbial standard and sampling/analysis in accordance with the Directions).

There are no Shellfish Water Protected Areas within 2 km of the Proposed Development at Hafan y Môr. The nearest Shellfish Water Protected Area is Mawddach, located approximately 25 km to the southeast[6].

6 https://naturalresources.wales/guidance-and-advice/environmental-topics/water-management-and-quality/water-quality/shellfish-water-protected-areas/?lang=en (Accessed October 2019).

Nitrates Directive

The Nitrates Directive (91/676/EEC) is designed to protect waters against nitrate pollution from agricultural sources. It requires European member states who do not opt for a whole territory approach to identify waters which are, or could become, polluted by nitrates. The member states are also required to designate as Nitrate Vulnerable Zones (NVZs) all land that drains to those waters and which contributes, as a result, to nitrate pollution.

There are no NVZs within 2 km of the Proposed Development at Hafan y Môr, with the nearest NVZ approximately 30 km to the north on Anglesey/Ynys Môn (NVZ ID: 206)[7].

Urban Waste Water Treatment Directive

The Urban Waste Water Treatment Directive (91/271/EEC) aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban waste water. It sets treatment levels on the basis of sizes of sewage discharges and the sensitivity of waters receiving the discharges. In general, the Urban Waste Water Treatment Directive requires that collected waste water is treated to at least secondary treatment standards for significant discharges. Secondary treatment is a biological treatment process where bacteria are used to break down the biodegradable matter (already much reduced by primary treatment) in waste water. Sensitive areas under the Urban Waste Water Treatment Directive are water bodies affected by eutrophication of elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

There are no "Sensitive Areas" as designated under the Urban Waste Water Treatment Directive within 2 km of the Proposed Development at Hafan y Môr, with the surrounding land considered a 'normal area'[8].

[7] https://naturalresources.wales/about-us/what-we-do/water/nitrate-vulnerable-zones/?lang=en (Accessed October 2019).

[8] https://www.eea.europa.eu/themes/water/european-waters/water-use-and-environmental-pressures/uwwtd/interactive-maps/urban-waste-water-treatment-maps (Accessed October 2019).

L.3 Scoping

The Environment Agency's "Clearing the Waters for All" guidance provides a scoping template to record findings and consider potential risks for several key receptors (OGN 72 also sets out a similar framework for assessing potential risks; NRW, 2018), specifically:

- Hydromorphology (Section L.3.1);
- Biology (Section L.3.2):
  - Habitats;
  - Fish;
- Water quality (Section L.3.3);
- Protected areas (Section L.3.4) and
- Invasive non-native species (INNS) (Section L.3.5).

Each receptor is considered in the following sections and summarised in a table. Potential risks that have been scoped into the assessment are highlighted in red and considered within the impact assessment stage (see Section L.4), while those scoped out of the assessment are highlighted in green.

It is recognised that the above receptors are primarily in relation to surface water bodies (i.e. in this case, the Tremadog Bay coastal water body and Erch – lower river water body), and do not consider the potential effects of the Proposed Development at Hafan y Môr on groundwaters. Therefore, additional scoping considerations have been given to consider potential effects on the Llŷn and Eryri groundwater water body (Section L.3.6).

L.3.1 Hydromorphology

Hydromorphology is the physical characteristics of estuaries and coasts, including the size, shape and structure of the water body and the flow and quantity of water and sediment. Table L.4 presents a summary of hydromorphological considerations and associated risk issues for the Proposed Development at Hafan y Môr. As at least one hydromorphological consideration indicates that a risk could be associated with the Proposed Development (Tremadog Bay coastal water body only), this receptor has been scoped into the impact assessment (see Section L.4).

Table L.4. Hydromorphology scoping summary

Hydromorphology Considerations	Hydromorphology Risk Issue(s)
Consider if your activity could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status?	Yes (Tremadog Bay coastal water body at high status for morphology; Erch – lower river water body at high status for hydrological regime but considered unlikely to be impacted by the Proposed Development at Hafan y Môr). Requires impact assessment (Tremadog Bay coastal water body only).
Consider if your activity could significantly impact the hydromorphology of any water body?	Yes (potential changes to hydromorphology of the Tremadog Bay coastal water body as a result of proposed works Hafan y Môr; Proposed Development considered unlikely to impact the Erch – lower river water body). Requires impact assessment (Tremadog Bay coastal water body only).
Consider if your activity is in a water body that is heavily modified for the same use as your activity?	No (neither surface water body is designated as heavily modified). Impact assessment not required.

L.3.2 Biology

Habitats

It is necessary to consider the impact of the physical footprint of an activity on nearby marine and coastal habitats. This specifically refers to habitats of higher sensitivity (e.g. intertidal seagrass, maerl and saltmarsh) and lower sensitivity (e.g. cobbles, gravel and shingle, subtidal rock reef and intertidal soft sediments like sand and mud). Table L.5 presents a summary of biology (habitat) considerations and associated risk issues for the Proposed Development at Hafan y Môr. As at least one biology (habitat) consideration indicates that a risk could be associated with the Proposed Development (Tremadog Bay coastal water body only), this receptor has been scoped into the impact assessment (see Section L.4).

Table L.5. Biology (habitat) scoping summary

Biology (Habitat) Considerations	Biology (Habitat) Risk Issue(s)
Is the footprint of the activity 0.5 km^2 or larger?	No (minimal overlap with Tremadog Bay coastal water body – 1,542 m^2 or 0.0015 km^2; no direct overlap between the Proposed Development and the Erch – lower river water body). Impact assessment not required.
Is the footprint of the activity 1% or more of the water body's area?	No (the surface area of the Tremadog Bay coastal water body is 239.42 km^2 and there will be minimal overlap with the Proposed Development, approximately 1,542 m^2 or 0.0015 km^2, equating to <0.001%; footprint of the Proposed Development does not overlap the Erch – lower river water body). Impact assessment not required.
Is the footprint of the activity within 500 m of any higher sensitivity habitat?	Yes (Polychaete reef within the Tremadog Bay coastal water body are located <500 m from the Proposed Development – see Table L.1; no higher sensitivity habitats identified for the Erch – lower river water body). Impact assessment required (Tremadog Bay coastal water body only).
Is the footprint of the activity 1% or more of any lower sensitivity habitat?	No (spatial extent of the Proposed Development within the Tremadog Bay coastal water body is minimal compared to extent of lower sensitivity habitats in the area; footprint of the Proposed Development does not overlap the Erch – lower river water body). Impact assessment not required.

Fish

Activities occurring within an estuary could impact on normal fish behaviour such as movement, migration or spawning. Table L.6 presents a summary of biology (fish) considerations and associated risk issues for the Proposed Development at Hafan y Môr. As none of the biology (fish) considerations indicate that a risk could be associated with the Proposed Development, this receptor has been scoped out of the impact assessment.

Table L.6. Biology (fish) scoping summary

Biology (Fish) Considerations	Biology (Fish) Risk Issue(s)
Consider if your activity is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary?	No. "*Go to next section*". Impact not assessment required.
Consider if your activity could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)?	-
Consider if your activity could cause entrainment or impingement of fish?	-

L.3.3 Water quality

Consideration should be made regarding whether phytoplankton status and harmful algae could be affected by the proposed works, as well as identifying the potential risks of using, releasing or disturbing chemicals. Table L.7 presents a summary of water quality considerations and associated risk issues of the Proposed Development at Hafan y Môr. As at least one water quality consideration indicates that a risk could be associated with the Proposed Development (Tremadog Bay coastal water body only), this receptor has been scoped into the impact assessment (see Section L.4).

Table L.7. Water quality scoping summary

Water Quality Considerations	Water Quality Risk Issue(s)
Consider if your activity could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)?	Yes (potential for sediment disturbance within the Tremadog Bay coastal water body during the proposed coastal defence works; no changes to water quality anticipated for the Erch – lower river water body). Impact assessment required (Tremadog Bay coastal water body only).
Consider if your activity is in a water body with a phytoplankton status of moderate, poor or bad?	No (phytoplankton status not assessed for Tremadog Bay coastal water body; phytobenthos sub-element status currently at moderate for Erch – lower river water body, but unlikely to no changes to water quality anticipated). Impact not assessment required.
Consider if your activity is in a water body with a history of harmful algae?	No (neither surface water body included as sampling location within the Biotoxin and Phytoplankton Official Control Monitoring Programmes for England and Wales; limited evidence for harmful algae)[9]. Impact not assessment required.

[9] https://www.cefas.co.uk/cefas-data-hub/food-safety/habs-surveillance-programmes-and-monitoring (Accessed October 2019).

Water Quality Considerations	Water Quality Risk Issue(s)
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if the chemicals are on the Environmental Quality Standards Directive (EQSD) list?	No (beach nourishment and rock material will not introduce chemicals included on the EQSD list). Impact not assessment required.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if it disturbs sediment with contaminants above Cefas Action Level 1?	Yes (contaminant concentrations unknown in sediments which could be disturbed; therefore, scoped in on pre-cautionary basis for the Tremadog Bay coastal water body only). Requires impact assessment.
If your activity has a mixing zone (like a discharge pipeline or outfall) consider if the chemicals released are on the Environmental Quality Standards Directive (EQSD) list?	No (not applicable). Impact assessment not required.

L.3.4 Protected areas

Consideration should be made regarding whether WFD protected areas are at risk from your activity, including SACs and SPAs (Natura 2000 sites), as well as bathing waters, Shellfish Water Protected Areas and nutrient sensitive areas. Table L.8 presents a summary of protected area considerations and associated risk issues of the Proposed Development at Hafan y Môr. As the protected areas considerations indicate that a risk could be associated with the Proposed Development (Tremadog Bay coastal water body only), this receptor has been scoped into the impact assessment (see Section L.4).

Table L.8. Protected areas scoping summary

Protected Area Considerations	Protected Area Risk Issue(s)
Consider if your activity is within 2 km of any WFD protected area?	Yes (coastal defence works of the Proposed Development, within the Tremadog Bay coastal water body, overlap the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC, while the boundary of the Northern Cardigan Bay/Gogledd Bae Ceredigion SPA is <2 km to the southeast; landside works). Impact assessment required (Tremadog Bay coastal water body only).

L.3.5 Invasive non-native species (INNS)

Consideration should be made regarding whether there is a risk the activity could introduce or spread INNS. Risks of introducing or spreading INNS include materials or equipment that have come from, had use in or travelled through other water bodies, as well as activities that help spread existing INNS, either within the immediate water body or other water bodies. Table L.9 presents a summary of INNS considerations and associated risk issues of the Proposed Development at Hafan y Môr. As the INNS considerations indicate that a risk could be associated with the Proposed Development, this receptor has been scoped into the impact assessment (see Section L.4).

Table L.9. Invasive non-native species (INNS) scoping summary

INNS Considerations	INNS Risk Issue(s)
Consider if your activity could introduce or spread INNS?	Yes (potential for introduction or spread of INNS as a result of the Proposed Development, including coastal defence works and landside works; it is also noted that 'Alien species' is recorded as the driving ecological quality element for the Tremadog Bay coastal water body). Requires impact assessment.

L.3.6 Groundwaters

As noted in Section L.2.2, the Llŷn and Eryri groundwater water body covers the entire Llŷn and Eryri management catchment and, therefore, all landside works of the Proposed Development at Hafan y Môr directly overlap this groundwater. These works could lead to potential changes to surface water drainage across the Holiday Park, required to be compliant with Sustainable Drainage Systems (SuDS) regulations, and therefore, this receptor has been scoped into the impact assessment (see Section L.4).

L.4 Impact Assessment

An impact assessment should be conducted for each receptor identified during the scoping stage as being at risk from an activity. As highlighted in Section L.3, the following receptors have been scoped into the impact assessment, noting the relevant water bodies:

- Hydromorphology (Section L.4.1);
  - Tremadog Bay coastal water body
- Biology (habitats) (Section L.4.2);
  - Tremadog Bay coastal water body
- Water quality (Section L.4.3);
  - Tremadog Bay coastal water body
- Protected areas (Section L.4.4);
  - Tremadog Bay coastal water body
- Invasive non-native species (INNS) (Section L.4.5);
  - Tremadog Bay coastal water body
  - Erch – lower river water body
- Groundwaters (Section L.4.6)
  - Llŷn and Eryri groundwater water body

Each of these WFD parameters has been evaluated in order to determine whether the Proposed Development at Hafan y Môr might cause deterioration in the status of the relevant water body (defined as a non-temporary effect on status at water body level), or an effect that prevents the water body from meeting its WFD objectives. Where possible, the assessment has drawn on information presented in the Environmental Statement (ES; see main report), as well as a previous Screening and Scoping Report submitted to Gwynedd Council and NRW (ABPmer, 2018).

L.4.1 Hydromorphology

Hydromorphology constitutes both 'hydrology' and 'geomorphology', describing the physical characteristics and processes of a water body. Where a scheme changes the physical form or alters the process of sediment transport (erosion, deposition or transfer) then these morphological impacts need to be considered (NRW, 2018). It is unlikely that the Proposed Development at Hafan y Môr would lead to significant changes to the flows through the boating lake and Watercourse A (Figure L.2) and thus towards the Erch – lower river water body (see Figure L.1). Therefore, the Proposed Development is not expected to lead to a deterioration of the assessed hydromorphological elements within the Erch – lower river water body, nor prevent this water body from meeting its WFD objectives.

With respect to the Tremadog Bay coastal water body, impacts relating to physical and coastal processes are discussed in Section 6 of the ES. Relevant aspects concerning hydromorphology of this analysis are re-stated here within the context of the WFD. It is important to note that the footprint of the proposed coastal defences is 0.0104 km^2. The Tremadog Bay coastal water body has a surface area of 239.42 km^2. Therefore, the extent proposed coastal defences represent a small fraction (0.0043%) of the total area of the water body.

The exposure to change caused by changes to sediment transport and supply as a result of the proposed coastal defences is considered to be negligible (see Section 6.3.1 of main ES). This is because the defence intrudes 20 m below MHWS and is above MHWN and as such only has a small effect on the sediment fluxes along the shoreline. Losses of material from beach nourishment is also expected to be undetectable against natural fluctuations in the area.

The exposure to change associated with coastal squeeze is also considered to be negligible (see Section 6.3.2 of the main ES). This is because specific consideration was given to ensuring the proposed coastal defences will avoid any potential effects on coastal squeeze. They have been designed to be set-back in the landform, and flexible and adaptable to accommodate future sea level rise. In this way, the proposed coastal defences allow the intertidal habitat fronting the defences to adapt and 'roll-back' into the newly created space (i.e. not suffer coastal squeeze).

In conclusion, the Proposed Development is not expected to lead to a deterioration of the assessed hydromorphological elements within the Tremadog Bay coastal water body, nor prevent this water body from meeting its WFD objectives.

L.4.2 Biology (habitats)

Notable features of the intertidal habitat on the beach at Hafan y Môr Holiday Park, found during an intertidal survey, and potential impacts to these features, are described in the main ES. A full description of each biotope is also provided in Appendix E of the main ES (ABPmer, 2017b).

The honeycomb worm *Sabellaria alveolata* was commonly recorded encrusting the boulders in the mid-shore area fronting the Hafan y Môr Holiday Park. The *S. alveolata* structures generally consisted of flat (sheet) crusts or patchy mounds, though several patches were recorded where more notable biogenic growth had occurred (LS.LBR.Sab.Salv: *Sabellaria alveolata* reefs on sand-abraded eulittoral rock). These *S. alveolata* reefs are considered a higher sensitivity habitat under the WFD (polychaete reef) and are located approximately 150 m away from the proposed coastal defences. Despite being recorded on MagicMap, no evidence of mussel beds was found on the beach at Hafan y Môr during the survey.

Given the location of the higher sensitivity habitat away from the proposed coastal defences, direct loss will not occur. Any effects from physical disturbance during construction are also not expected as construction activity will be highly localised to the direct vicinity of the works.

The potential effects from changes to physical and coastal processes include changes to sediment transport and supply. However, these are considered to be negligible because the defence works only intrudes 20 m below MHWS and are above MHWN and, as such, only has a small effect on the sediment fluxes along the shoreline (see Sections 6 and 8 of main ES). Losses of material from beach nourishment is expected to be undetectable against natural fluctuations in the area (see Section 6 and 8 of main ES). In any case, *S. alveolata* reefs are considered to be 'not sensitive' to smothering and have a 'very low' sensitivity to increases in suspended sediment (Jackson, 2008).

In conclusion, the Proposed Development is not expected to lead to a deterioration of the assessed habitats within the Tremadog Bay coastal water body, nor prevent this water body from meeting WFD objectives.

L.4.3 Water quality

There is some risk from accidents and spillages/leaks in any construction operation (e.g. oil, fuel and lubricants from machinery) which could result in the contamination of the adjacent sediments and water. Should pollution occur from runoff, stored material or accidental spillages, the adverse effect on water resources and their associated ecology could be significant, the scale of which will depend on the nature and magnitude of the pollution incident. The implications of a pollution incident are highly dependent on both the nature of the substance released and the species that would be affected. However, this risk will be minimised by ensuring that the construction methods, Proposed Development design, and the contractual arrangements are pursued in an appropriate way.

In order to reduce the risk of accidental spillages and/or leaks from construction plant, the following guidance will be adopted:

- Pollution Prevention Guidance (PPG), or Guidance for Pollution Prevention (GPP)[10]:
  - Understanding Your Environmental Responsibilities – Good Environmental Practices (PPG1);
  - Works and maintenance in or near water (GPP5);
  - Working at construction and demolition sites (PPG6); and
  - Safe storage and disposal of used oils (GPP8);
- Regulatory guidance available from GOV.UK[11]
- The Oil Care Code; and
- CIRIA's Environmental Good Practice on Site (CIRIA, 2010).

In adherence with this guidance, a number of best practice measures will be followed. All wastes generated on site will be removed in a timely manner and any materials and containers giving rise to possible spills or contamination of the surrounding environment will be taken from site to be processed at a licensed facility. In the event of a pollution incident then measures to report, manage and minimise any impacts will be pursued.

Plant will also be maintained regularly, will use biodegradable hydraulic oils and will carry spill kits in the event of an accident. Refuelling will be in designated sites away from the water to limit the potential for spillages. Fuel will be stored in the site compound overnight, limiting the potential for fuel theft and vandalism which could cause pollution. Should any pollution incidents occur, they will be reported immediately to NRW on the hotline number (0300 065 3000). The workforce will be trained in preventing and dealing with pollution incidents.

The potential for changes in water quality to occur arise primarily where sediment is released into the water column as a result of physical disturbance to the seabed or introduction of new materials to the marine environment. This is particularly the case for fine sediments (<63 µm) which can become suspended more easily. Increased suspended sediment concentrations can cause a wide range of environmental impacts, including clogging of gills (e.g. essential feeding apparatus for filter-feeders), smothering of sedentary organisms and attenuation of light (Newell *et al.* 1998). Elevated levels of suspended sediment (increased turbidity) can cause a reduction in light penetration through the water column, restricting the light availability for photosynthesis in important primary producers such as phytoplankton and macrophytes. Such primary producers are important sources of food and oxygen and a reduction in their productivity can reduce water quality. High levels of suspended sediment may also increase chemical oxygen demand (COD) and encourage the oxidation of organic matter by bacteria (Biological Oxygen Demand or BOD), depressing dissolved oxygen content.

Larger disturbed particles are generally quickly deposited on the seabed, while finer sediments remain suspended for longer durations and, coupled with a highly dispersive environment, can be transported over greater distances. The potential to impact the marine environment as a result of any sediment-bound contaminants arises primarily when the sediment that is released into the water column disperses and deposits elsewhere. The proposed construction works will not input any additional contaminants into the system through the introduction of contaminated sediment (i.e. material used for beach recharge will be clean), but it could potentially redistribute any contaminants already present in the sediments.

[10] http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed October 2019).

[11] https://www.gov.uk/government/collections/pollution-prevention-guidance-ppg (Accessed October 2019).

The resuspension of sediment can lead to the release and mobilisation of sediment-bound contaminants into the water column. These include both toxic contaminants, such as heavy metals, pesticides and hydrocarbons, and non-toxic contaminants, such as nutrients. The occurrence of contaminated sediment is most likely to occur where the sediments are finer (with more surface area for absorption of contaminants) and where toxic material has previously settled onto the seabed. The chemical contaminants associated with sediments can be removed or disturbed during construction and may be dispersed, redistributed and deposited elsewhere in the marine environment where they may become available for uptake by marine organisms. As sediment is disturbed and re-distributed into the water column, sediment-bound contaminants may be partitioned from the solid phase (i.e. bound to sediments or suspended matter), to the dissolved or aqueous phase (i.e. dissolved in pore water or overlying water) (Luoma, 1983).

The construction of the groynes, as well as beach recharge, will be undertaken in a dry working environment (i.e. around low tide). The majority of the proposed works are located above mean high water springs and thus resuspension of unconsolidated sediments will be minimal on subsequent flooding tides above these levels. Samples collected in 2016 and 2017 indicate that surface sediments in the vicinity of the Proposed Development predominantly comprise sands and gravels, particularly in the upper foreshore (Table L.10). The potential for these surficial sediments to be resuspended and dispersed in the wider marine environment is limited. While material below these relatively coarse surface sediment includes dense/firm clay material (based on a number of boreholes), it is considered unlikely that large quantities of fine sediments, once unconsolidated by the proposed works, will be redistributed in the wider area. Any sediment disturbance that results in increases in suspended sediment concentrations during construction is likely to be small in scale, highly localised and short-term.

The coarse surface material situated in the vicinity of the Proposed Development is likely to have low concentrations of organic matter and be uncontaminated. This is because coarser sediments have a lower surface area for adsorption of particles. Therefore, the resuspension of these sediments is not expected to result in a significant redistribution of contaminants or reductions in dissolved oxygen. While high contaminant concentrations are typically associated with finer material, it is considered unlikely that the clay material present below the coarse surface layer will be contaminated (no known historic contamination events in the area). Material used for beach recharge will be clean and will also be of a similar grain size to that found naturally on the local foreshore. Therefore, this is unlikely to result in significant changes in suspended sediment concentrations, nor introduce contaminants to the marine environment.

In conclusion, the Proposed Development at Hafan y Môr is not expected to lead to a deterioration of water quality within the Tremadog Bay coastal water body, nor prevent this water body from meeting its WFD objectives.

Table L.10. Particle size distribution of surface sediment samples collected in the vicinity of the proposed coastal defence works at Hafan y Môr

Surface Sediment Sample	Particle Size Distribution (%)		
	Gravel (>2 mm)	Sand (<2 mm - >63 µm)	Silt (<63 µm)
B1	0.0	100.0	0.0
B2	1.9	97.9	0.2
B3	0.0	100.0	0.0
B4	38.1	58.4	3.6
B5	28.3	71.4	0.3
BS02	65	34	1
BS04	2	96	2
BS06	81	18	1
BS07	4	94	2
BS08	0	7	93
BS09	0	89	11
BS10	0	97	3
BS11	41	57	2
BS12	4	95	1
BS13	0	98	2
BS14	1	71	28
BS15	1	96	3
BS16	64	35	1
BS17	0	99	1
BS18	0	89	11
BS19	0	89	11

L.4.4 Protected areas

The objectives for Natura 2000 sites (SACs and SPAs) are to maintain or restore designated features to favourable conservation status and the objectives of these protected areas must not be compromised if the overarching objective of the WFD is also to be maintained. It is recognised in NRW (2018) that the assessment of protected areas is typically completed alongside a WFD compliance assessment as part of a Habitats Regulations Assessment (HRA). Information is provided in the main ES, mainly Appendix K, to inform an HRA of the Proposed Development at Hafan y Môr. However, it is also necessary to record the outcome of the assessment of protected areas in the WFD assessment.

The coastal defence works of the Proposed Development overlap with the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC (Figure L.3). Impacts on this European site could be via both direct and indirect pathways and these were screened into the HRA. The qualifying interest features of this designated site are listed below, and those screened into the HRA are highlighted bold:

- Annex I habitats that are a primary reason for selection of this site:
  - 1110 Sandbanks which are slightly covered by sea water all the time
  - 1130 Estuaries
  - 1150 Coastal lagoons
  - **1160 Large shallow inlets and bays**
  - **1170 Reefs**
- Annex I habitats that are present as a qualifying feature, but not a primary reason for selection of this site:
  - **1140 Mudflats and sandflats not covered by seawater at low tide**

- 1310 *Salicornia* and other annuals colonizing mud and sand
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- 8330 Submerged or partially submerged sea caves

- Annex II species that are present as a qualifying feature, but not a primary reason for site selection:
  - **Bottlenose dolphin *Tursiops truncatus***
  - **Otter *Lutra lutra***
  - **Grey seal *Halichoerus grypus***

As recorded in Appendix K of the main ES, for the majority of interest features and impact pathways, no adverse effects on site conservation objectives and integrity of the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC is expected assuming suggested mitigation is implemented.

However, a potential adverse effect on site conservation objectives and integrity cannot be excluded for direct loss of sandflat habitat under the coastal defences. The coastal defences will extend over, and result in the direct loss of, around 0.15 ha (1,542 m^2) of sandflat habitat beneath the footprint of the rock armour groynes. This loss of sandflat habitat represents less than 0.005% of the 3,358 ha of this habitat across the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC. Although this is a very small change in the context of a large designated site, given NRW's position to not adopt a *de minimis* approach, this loss is likely regarded as having an adverse effect on the integrity of the European/Ramsar site (see Appendix K of main ES for detail). If the competent authorities reach this view, compensatory habitat to the east of the Proposed Development will be created to assure that the project will not have an adverse effect on the integrity of the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC.

Indirect impacts are also possible to the Northern Cardigan Bay/Gogledd Bae Ceredigion SPA, located approximately 1.8 km to the southeast (screened into the WFD compliance assessment as <2 km from the Proposed Development; Figure L.3), which is designated for the nationally important non-breeding, wintering population of Red-throated Diver (*Gavia stellata*). However, although the main construction work will be carried out in the winter months, it is not expected to have a significant effect on overwintering or passage waterbirds from changes to or losses of habitats or, alternatively from disturbance effects. This is due to the distance of the Proposed Development away from the SPA, and the type of habitats that are likely to be affected (i.e. those not used by Red-throated Diver). Therefore, the Northern Cardigan Bay/Gogledd Bae Ceredigion SPA was not screened into the HRA and is not considered any further as part of this WFD compliance assessment.

In conclusion, the Proposed Development are not expected to lead to a deterioration of the assessed protected area designations, nor prevent the water bodies from meeting their WFD objectives, once mitigation/compensatory measures are implemented.

L.4.5 Invasive non-native species (INNS)

As with most activities which occur in or close to the water environment, there is potential risk that the Proposed Development could result in the introduction or spread of INNS. In November 2015, Marine Biosecurity Planning Guidance for England and Wales was published. This document provides guidance on developing site-based biosecurity plans for a number of activities, including construction programs.

Current legislation in England and Wales does not require biosecurity plans to be in place for construction activities; however, the development of such a document may be a condition of the marine licence or planning consent for the proposed plans. The Marine Biosecurity Planning Guidance for England and Wales is therefore a best practice guidance document only (Payne *et al.* 2015). This guidance will inform the development of any required Biosecurity Plan which will need to include:

- The identification of scheme activities which risk introducing or spreading non-native species;
- The development of appropriate best practice biosecurity control measures; and
- Contingency planning if the presence or spread of a non-native species is linked to the works.

For the Proposed Development, a Biosecurity Plan will be prepared and included within a Construction Environmental Management Plan (CEMP).

L.4.6 Groundwaters

The Proposed Development at Hafan y Môr will not involve any abstraction of groundwater during construction. Therefore, the quantitative status of the groundwater water body is unlikely to be affected by the Proposed Development. Furthermore, the groundwater is not designated as a groundwater source protection zone.

The proposed construction works will not input any additional contaminants into the system through the introduction of contaminated sediment or construction materials (i.e. materials used will be clean). Furthermore, deep excavations or piling is not required and therefore pathways for contaminants into the groundwater are limited. Therefore, chemical (groundwater) status of the Llŷn and Eryri groundwater water body is also unlikely to be affected.

In conclusion, the Proposed Development is not expected to lead to a deterioration of the Llŷn and Eryri groundwater water body, nor prevent this water body from meeting its WFD objectives.

L.5 Conclusion

Based upon the information presented within this WFD compliance assessment, and considering the additional information presented in the Environmental Statement (see main report), it is concluded that the Proposed Development at Hafan y Môr is not likely to have a permanent (i.e. non-temporary) effect on the status of WFD parameters that are significant at water body level. Therefore, deterioration to the current status of the Tremadog Bay coastal water body, Erch – lower river water body or Llŷn and Eryri groundwater water body is not predicted, nor a prevention of these water bodies achieving future WFD status objectives.

L.6 References

ABPmer, (2018). Hafan y Môr Holiday Park '2030 Vision' Masterplan, Scoping Report for Environmental Impact Assessment with Screening for Habitats Regulations Appraisal, ABPmer Report No. R.2958. A report produced by ABPmer for Bourne Leisure Ltd., October 2018

Natural Resources Wales (NRW). (2015). Western Wales River Basin Management Plan 2015 – 2021 Summary.

Natural Resources Wales (NRW). (2018). Guidance for assessing activities and projects for compliance with the Water Framework Directive. OGN 72. Document Owner: WFD Team. February 2018.

Payne, R.D., Cook, E.J., Macleod, A. and Brown, S. (2015). Marine Biosecurity Planning Guidance for Producing Site and Operation-Based Plans for Preventing the Introduction and Spread of Invasive Non-Native Species In England and Wales. November 2015.

Weetwood. (2019). Hafan Y Mor, Pwllheli. Indicative Surface Water Drainage Strategy. Final v 1.1, 4 September 2019.

L.7 Abbreviations

AWB	Artificial Water Body
EC	European Commission
EEC	European Economic Community
EQS	Environmental Quality Standards
EQSD	Environmental Quality Standards Directive
EU	European Union
GCS	Good Chemical Status
GEP	Good Ecological Potential
GES	Good Ecological Status
GS	Good Status
HMWB	Heavily Modified Water Body
INNS	Invasive Non-Native Species
NRW	Natural Resources Wales
PSD	Priority Substances Directive
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SPA	Special Protection Area
WFD	Water Framework Directive

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

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