

Carew Mill and Causeway Repairs

Water Framework Directive Assessment

Pembrokeshire Coast National Park Authority (PCNPA)

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1. Introduction

Atkins Limited (Atkins) was commissioned by Pembrokeshire Coast National Park Authority (PCNPA) to support the small-scale repairs to the historic causeway structure located at Carew Mill, Grid Reference - SN04170385 (Figure 1-1).

This document presents the Water Framework Directive (WFD) assessment for the Works. The aims of the document are to:

- Provide background information on the WFD legislation and the proposed works;
- Provide a high-level baseline understanding of the affected water bodies in the context of the WFD;
- Provide an assessment of the potential for the proposed works to cause deterioration in the WFD status of any waterbody directly or indirectly affected by the Works; and
- Provide an assessment of the potential impacts on waterbody improvement measures and the ability to meet WFD objectives, as well as to suggest mitigation measures where necessary.

1.1. The Site

The works are located at Carew Tidal Mill also known as the French Mill (Figure 1-1). Built around 1801, it is one of the oldest corn mills still powered by tidal water in Wales. The works will be focused within the below 4 setting out points (SOP) forming the corner extents of the Site.

- SOP1 – 204139, 203813;
- SOP2 – 204167, 203857;
- SOP3 – 204161, 203813; and
- SOP4 – 204178, 203853.

The Works are required to repair the walls of the causeway adjacent to the Millpond and remove/repair the channel sluice gates required under Section 10 and 11 of the Reservoirs Act 1975 to ensure the integrity of the causeway structure. Some of the works will be undertaken from the surface of the causeway around the perimeter of the Mill House and the remainder of the works will be to the vertical walls of the causeway.



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Figure 1-1 – Carew Mill and Sluice Gates

1.2. Previous Consultation

Past consultation on the method of works has been undertaken with Natural Resources Wales (NRW), at a site meeting on 25/7/17 and approved in a previous marine licence CML1736. This was undertaken due to the potential impact on marine ecology in the Millpond, specifically the tentacled lagoon worm, *Alkmaria Romijni*. Responses from this consultation are incorporated into the new method of works that follows.

2. Methodology

2.1. The Water Framework Directive (WFD)

The Water Framework Directive (WFD) 2000/60/EC is a European Directive. Its purpose is to establish a framework for the protection and improvement of inland surface waterbodies, estuaries, coastal waters and groundwater. The framework for delivering the directive in Wales is through Natural Resources Wales River Basin Management Plans (RBMPs), which requires water bodies to achieve both Good Chemical Status (GCS) and Good Ecological Status (GES). The RBMPs outline the actions required to enable natural water bodies to achieve GES. Artificial and Heavily Modified Water Bodies (AHMWBs) may be prevented from reaching GES due to the modifications necessary to maintain their function. They are, however, required to achieve Good Ecological Potential (GEP), through the implementation of a series of mitigation measures outlined in the RBMPs.

New activities and works that affect the water environment may adversely impact biological, hydro-morphological, physicochemical and/or chemical quality elements (WFD quality elements), leading to a deterioration in waterbody status. They may also render proposed improvement measures ineffective, leading to the waterbody failing to meet its WFD objectives for GES/GEP. Under the WFD, activities and works must not cause deterioration in waterbody status or prevent a waterbody

from meeting GES/GEP by invalidating improvement measures. A summary of key WFD objectives are presented in Figure 2-1.

WFD Objectives

The WFD is a European Directive which sets out a strategic planning process for the purposes of managing, protecting and improving the water environment. The main objectives of the WFD are to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- Aim to achieve at least 'Good Status' for all waters by 2015 (2021 or 2027) where fully justified within an extended deadline under Article 4.4;
- Promote sustainable use of water;
- Conserve habitats and species that depend directly on water;
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Help reduce the effects of floods and droughts.

NRW is responsible for implementing the WFD in Wales and monitors, advises and manages many aspects of the water environment through regulating discharges, abstractions and processing environmental permits and licences. NRW is committed to implement environmental improvements by reducing the physical impacts of flood risk management activities within artificial or heavily modified water bodies.

WFD Classification

The WFD classification for a defined waterbody is produced by the assessment of a wide variety of different 'elements' which includes:

- '*biological elements*' such as fish, invertebrates, phyto-benthos (which includes plants, macro-algae, phytoplankton);
- '*supporting elements*' that include chemical measurements such as ammonia, dissolved oxygen, pH, phosphate, copper, zinc and temperature; and
- '*supporting conditions*' (sometimes referred to as hydro-morphology) that assess the physical attributes of the waterbody such as 'quantity and dynamics of flow' and 'morphology'.

The assessment given for each element is also accompanied by a measure of certainty in the result. The status classification is published in the RBMP and provides a baseline condition against which compliance and future improvements can be measured.

WFD Compliance

There are three key objectives against which the impacts of proposed works on a waterbody need to be assessed to determine compliance with the overarching objectives of the WFD:

- Objective 1: The works will not cause a deterioration in any element of waterbody classification.
- Objective 2: The works will not prevent the WFD status objectives from being reached within the waterbody or other downstream water bodies.
- Objective 3: The works will contribute to the delivery of the relevant WFD objectives. In this case, it will be what contribution the works can make towards the waterbody reaching its objective GEP through planned RBMP mitigation measures.

Objective 1 and Objective 2 must be met to avoid infraction of the WFD. The delivery of the third objective is central to NRW's implementation of the WFD, where it can be supported through its operational activities. If it is considered that the works is likely to cause deterioration in waterbody status or prevent a waterbody from meeting its ecological objectives, then an assessment would be made against the conditions listed in Article 4.7 of the WFD. Article 4.7 can be invoked if; 'new modifications' are of overriding public interest and/or the environmental and social benefits of achieving the WFD objectives are outweighed by the benefits of the new modifications to human health, safety and sustainable development; there are no significantly better environmental options that are technically feasible or not disproportionately costly; and all practicable steps for mitigation have been taken.

Figure 2-1 - Background to WFD Assessments

2.2. Methodology of WFD assessment

NRW is the authority for WFD in Wales and has provided guidance on assessing impacts of new works. Although there is no prescribed template, some recommendations for WFD outline methodology can be found on the gov.uk website. This WFD assessment has been conducted with the following outline methodology:

- Proposed works and programme;
- Baseline WFD data collation;
- Screening of associated surface and ground water bodies;
- Identification of WFD elements which may be affected by the proposed works;
- Assessment of impacts on identified WFD elements against WFD status/objectives; and
- Provision of a WFD summary statement of compliance.

3. Proposed Works and Programme

3.1. Overview

The purpose of the project is to undertake small scale repairs to the historic causeway structure at the Site. Some of the works will be undertaken from the surface of the causeway around the perimeter of the Mill House and the remainder of the works will be to the vertical walls of the causeway.

Further details of the works required, and detailed design can be found in the following drawings, which were submitted as part of the Marine Licence application:

- 5129589.012-ATK-ZZ-ZZ-DR-D-001;
- 5129589.012-ATK-ZZ-ZZ-DR-D-002; and
- 5129589.012-ATK-ZZ-ZZ-DR-D-003.

Work is anticipated to commence in September 2020 and will continue into November 2020, taking approximately 8 weeks. If, for any reason, the works cannot be completed in this time period, they would take place in the following financial year; recommencing in April 2021 and completing in June 2021. There is a need to avoid any works during the peak summer tourist period.

3.2. Outline construction method

The following work activities are required:

- Activity 1 – Inspection of causeway masonry walls;
- Activity 2 – Carry out pointing repairs to masonry walls;
- Activity 3 – Carry out grouting repairs to masonry walls;
- Activity 4 – Install stoplog channels and stoplogs to drain the pond and remove sluice gates for repair; and
- Activity 5 – Reinstall the gates and remove stoplogs.

Activities 1, 2 and 3 will take place in a sequence at sections along the wall i.e. cleaning, inspection and repair in one area will be completed before moving on to the next area of wall.

Activities 4 and 5 are linked, as they enable to removal / replacement of the sluice gates.

3.2.1. Activity 1

The walls (3-4m height) will be cleaned by hand so that the joints in the masonry can be inspected and any voids identified for infilling. Any loose material or weeds growing in joints of the wall will be placed in buckets and removed to a skip located at the site compound. Waste materials will be removed to an appropriate licensed waste disposal site.

3.2.2. Activity 2

Voids identified during inspection will be hand repaired with like for like lime-mortar material. Existing drainage holes to the coping of the walls (above MHWS) will have new small cast iron (150mm size) flap valves affixed the walls.

The sequence of works is as follows:

- Mix lime mortar materials on the causeway (above MHWS) by hand in small quantities and place into buckets; and
- Place a 1m strip of plastic sheeting on the river-bed, to catch falling mortar materials used in repointing. Plastic sheeting and waste materials will be removed at the end of each working day and placed in the skip.
- Hand-fill voids with lime mortar.
- All unused lime mortar will be removed from site and disposed of to the skip in the site compound. Hand tools and equipment will be collected and taken to the site compound to be cleaned.

3.2.3. Activity 3

Any identified larger voids will be infilled by pressure grouting. Holes of 35mm will be drilled into the existing masonry to reach the voids in the walls. Tubes will be placed into the drilled holes and concrete grout pumped under moderate pressure to infill the voids and stabilise the walls.

The sequence of works is as follows:

- Drill horizontal holes using a hand drill of 35mm diameter and up to ~400mm depth in mortar joints (avoiding stone) for placing horizontal grout pipes;
- Place tubes into the drilled holes; and
- Pump lime-based grout through grout pipes to fill voids in wall. The grout materials will be discharged from the causeway above through a grouting pipeline (35mm size pipe) under controlled pressure using a compressor.
- The process of using plastic sheeting as discussed in Section 3.2.2 will be applied here whilst larger voids are filled. Leakage of grout is rare in these circumstances, however, if leakage occurs all grout pumping will stop and leaks plugged with hand applied mortar. The mortar will be allowed to set before further attempts at grouting are made. Grout pipes will be removed on completion.

3.2.4. Activity 4

The sluice gates currently in place are mitre gates which allow the water to flow upstream but prevents water travelling downstream during low tide as the gates self-close retaining water in the Millpond. By removing the gates, water is able to flow freely in both directions, both filling and emptying the pond (twice daily) as the tide rises and falls.

In order to enable safe access to the wall for inspection and repairs, a stoplog system to control water levels in the Millpond will be installed. The channels holding the stoplogs will be new permanent structures. Stoplogs can be added / removed to the channels to retain / exclude water from the Millpond as required for these works, and any future repairs that may be needed. The installation and use of the stoplog system will enable a controlled temporary change to the hydrological regime in which the sluice gates hold water upstream of the causeway, forming the Millpond (a Saline Lagoon).

The stoplog channels will be installed in the channel upstream of the sluice gates, creating a weir that allows water to overtop the stoplogs during a rising tide, but preventing water travelling back downstream.

Once the stoplogs have been installed, the gates will be removed and sent off-site for repair.

Once the gates have been removed, the stoplogs will be removed from the channels to allow the pond to drain. The stoplogs will then be replaced in advance of the incoming tide to prevent water from entering the pond and enabling safe, dry access to the wall for the repairs.

The stoplogs will only exclude the tide during neap tides, which occur every other week. Spring tides will overtop the spillway and the pond will naturally fill. This means that the Millpond will only be dry for up to a maximum of seven days, allow the pond mud to regain some moisture and protect the worm habitat.

3.2.5. Activity 5

Stoplogs will be installed in the stoplog channels to allow the gates to be reinstalled once they have been repaired. Once reinstalled, the stoplogs will be removed and the sluice gates will operate as before, allowing the Millpond to refill.

3.2.6. Plant, machinery and vessels

No vessels are required for the Works, all work will be undertaken using land-based machinery. The works will be undertaken using medium or small sized construction equipment such as mini-excavators, excavators and tipper-dumpers, in addition to manual labour for handling materials and repointing works. All works are to take place out of the water column and will occur either at low tide or while stoplogs are in place to exclude water from the working area (See example Figures below).



Figure 3-1 - 6T All Terrain tipper-dumper



Figure 3-2 - JCB 3CX back-actuated excavator and shovel

3.2.7. Site Access

The main access to the Site will be via Castle Lane, which is connected to the A4075. Access to the gates will be via the causeway running alongside the Mill and the temporary removal of the disabled access ramp to the Mill Shop (See Figure 3). Walls will be accessed from the top of the causeway, or via ladders for lower parts of the wall.



Figure 3-3 - Site access via the causeway and temporary removal of the disabled ramp (far end)

A site compound will be located in the small PCNPA depot in Castle Lane. This will reduce the number of vehicles required to drive down to the mill itself. Deliveries will be to the site compound.

3.3. Operation

Operation of the Works will commence as soon as the Works are completed. No further works are expected once the site is in operation. Once established, the Site will be taken over by PCNPA.

3.4. Decommissioning

There are no plans to decommission the Works. They are permanent works required to maintain the Mill and the Millpond.

4. WFD Baseline

Carew Mill is situated in the Western Wales River Basin District. The management strategies for the district are stated in the Western Wales River Basin Management Plan (NRW, 2020). River basin management is a continuous cycle of planning and delivery. The first RBMP was published in 2009 and set out the management plan for the first six years 2009-2015 (Cycle 1). The plan was updated in 2015 to cover the second period 2015-2021 (Cycle 2) and will be updated again in 2021. The purpose of the management plan is to protect and improve the water environment for the wider benefits to people and wildlife.

Data obtained from NRW Water Watch Wales Map Gallery (Natural Resources Wales, 2020) and DEFRA's Magic Map (DEFRA, 2020) was used to determine this WFD baseline, including any surrounding protected sites. A 2 km buffer around the central search point (Grid Ref: SN04170385) of the Site was used, as per guidance provided by NRW.

4.1. Surface Waterbodies

Carew Mill is located in the 'Cleddau and Pembrokeshire Coastal Rivers' catchment and the surrounding designated water body is the 'Milford Haven Inner' (ID: GB531006114100). This waterbody is classified as a transitional waterbody, approximately 21 km² in size and is currently achieving 'Moderate' overall water quality status. As the works lie directly in the boundary of this designated waterbody, it has been **screened in** for further assessment.

The Cleddau and Pembrokeshire Coastal Rivers catchment also contains the 'Carew - HW to conf with Carew Tidal Millpond' (ID: GB110061031210), a river waterbody approximately 1 km upstream of the Site, and the 'Milford Haven Outer' (ID: GB641008220000), a coastal waterbody approximately 10 km downstream from the Site. The extents of the 'Carew - HW to conf with Carew Tidal Millpond' waterbody do not include the actual Millpond which is to be drained, and is also not tidally influenced. Due to this, the distance from the Site and the localised nature of the Works, it is deemed unlikely that there will be any impacts on either of these waterbodies and therefore, they have been **screened-out** from further assessment.

The above water bodies classifications for Cycle 1 and Cycle 2 are summarised in Table 4-1 below.

Table 4-1 - WFD Baseline Information (Natural Resources Wales, 2020)

Name	Type	HMWB	Waterbody ID	Area (km ²)	Protected Area Designation	Overall Status Cycle 1	Overall Status Cycle 2
Milford Haven Inner	Transitional	No	GB531006114100	21	SAC	Moderate	Moderate
Carew - HW to conf with Carew Tidal Millpond	River	No	GB110061031210	5 km (Length)	N/A	Good	Good
Milford Haven Outer	Coastal	No	GB641008220000	35	SAC, Bathing Water	Moderate	Moderate

4.2. Ground Waterbodies

The surrounding ground waterbody is the 'Pembrokeshire Carboniferous Limestone' (ID: GB41002G206000), approximately 336 km² in size and is currently achieving 'Good' overall quality status (See Table 4-2). Groundwater is present at very shallow depths, at or immediately below the ground surface, and is expected to be tidally influenced. However, as none of the proposed works includes; dredging or depositing of sediment, which may cause disturbance to the river or lagoon bed, it is deemed unlikely that there will be any impact to the ground waterbody and therefore it has been **screened-out** from further assessment.

Table 4-2 – WFD Ground Waterbodies Baseline Information (Natural Resources Wales, 2020)

Name	Type	Waterbody ID	Area (km ²)	Overall Status Cycle 1	Overall Status Cycle 2
Pembrokeshire Carboniferous Limestone	Groundwater	GB41002G206000	336	Good	Good

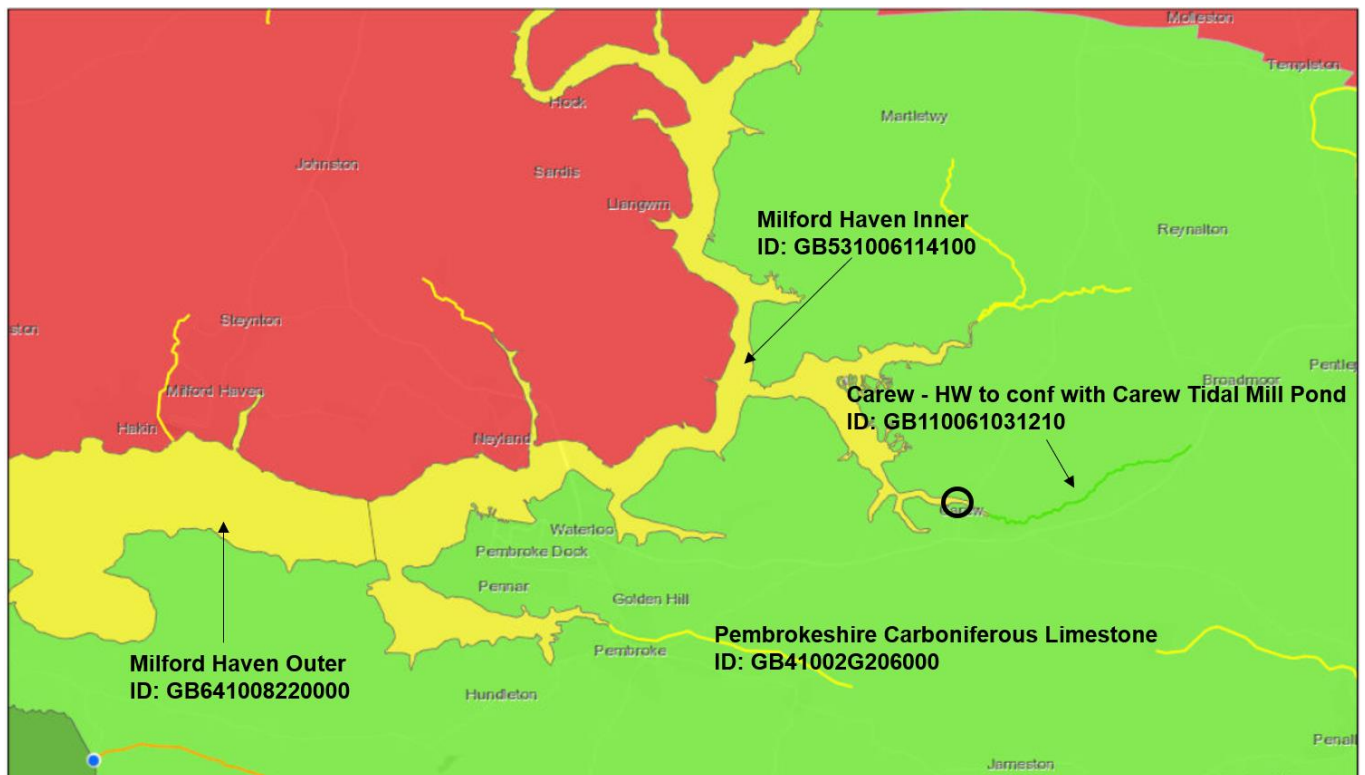


Figure 4-1 - Map of Waterbodies and Site Location (Circled Black) (Natural Resources Wales, 2020)

The following waterbody has been screened-in for further assessment:

- Milford Haven Inner (ID: GB531006114100)

4.3. Milford Haven Inner

Milford Haven Inner is not a AHMWB and therefore is not required to be assessed for mitigation measures. The overall status for the waterbody has been assessed as 'Moderate', with ecological status as 'Moderate' and chemical status as 'Fail'. Localised evidence from WFD monitoring suggests this is due to hyper-nutrification from dense growth of opportunistic macroalgae species

in some areas and Dissolved Inorganic Nitrogen (DIN) achieving 'Moderate' classification (NRW, 2020). A summary of the WFD status classification is provided in Table 4-3.

Table 4-3 – WFD Status –Milford Haven Inner (Natural Resources Wales, 2020)

Waterbody: – Milford Haven Inner, transitional waterbody		
Overall status: Moderate		
Ecological status: Moderate		
Chemical status: Fail		
Mitigation measures: Not Assessed		
Biological quality elements	Physico-Chemical quality elements	Hydro-morphological supporting elements
Fish: Good	Temperature: Not Assessed	Hydrological Regime: Supports Good
Invertebrates: Good	pH: Not Assessed	HMWB: No
Macroalgae: Moderate	Dissolved oxygen: High	Morphology: Supports Good
Phytoplankton: High	Phosphate: Not Assessed	
	Copper: Good	
	Zinc: Good	
	Arsenic: Good	
	Iron: Good	

4.4. Statutory Designations

To understand the wider impacts on surrounding protected areas and their features, a site check was performed on Defra's MAGIC map service (DEFRA, 2020), the Welsh governments open-source spatial platform – Lle (Welsh Government, 2020) and NRW Water Watch Wales Map Gallery (Natural Resources Wales, 2020). A 2 km buffer was used, however, a sense-check on designations outside of this boundary was carried out in case mobile and/or migratory species features could be present. The following statutory designations are located in a 2km vicinity of the works.

- Pembrokeshire Marine / Sir Benfro Forol Special Area of Conservation (SAC);
- Pembrokeshire Bat Sites and Bosherton Lakes / Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherton SAC; Milford Haven Water Site of Special Scientific Interest (SSSI); and
- Carew Castle SSSI.

Under the WFD and government guidance, assessment is to be carried out on any designated Natura 2000 conservation sites defined under European legislation, which includes the Two SACs. Any additional features of the two SSSIs which are not designated as part of the SACs, were also considered. However, neither SSSI has additional features which are likely to be impacted by the works, mainly due to the inhabitable environment, localised nature of the works, and / or the salinity tolerances of those habitats / species.

Carew Tidal Mill is located in one of the most upstream ends of the Pembrokeshire Marine SAC which covers an area of 1,380 km² and has been selected for the presence of 8 marine habitat types and associated Annex II species from the Habitats Directive as summarised in Table 4-3.

Pembrokeshire Bat Site and Bosherton Lakes is located approximately 200m upstream of Carew Mill and covers an area of 1.2 km², which mainly consists of the grounds of Carew Castle (JNCC, 2020). Bat usage of the Castle is well known, with some areas being out of bounds for visitors to avoid disturbing the bats.

Table 4-3 – Surrounding European designated sites and their qualifying features

Site Name	Designated Features	Conservation Objectives
Pembrokeshire Marine / Sir Benfro Forol SAC	Habitats: - Sandbanks which are slightly covered by seawater all the time; - Estuaries; - Mudflats and sandflats not covered by seawater at low tide; - Coastal lagoons; - Large shallow inlets and bays; - Reefs; - Submerged or partially; - submerged sea caves; and - Atlantic salt meadows. Species: - Grey seal <i>Halichoerus grypus</i>; - Shore dock <i>Rumex rupestris</i>; - Otter <i>Lutra lutra</i>; - Allis shad <i>Alosa alosa</i>; - Twaite shad <i>Alosa fallax</i>; - River lamprey <i>Lampetra fluviatilis</i>; and - Sea lamprey <i>Petromyzon marinus</i>.	‘Conservation objectives are required by the 1992 ‘Habitats’ Directive (92/43/EEC). The aim of the Habitats Directives is the maintenance, or where appropriate the restoration of the ‘favourable conservation status’ of habitats and species features for which SACs and SPAs are designated.’ See individual links for further details. Pembrokeshire Marine
Pembrokeshire Bat Sites and Bosherton Lakes / Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherton SAC	Habitat: - Hard oligo-mesotrophic waters with benthic vegetation of Chara species. Species: - Greater horseshoe bat <i>Rhinolophus ferrumequinum</i>; - Lesser Horseshoe bat <i>Rhinolophus hipposideros</i>; and - Otter <i>Lutra lutra</i>.	Pembrokeshire Bat Sites and Bosherton Lakes

The main source of impact from the works will be from the draining of the Millpond. The majority of the features of the Pembrokeshire Marine SAC are extremely unlikely to inhabit or be found in the Millpond. It is possible for shad species to migrate up to 800 km upstream to spawn (JNCC, 2020). However, they are not known to traverse obstacles and prefer gravelly sites to spawn. The muddy substrate around the Site is not suitable and therefore impacts to shad are unlikely. Past site visits have determined no Otter holts (dens) in the area, and no disturbance to the embankments is expected, as works are confined to the walls and causeway.

The designated features of Pembrokeshire Bat Sites and Bosherton Lakes SAC located upstream of the Site, specifically the Bat species, are unlikely to be impacted by the works as all proposed works are to be carried out during daylight, with minimal noise and / or light disturbance. The walls and causeway are not likely to provide bat roosting habitat.

Therefore, the surrounding statutory designated sites of Carew Tidal Mill have been **screened-out** from further assessment.

4.5. Protected Areas and Sensitive Habitats

WFD protected areas and sensitive habitats within the area need to be considered and are summarised in Table 4-4 (See Figure 4-2).

No bathing and/or drinking water protected areas were found within the 2 km buffer of the Site. The closest Bathing Water Protected Area (BWPA) is 'Sandy Haven' approximately 17 km Northwest from the Site. The closest drink water protected area (DWPA) is 'Penglyn Brook - HW to tidal limit, Cleddau Estuary' approximately 8 km Northeast from the Site.

Table 4-4 - Summary of WFD Sensitive habitats and Protected Areas

WFD Protected Areas and Habitats	Location in relation to the Site
Special Area of Conservation (SAC)	The Works lie in the Pembrokeshire Marine SAC and approximately 200m East of the Pembrokeshire Bat Sites and Bosherton Lakes SAC.
High Sensitivity	There are small scattered areas of Saltmarsh along the river embankments around the Site, with the largest area being approximately 800m from the Site. Saltmarsh often plays an important role in the structural composition or stability of the seabed and provides semi-sheltered areas for some species (Wildlife Trusts, 2020).
Low Sensitivity	Areas of the following lower sensitive habitats are located in 2 km Site. See Figure . • Rocky shore • Subtidal Soft Sediment • Intertidal Soft Sediment

The main source of impact of the sensitive habitats comes from pollution spills and increased sedimentation. However, as discussed in Table 5-1, the likelihood for these impacts to occur with the suitable mitigation measures employed throughout the Works is minimal. Furthermore, due to the distance of the Site from the protected areas, there is little to no risk of the proposed works impacting them and so they have been **screened-out** from further assessment.

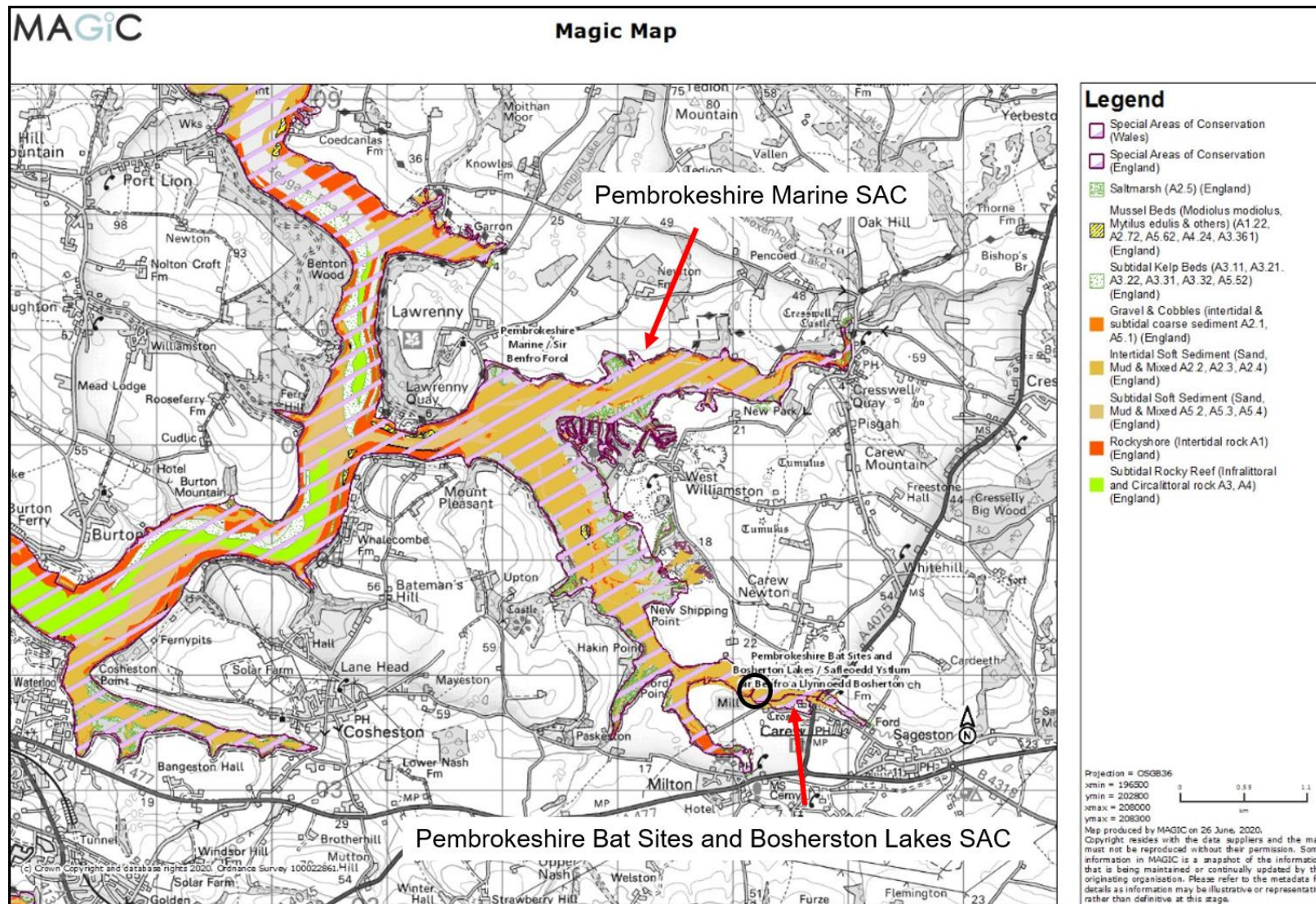


Figure 4-2 – Surrounding sensitive habitats and designations of the Carew Tidal Mill Site (Circled black) (DEFRA, 2020)

5. WFD Assessment

The following table - Table 5-1, presents the results of the preliminary WFD assessment for the Milford Haven Inner waterbody.

Table 5-1 Assessment of impacts on waterbody quality elements of the Milford Haven Inner waterbody

Biology	Physicochemical	Hydro-morphological Supporting Elements	Mitigation Measures that will be employed throughout the works
Fish fauna: Species composition and abundance; Presence of type-specific disturbance sensitive species; Age structure of fish communities. Benthic invertebrate fauna: Composition; Abundance. Macroalgae and phytoplankton: Taxonomic composition; Average macroalgae and phytoplankton abundance.	Salinity, Nutrient concentrations, pH, Oxygen balance; Acid neutralising capacity, Temperature, Transparency. Pollution by all priority substances identified as being discharged into the waterbody. Pollution by other substances identified as being discharged in significant quantities into the waterbody.	Hydrological regime: Quantity and dynamics of water flow. Morphological conditions: water column depth variation; Structure and substrate of the river bed.	
Assessment of Impact	Assessment of Impact	Assessment of Impact	
During previous consultation as discussed in Section 1.2, assessment of impacts were raised regarding the tentacled lagoon worm, <i>Alkmaria romijni</i>, and the potential drying out of the mudflats. NRW reported the Millpond as having patchily dense oligochaete worms, including low population numbers of the tentacled lagoon worm (NRW, 2018). The method of works has been updated to ensure efficient flooding of the mudflats including spill over during Spring tides so that the Millpond will only be left dry for a maximum of, up to 7 days, allowing sufficient hydration for the Tentacled Lagoon Worm communities. All repair works will be undertaken during neap tides or at the surface, away from tidal reaches and in a limited timeframe. Therefore, as there are limited pathways between the Works and the waterbody when the works are proposed to take place, no impacts on biological elements are expected.	As shown in Table 4-3, the Milford Haven Inner waterbody has had ‘Fail’ chemical status since 2015. WFD monitoring has recorded the reason for this to be Tributyltin levels along with ‘Moderate’ Dissolved Inorganic Nitrogen levels (DIN). Dissolved Oxygen has been assessed as ‘High’. Temperature and pH have not been assessed. All trace metals have been assessed as ‘Good’. The proposed works are not expected to disturb any dormant contaminants back into the water column as no dredging or depositing of sediment is proposed and the majority of the works will be carried out at the surface or during low tide / areas from which the tide has been excluded. Once the tide starts to rise any disturbance on the mudflats from work carried out on the walls of the dam will be minimal. The works will not affect DIN levels. There is potential for pollutants such as fuel/oil from machinery and concrete to leak onto the mudflats during the works. However standard good practice measures have been considered in the Mitigation Measures section to reduce these impacts including; the use of bio-degradable fuel, spill kits no fuelling allowed alongside the Mill. All appropriate mitigation measures will be in place and deployed during the Works to minimise any pollution risks.	The Milford Haven Inner waterbody has ‘Supports Good’ status for both morphological conditions and hydrological regime since 2015. The type of works are expected to have minor temporary changes to the hydro-morphological supporting elements of the waterbody, with the removal of the sluice gates and use of the stoplogs. However, this will be short temporary changes and will revert to the current regime once the works are complete. The Works will also enhance the stability of the walls and life expectancy of the sluice gates, which provides benefits to the users of the Carew Tidal Mill and will come at a greater cost if not repaired.	- Working during daylight hours, during low tide / areas from which the tide has been excluded and outside busy summer months; - A toolbox talk will be given to contractors prior to the start date in order to inform contractors of the sensitive habitat and the limitations on access and working areas within the Millpond. - Use of bio-degradable fuels, well-maintained equipment and spill kits provided for fuel/oil leaks. Plant and machinery will be switched off when not in use; - No materials to be stored in the intertidal area. - General measures to avoid or alleviate negative impacts on ecological receptors such as following the Pollution Prevention Guidelines, and the Construction Industry Research and Information Association (CIRIA) guidance on the control of water pollution from construction sites; - All equipment and materials used will be in a clean condition prior to their arrival on site, and on removal from site, to minimise risk of introducing INNS into the marine environment. - Raise awareness of the presence of otters (no holt in vicinity).
The potential for the proposed works to result in deterioration to the biological quality elements is considered NEGLIGIBLE.	The potential for the proposed works to result in deterioration to the physicochemical quality elements is considered NEGLIGIBLE.	The potential for the proposed works to result in deterioration to the hydro-morphological supporting elements is considered NEGLIGIBLE to MINOR.	

6. Summary

This preliminary WFD Assessment has evaluated the proposed works at Milford Haven Inner waterbody (ID: GB531006114100), against the biological, physicochemical and hydro-morphological elements of the WFD and potential impacts on the surrounding protected areas, sensitive habitats and statutory designated sites. Based on the information available and considering the mitigation measures which will be employed throughout the Works, the Works is expected to have a NEGLIGIBLE impact on the biological, physicochemical and hydro-morphological quality and supporting elements of the WFD waterbodies and is therefore WFD compliant.

The implementation of the repair works will prevent further deterioration to the Carew Tidal Mill wall and sluice gates, supporting the ongoing operation and recreational use of a unique historic site.

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