Note

HaskoningDHV UK Ltd.
Industry & Buildings

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Our reference:	PB9014-RHD-BW-XX-FN-C-0136
Classification:	Project related

Subject: **Holyhead Breakwater Refurbishment Options and Impacts to Heritage Significance**

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1 Introduction

The Port of Holyhead is situated on Holy Island off the North West Coast of the Isle of Anglesey, close to the North Wales mainland. The harbour, which provides shelter for the port and leisure facilities including a marina, is provided by the Holyhead breakwater which is 1.5 miles (2.4km) long, is considered the longest breakwater in Europe and is protected by CADW as a Grade II* structure. A Grade II listed lighthouse is also located at the head of the breakwater.

An aerial view of the Holyhead harbour is shown in Figure 1.

Figure 1: Aerial view of Holyhead harbour (© Holyhead Port Authority)

The Holyhead breakwater was constructed between 1848 and 1873 to act as a Harbour of Refuge which can be accessed during all weather conditions and at all states of the tide. The breakwater currently provides refuge to cruise ships and coastal vessels such as ferries, fishing vessels and pleasure crafts. In addition, it is a considerable amenity to the local population and provides recreational value in addition to fulfilling a coastal and flood risk protection function to coastal amenities and parts of Holyhead town.

Although the breakwater has been subject to ongoing, regular maintenance, considerable wave action has led to movement of the rock blocks that make up the rubble mound foundation, and damage to the vertical blockwork of the superstructure. Whilst the current maintenance programme provides a temporary solution

to the problem, the likelihood of a failure of the breakwater during more frequent but less severe storm events increases with time. A more permanent solution is, therefore, required in order to secure the longevity of the breakwater as both a nationally important heritage asset and for its essential role as part of the Port's infrastructure.

Pre-application consultation advice received from the Gwynedd Archaeological Planning Service (GAPS), the autonomous planning service of Gwynedd Archaeological Trust (GAT), has drawn attention to three areas of potential archaeological impact for the proposed work:

1 Physical (direct) impact to the breakwater itself;

2 Visual impacts, i.e. change in appearance of the breakwater which could results in an impact to the setting of the breakwater and the lighthouse and other coastal heritage assets; and

3 Direct impact to archaeology in the vicinity of the breakwater during pre-construction investigations and construction works.

Following a request for a screening opinion from Natural Resources Wales (NRW) and Isle of Anglesey County Council (IoACC), it has been concluded that the breakwater refurbishment project will require an Environmental Impact Assessment (EIA). The EIA will include an assessment of potential impacts to archaeology and cultural heritage, with specific consideration of the areas of potential impact raised by GAPS.

In 2017, GAT completed a comprehensive building record (Level 4) commissioned by Royal HaskoningDHV, which will provide baseline information to inform consideration of Point 1 and Point 2. Settings impacts are also being considered with respect to visual impact assessment, supported by photographs and viewpoints from/to the lighthouse, breakwater and further coastal heritage assets, being prepared by DRaW (UK) Ltd on behalf of Royal HaskoningDHV. A Heritage Statement, based upon the EIA baseline and impact assessment, prepared by Royal HaskoningDHV will also be issued in support of an application for Listed Building Consent to IoACC.

In order to inform appropriate consideration of heritage impacts, and any requirements for additional mitigation, as part of the design of the scheme, early consultation with IoACC, Cadw and the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW, with specific respect to Point 3) will be essential. This note has, therefore, been prepared to present a preliminary review of heritage considerations, with specific reference to the selection of the proposed option for refurbishment of the breakwater, to inform consultation with heritage stakeholders.

2 Breakwater Design

Details of the construction of the breakwater are recorded in a paper entitled 'Holyhead New Harbour' by Hayter and published by the ICE in 1876. The paper provides information concerning the design and construction of the breakwater and notes key decisions that were made to determine the final alignment.

The original accepted plan for the harbour was to provide protection by constructing a 1.63km long northern breakwater extending in an easterly direction from Soldier's Point and a 610m long eastern breakwater extending in a northerly direction from Salt Island to Platters and Skinners Rocks. Both these breakwaters would have provided an enclosed area of 1.1km^2. However, the east breakwater was abandoned due to the decision to principally operate as a harbour of refuge rather than to accommodate quay side facilitates such as a packet pier. The start of the east breakwater is still evident at Salt Island.

Although during the design stage, it was felt that the original plan would provide sufficient capacity for the harbour, it soon became apparent as the construction of the north breakwater neared completion that it would prove too small to act as a harbour of refuge given the number and frequency of incoming vessels. Given this, the then harbourmaster requested the Lords of Admiralty to increase the length of the northern breakwater by a further 760m to form a total length of 2.4km from the shore, which would more than double the capacity of the harbour whilst providing deep water for larger vessels. However, rather than simply continuing the breakwater in a due east direction, it was decided that the extension of the breakwater would dogleg to take a north-easterly direction in order to shelter a greater area and to enable vessels to more easily access the harbour.

The breakwater is typical of one built during the Victorian period and consists of a mound of rubble stone (hereon known as 'rubble mound'), upon which is erected a substantial stone superstructure (hereon known as the 'superstructure'), the end of the breakwater being terminated by a head, on which sits a Grade II Listed lighthouse. A cross-section of the breakwater, taken from Hayter's Paper, is reproduced in Figure 2.

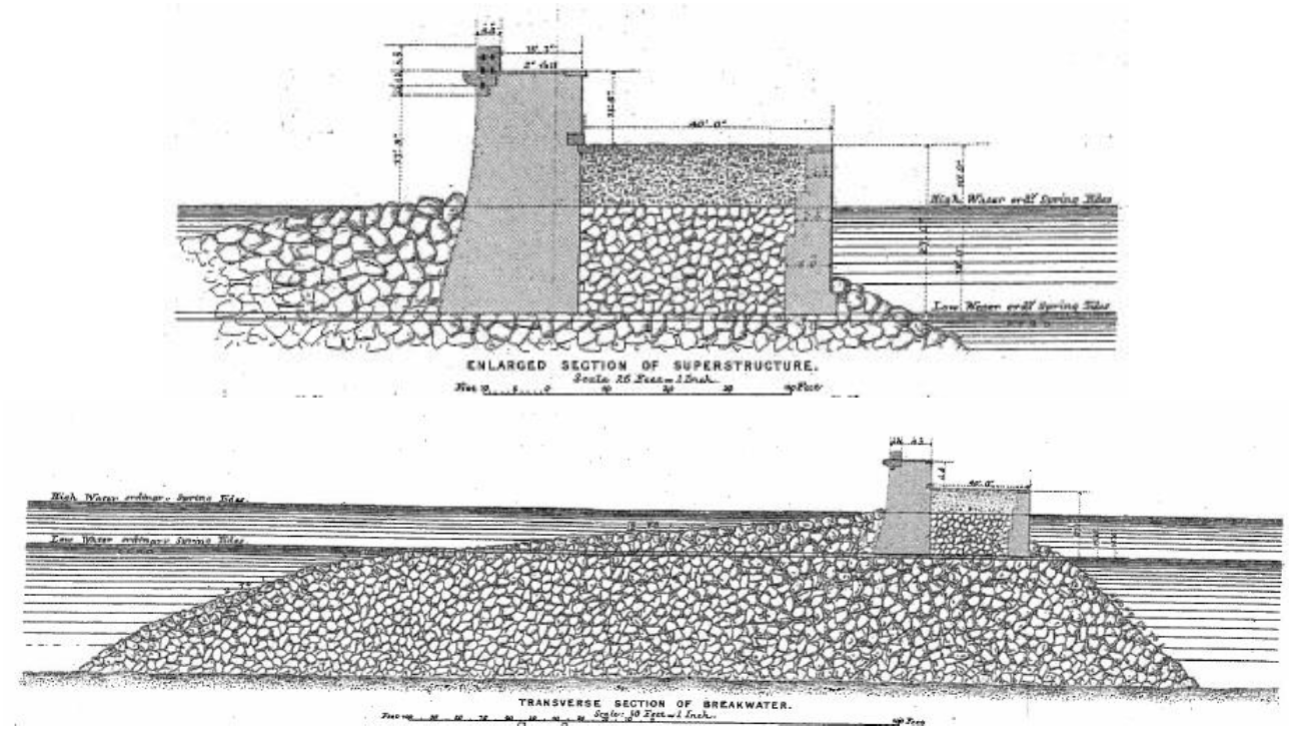

Figure 2: As built cross-section through Breakwater (Hayter, 1876)

The construction of the rubble mound was formed by dumping a large quantity of rock and using the natural processes of the sea this rock was moved around by the action of waves. The rock was then regularly replenished until the sea shaped the rubble mound to the form required. The completed rubble mound contained some 7 million tonnes of quartzite that was quarried from the nearby Holyhead Mountain.

Once the rubble mound had been formed, and consolidated by the natural processes of the sea, the superstructure was built along the rubble mound crest. The superstructure consisted of a solid sea wall of masonry, built principally of larger quartz rock (individual units weighing up to 15ton), again quarried from the Holyhead Mountain, and set in lias-lime mortar. The foundation of the superstructure approximates to

0.0mCD and was placed following the excavation of loose rock along the crest of the mound. The top of the sea wall is at 12mCD which is further increased to 13.2mCD by the use of a parapet structure. The sea wall supports a 12.2m wide promenade road-way which is also supported by a lee side retaining wall, which is founded at 0.0mCD. The promenade and the top of the lee wall are set at a level of 8.5mCD. The space between the sea wall, lee wall and promenade surface is filled with a layer of stone placed on a loose stone core material. The plinths, cornices, parapets, paving, coping and other ashlar works are constructed from Anglesey limestone.

The head at the seaward end of the breakwater is a structure 45.7m (150ft) long and 15.2m (50ft) wide. It is founded on the rubble mound at -5.8mCD and is mostly built of ashlar masonry using stone that is partly Runcorn sandstone and partly Anglesey limestone set dry below MLWS or Anglesey limestone set in mortar above MLWS.

3 Management Regime

Stena Line Ports Limited (Stena) owns and is responsible for the management of the breakwater, having acquired the asset from Sealink (previously British Rail) in 1993. Stena has the power to raise funds for the maintenance and up-keep of the breakwater through port dues and through grants and awards.

As part of the Project Appraisal Report (PAR) study undertaken in 2016/2017, records dating back to 1960 were reviewed and they indicated that the breakwater has been subject to a prolonged period of a planned maintenance, which has generally included the strategic replenishment of large quantities of rock to the rubble mound and other major repair work such as making good of holes which appear in the masonry face of the structure and general re-pointing. Indeed, records indicate that 3,000 to 4,000 tonnes of rock was tipped on the rubble mound each year between 1967 and 1976 (note that records of the quantities of rock tipped outside of this period was not available). The source of this rock is understood to be Holyhead Mountain but when the quarry closed down rock was sourced from much further afield namely Beshesda slate quarries and Penamanemawr granite quarries.

Due to financial constraints (mainly due to the significant increases in rock transportation costs), Sealink Ports Ltd took the decision in 1984/1985 to abandon the planned rock replenishment programme, although the level of maintenance had actually been diminishing for a number of years beforehand. Contrary to popular belief the rock replenishment programme ceased some 5 years before Stena Line become involved in the Port. It is to be noted that up until 1985 the Port owners were British Rail (the State), In 1984 the Port was sold to Seacontainers Ltd who then sold the Port to Stena Line Ports Limited on 9th April 1990.

Since 1985, when the port was transferred to the private sector, there has been ongoing maintenance of the superstructure (e.g. repairing cavities in the superstructure as and when they appear and general re-pointing) at a cost of approximately £210k/year. This maintenance regime generally consists of impromptu walk over inspections during spring/early summer to identify areas of winter damage to the superstructure then to remedy as part of a maintenance programme carried out during the summer months. The £210k/year budget is clearly insufficient to keep up with the rate of deterioration of the superstructure / rubble mound. Since taking ownership of the Port in 1990 Stena has carried out a number of detailed surveys of the breakwater and its rubble mound and has commissioned several studies in order to gain a better understanding of the structure and its weaknesses.

4 Historical Problems

Since its construction in the 1870's, Holyhead Breakwater has suffered from inherent weaknesses in its initial design and construction. The quartz rock used to form the original rubble mound was unsuitable by modern standards for use in the harsh marine environment, suffering relatively rapid attrition. This led to a reduction in stone size in the rubble mound and subsequent mobility of the rock along and away from the breakwater.

The removal and re-distribution of significant quantities of rubble mound material increases the depth in front of the structure. This allows larger wave heights to impact on the front face of the masonry superstructure, causing damage to the masonry and accelerates the attrition of the rubble mound rock. This leads to a viscous cycle, whereby initial damage to the mound leads to bigger waves which cause more damage to the mound.

Deterioration of the mound on the seaward side is concerning because the rubble mound protects the footing of the masonry wall, which is instrumental in reducing overtopping, breaking waves and preventing a breach of the breakwater.

In addition, the slope of the rubble mound on the leeward side was constructed at a relatively steep angle. Therefore, the exposure of the toe and subsequent collapse of the leeward side masonry wall has historically been a threat to the continued service of the structure.

Various studies and reviews of the breakwater over time have identified concerns about the loss and re-distribution of material from both the toe and crest of the rubble mound. These concerns apply to both the seaward side and leeward side of the breakwater.

5 Management Options

The breakwater's function of providing shelter to Holyhead Harbour is fulfilled, in most part, by the blockwork superstructure and this structure must be capable of withstanding storm waves.

The long-term future of the superstructure is dependent on maintaining its integrity and a secure foundation. It derives strength as a coherent structure and will always be vulnerable to rapid deterioration if local damage such as missing pointing between blocks or slabs it is not maintained or if dislodged blocks are not made good.

The critical aim for any breakwater management strategy is to maintain the integrity of the superstructure and is all about raising the threshold of storm severity that will cause damage, by making it difficult for waves to disrupt the structure, relieving wave loads on the structure and protecting the foundation.

A number of management options were considered as part of the PAR and Outline Business Case (OBC) study in 2016/17. These management options are outlined below for both the seaward and leeward side:

Seaward Side:

- "Do Nothing" – baseline case where existing structure is allowed to deteriorate over time;
- "Do Minimum" – Continue the existing maintenance strategy for the existing structure;
- "Do Something" (various options):
    - Option S3 – Reinforce or strengthen the existing superstructure;
    - Option S4 – Provide detached breakwaters / offshore reefs to reduce the waves impacting the superstructure;

- Option S5 – Restore rubble mound with robust rock armour to a suitable level to create a "wave dissipating beach";
- Option S6 – Provide armoured slope to seaward face of superstructure to reduce wave impact forces and wave overtopping;
- Option S7- Periodic Replenishment of the Rubble Mound.

Leeward Side (harbour):

- "Do Nothing" – baseline case where existing structure is allowed to deteriorate over time;
- "Do Minimum" – Continue the existing maintenance strategy for the existing structure;
- "Do Something" (various options):
  - Option L3 – Construct rock groynes to reduce loss of rubble mound due to alongshore transport of material along the leeward side of the superstructure;
  - Option L4 – Restore rubble mound to original levels using robust rock armour;
  - Option L5 – Restore rubble mound to original levels using concrete mattresses;
  - Option L6 – Periodic Replenishment of the Rubble Mound.

The PAR study assessed each of these options and the conclusion of the OBC study was that the preferred options for the seaward and leeward sides were selected considering a balance across all the appraisal categories (technical, environmental, economic, and they aligned with the Well-Being Act and Critical Success Factors).

The preferred option selected for the seaward side is Option S6: Lower crest armoured slope, as it is the most economically attractive option that does not have significant uncertainties or risks associated with its ability to perform the function of protecting the superstructure of the breakwater over the full 100-year appraisal period. Environmentally this option minimises the effect on the area's visual setting and benthic habitats.

On the leeward side Option L5: Restore mound using concrete mattress, has the highest benefit-cost ratio, performs the best technically, has the best alignment with the Well-Being Act and Critical Success Factors, and environmentally is considered the best option.

6 Preferred Option

Although the preferred option for both the seaward and leeward side were chosen on the grounds of balancing the appraisal objectives, clearly one of the main drivers for the solution which has recently been developed into a workable construction scheme is the engineering performance of the scheme relative to any other option that could have been considered.

As mentioned above, there are a several issues with the Holyhead breakwater which stem from its initial design and construction. The main issue affecting the performance of the Holyhead breakwater today is the lowering of the rubble mound on the seaward side due to wave attrition, which is reducing the stone size and allowing this material to be moved by the everyday wave and tidal conditions. The same process is also happening on the leeward side to a lesser extent because the tidal currents and wave climate in this region is less. Clearly as the rubble mound lowers, then the wave climate becomes large and this exacerbates the situation.

The other issue that the Holyhead Breakwater suffers from is the ongoing deterioration of the masonry superstructure due to the large waves crashing into the front face of the structure. These waves create impulsive wave conditions, which effectively means that the wave is thrown vertically upwards due to the violent action of the waves crashing into the superstructure. This phenomenon creates large wave forces,

which can damage the pointing between the blocks and under certain circumstances can cause a block to pop out or be dislodged particularly at the crest of the superstructure.

The violent action of the waves on the seaward side of the Holyhead Breakwater can been seen on any windy day when sheets of water are thrown up and over the superstructure and land on the structure behind. Under extreme storm conditions this phenomenon looks very spectacular but is extremely dangerous for anyone on the breakwater and can lead to significant damage to the superstructure. The photograph below shows the water being thrown vertically and then over Holyhead Breakwater during Storm Doris on 23rd February 2017.

Figure 3: Storm Doris (23 February 2017) (Copyright DJ Photography)

To prevent the rubble mound from lowering anymore and eventually leading to the catastrophic failure of the masonry superstructure, it is important to hold as much of this this rubble mound material in place. To achieve this some form of additional layer needs to be placed over the rubble mound on the seaward and leeward side.

The historical solution has been to replenish the rubble mound with any rock material that is available locally to maintain the level of the mound at or close to the high-water level. This means given the lack of replenishment for many years that significant quantities of rock are now urgently required. Given any suitable rock material that is used is not stable under wave action means that this will be easily eroded, and wave attrition will continue to reduce the size of the material placed on the rubble mound, so effectively this is an on-going yearly maintenance activity. Back in the mid 1980's this was deemed to be unsustainable and therefore this will never be a practical and/or long-term solution.

The best engineering solution would be to build a very large revetment structure on the seaward side, which would protect the rubble mound but also prevent the waves from violently impacting the vertical masonry superstructure completely. However, this is likely to be completely unacceptable on heritage

grounds because the iconic masonry superstructure would be hidden from view. Therefore, a compromise has been developed where large concrete armour units (2 layers of Tetrapods) are placed on the rubble mound to hold the top portion of the rubble mound in place (30m) whilst also trying to minimise the violent action of the waves crashing into the listed masonry superstructure.

Due to the aggressive nature of the wave climate approaching Holyhead under storm conditions the size (18.1m^3) and weight (42t) of the concrete armour units is significant. Although every effort has been made to minimise the height of the proposed Tetrapod scheme, which has to be formed from 2 layers, it will stand approximately 5.2m high above the existing rubble mound and therefore, it is unfortunate that it will hide some of the existing seaward masonry superstructure from view. A typical cross section of the Tetrapod solution is presented below in Figure 4 which shows that to hold the 2 layers of Tetrapods in place, a double line of 60t chevrons is also required.

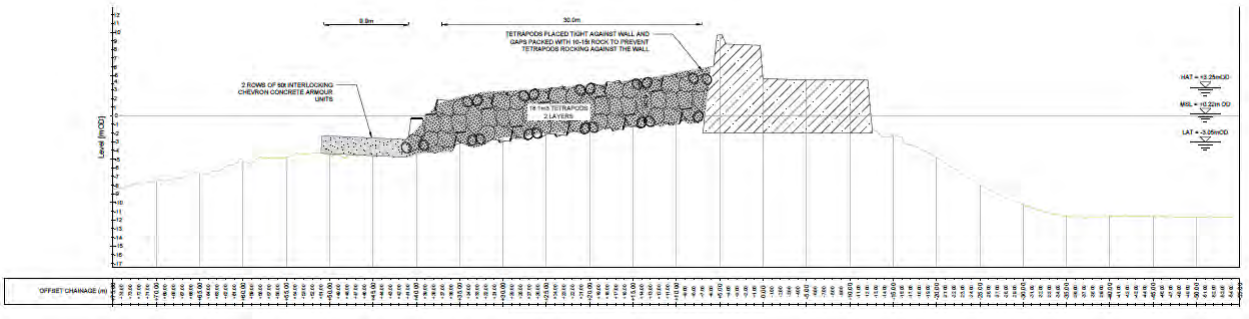

Figure 4: Typical cross section through proposed Tetrapod solution for the seaward side.

An option to use a more modern concrete armour unit was also considered (Xbloc). However, although the Xbloc units are smaller in size than the Tetrapods armour units and only one layer of them is required, this option had to be discounted on both performance, construction and financial grounds.

A draft indicative view of the tetrapod solution is shown in Figure 5.

Figure 5: Draft view of tetrapod solution (DRaW (UK) Ltd)

This image demonstrates that there will be a noticeable visual impact on the breakwater and, consequently, a change to the setting of these heritage assets which is anticipated to have an adverse effect upon their significance. However, from the breakwater itself, the tetrapods along the seaward side would only be visible from the upper promenade.

Based upon preliminary assessment, the visual impact upon adjacent, coastal assets from this solution is anticipated to be negligible. Additional viewpoints will be presented in due course so that any potential changes to the setting of these further afield heritage assets can be better understood.

The only practical alternative to the tetrapod solution would be to import a large quantity of rock with an individual mass in excess of 15t each. The problem with this solution is that rock with a mass greater than 15t can only be sourced from Norway. In Norway (Larvik), they produce dimension stone for the architectural industry, which can be produced in any size, due to the way they cut rather than blast the rock from the mountain. Not only would importing large quantities of very large rock from Norway be prohibitively expensive, the lack of an obvious competitor for the supply would lead to a scheme which would be unlikely to obtain a financial commitment from the local, and/or national Government. nor from a commercial organisation such as Stena without cost certainty.

In addition, although rock in excess of 15t will be more robust than the original material used to form the rubble mound, it could still easily be picked up and thrown around by the waves under extreme storm conditions. This may lead to significant damage to the historic masonry superstructure and could lead to damage to the leeward side of the structure if any of these rock pieces were thrown over the structure. Furthermore, this could also cause potentially serious injury to anyone on the breakwater at the time of the

storm. For all of these reasons, using very large rock piece in excess of 15t is impractical and would not prevent the rubble mound from continuing to lower over its lifetime. This would mean more frequent replenishment of the rubble mound which is a very costly and unsustainable solution.

On the leeward side the preferred solution is to place an articulated concrete block mattress (ACBM) on to the existing rubble mound profile, see Figure 6.

Figure 6: Example of an articulated concrete block mattress (ACBM), (Credit: Maccaferri)

This ACBM would be located below the water surface and consequently, is not anticipated to result in any settings impacts. As this is a relatively easy solution, which can be undertaken as and when required without the need for specialised marine construction equipment, and could also be undertaken from the breakwater itself, it is possible that this might be progressed by Stena as part of their ongoing maintenance activity, rather than forming part of the final proposed refurbishment project.

7 Conclusion

A number of options were considered for the long-term management of the Holyhead breakwater. These options were appraised against technical, environmental and economic criteria and a preferred solution for the seaward and leeward side were promoted.

Since the PAR/OBC study was completed in 2016/17, the preferred scheme has been developed into a workable construction scheme and the actual detail of the proposed construction has been thoroughly worked through and optimised to achieve the technical requirements whilst minimising its impact on the listed heritage structure and on the surrounding environment.

From a heritage perspective there is no perfect solution, however, the proposed scheme using Tetrapods is considered to be the only viable solution that will maintain the Holyhead Breakwater for future generations. Any other solutions require on-going maintenance and possible large-scale replenishments, which is not financially viable and is not considered a sustainable solution.

If the Holyhead Breakwater is breached, then the cost of repair is likely to be prohibitively expensive and a significant breach could ultimately lead to the closure of Holyhead Port. In such an event, any redevelopment plans for Holyhead including reestablishment of a marina in Holyhead would be unviable due to the increased wave climate within the existing harbour and the increased flood risk to low lying areas.

The Level 4 building record provides a detailed account of the breakwater and its significance and, as such, in itself represents a primary form of mitigation for heritage impacts. Potential direct impacts are currently understood to be limited in nature and extent, although this will require further consideration as part of the EIA.

In conclusion, whilst the ACBM solution on the leeward side will have no impact upon heritage significance, the introduction of Tetrapods along the seaward side will, without question, adversely affect the visual character of the heritage assets, and consequently result in an adverse effect upon the significance of the breakwater and lighthouse. However, in securing the longevity and ongoing utility of the structure, and in minimising the risk of significant breaches and storm damage to the superstructure, including the lighthouse, over time, the public benefit represented by the Tetrapod solution, which, as described in this note, has been identified as the only viable solution for refurbishment, must be weighed against the significance of the identified impact. It may also be possible to consider additional mitigation, such as colour matching, to minimise the visual impact as far as possible. To this end, further consultation with Cadw and IoACC is essential in order to fully understand the nature of any additional considerations or requirements which might be possible, in line with the proposed scheme.

A4 Gazetteer of Designated Historic Assets

Record Number	Name	Grade	Location
Within working area			
5743	Holyhead Breakwater	II*	Enormous Z-plan Breakwater (2.4km long) stretches into Holyhead bay from Soldier's Point, NW of town centre.
5744	Lighthouse on Holyhead Breakwater	II	Set on ovoid platform forming the outer end of the long Breakwater stretching into Holyhead Bay.
Within 1km buffer			
14729	Zodiac Restaurant	II	On rocks below Beach Road NE of junction with Walthew Avenue.
14730	Trinity House Office	II	Below Beach Road near sailing club; in walled enclosure.
14731	Trinity Yard Large Workshop	II	Below Beach Road near sailing club; in walled enclosure.
14732	Trinity Yard Small Workshop	II	Below Beach road bear sailing club; in walled enclosure. Aligned SW-NE, to rear of large workshop, at right angles.
14759	Porthyfelin House	II	Approximately 200m NW of junction of Porth-y-Felin Road and Beach Road with main front facing E (away from road).
14760	Soldier's Point House	II	Close to landward end of great Breakwater. In extensive grounds which include garden walls and ornaments in similar style to grand screen wall to N of house.
14761	Screen Wall to Soldier's Point House	II	To N and NW of Soldier's Point House.
14755	Gunpowder Magazine	II	To N of road to Breakwater Country Park, approximately 200m W of bridge over road.
Within 1km to 3km buffer			
AN019	Caer y Twr	SM	Iron Age hillfort situated on the top of Holyhead Mountain.
AN147	Gogarth Bay round cairn	SM	Bronze Age burial cairn, dramatically situated on the summit of a locally prominent ridge overlooking the cliffs of Gogarth Bay.
AN133	Enclosed Hut Circle Settlement	SM	Iron Age or Romano-British site at Capel Llochwydd, comprising the remains of three conjoined circular huts set within the boundaries of a contemporary enclosure.
AN016	Holyhead Mountain Hut Circles	SM	Area of later prehistoric settlement features, generally stone founded roundhouses, occupying a natural shelf or terrace below the south-eastern flank of Holyhead Mountain
AN033	Plas Meilw Hut Circles	SM	The remains of a hut group situated on rough, rocky ground.
AN017	Penrhos Feilw Standing Stones	SM	Two standing stones probably dating to the Bronze Age located in a saddle between two small hills.

Record Number	Name	Grade	Location
AN031	Roman Wall Surrounding St Cybi's Churchyard	SM	Remains of a Roman fort, interior occupied by St Cybi's church and associated graveyard. The fort lies on a low cliff which would originally have fronted the shore.
5413	St Cybi's Church	I	In chuchyard overlooking inner harbour, entered by archway from Market Square.
5415	Walls of upper churchyard	I	Between Stanley Street and Victoria Road enclosing St Gybi?s Church, and Capel-y-Bedd, entered by gateway from Market Square.
5762	Kingsland Windmill	II*	Prominent building set within a modern housing estate reached W off B4545 approximately 1km south of Holyhead town centre.
5772	Harbour Office	II*	Situated within the security zone of the Port of Holyhead, facing south across the inner harbour that is now the ferry terminal. Adjacent to Customs House.
5773	George IV Arch	II*	Situated within the security zone of the Port of Holyhead, to the east of the Harbour Office and Customs House and facing the end of the Admiralty Pier.
5414	Capel y Bedd	II	In churchyard overlooking inner harbour, entered by archway from Market Square. To S of St Gybi?s Church near archway to churchyard.
5417	Skinner Monument	II	Overlooking harbour on rocky outcrop; reached via steps on Turkey Shore Road.
5724	2 Victoria Terrace	II	At junction of Victoria Road and Market Street.
5726	Tanalltran Cottages	II	To E of Plas Alltran (see Turkey Shore Road).
5727	Plas Alltran	II	On acutely angled corner site between Turkey Shore Road and Llanfawr Road.
5728	Stable Block to Plas Alltran	II	To E of Nos 1 & 2 Turkey Shore Road.
5729	1 Turkey Shore Road	II	To E of Plas Alltran.
5734	Fitting, Boiler and Smithy Shops	II	Opposite Water Street. Irregular group of 3 parallel ranges to rear (NW) of office and stores building, the Smithy overlooks Victoria Road.
5735	Office and Stores Building	II	Part of a large group of marine workshop buildings opposite Water Street, this block behind Fitting, Boiler, and Smithy Shops facing harbour.
5736	Sailmakers, Seamstresses and Polishers Workshops	II	Opposite Cross Street.
5737	Store, Old Boiler Shop & Sawmill buildings at Marine Yard	II	Opposite Water Street.

Record Number	Name	Grade	Location
5741	Ucheldre Centre (Former Bon Sauveur Convent Chapel),	II	
5763	Market Hall	II	In town centre on sloping site. Set back and above the street behind single storey shops; side and rear elevations to Summer Hill and Trearddur Square.
5770	The Battery	II	On the headland at the NW edge of the park; Penrhos Beach below to W. Penrhos Coastal Park lies at the SE end of Holy Island.
5771	Customs House	II	Situated within the security zone of the Port of Holyhead, facing south across the inner harbour that is now the ferry terminal. Adjacent to Harbour Office.
14726	Stanley House	II	At SE corner of Churchyard, adjacent to entrance arches, with rear facing over Holyhead inner harbour.
14727	The Captains Table	II	At SE corner of Churchyard, adjacent to entrance arches, with rear facing over Holyhead inner harbour.
14728	Ty'n Parc	II	
14733	Ebenezer Chapel	II	Approximately 100m S of junction with Cytir Road. Behind low wall with stone posts, iron railings and gates.
14734	Tanalltran Cottages	II	To E of Plas Alltran (see Turkey Shore Road).
14735	Clock Turret in Station Approach	II	In forecourt of entrance to Holyhead station and ferry terminal, reached via incline from main bridge over railway.
14736	Caernarfon Castle P H	II	At top of Summer Hill facing down towards Stanley Street.
14737	Tabernacl Chapel	II	On corner with Baptist Street.
14738	Hyfrydle Chapel (including Forecourt Gates and Railings)	II	In prominent position near top of Thomas Street, on corner of Ucheldre Avenue. Behind forecourt with stone piers and iron gates and railings (from Blackbridge Foundry, Holyhead) dated 1888.
14739	Train Shed at Holyhead Station	II	On E side of inner angle of Holyhead inner harbour.
14740	2 Turkey Shore Road	II	To E of Plas Alltran.
14741	Pillbox near Skinner's Monument	II	On high ground 80m to S of Skinner Monument.
14742	South Pier	II	To S of Admiralty Pier; reached via Turkey Shore Road.
14743	Stanley Cottages	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.

Record Number	Name	Grade	Location
14744	Stanley Cottages	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.
14745	Stanley Cottages	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.
14746	Stanley Cottages	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.
14747	Stanley Cottages	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.
14748	Stanley Cottages	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.
14749	Cenotaph	II	Opposite Victoria Terrace.
14750	Lower Churchyard Walls and Gateway	II	Below St Cybi's Church, parallel to road enclosing lower level of churchyard.
14751	3 Victoria Terrace	II	At junction of Victoria Road and Market Street.
14752	4 Victoria Terrace	II	At junction of Victoria Road and Market Street.
14753	5 Victoria Terrace	II	At junction of Victoria Road and Market Street.
14754	6 Victoria Terrace	II	At junction of Victoria Road and Market Street.
14756	Cottage on corner of Pentre Pella (including Foregardem Wall)	II	In settlement on lower slopes of Holyhead Mountain, above south stack road. On S corner of Pentre Pella, at R of row, facing SE.
14757	Admiralty Pier (including Sea Wall between Salt Island Bridge and George IV Arch)	II	At NE end of Victoria Road, projecting E into harbour.
14758	Lighthouse on Admiralty Pier	II	At the E end of Admiralty Pier.
16526	Bridge Over Railway near Ty Mawr Farmhouse	II	Carries footpath over main railway line near Ty Mawr Farm.
20076	Former powder magazine for fog signalling station and enclosure walls	II	Located on the NE corner of Holy Island, on the edge of high cliffs, in an enclosure bounded by a low stone wall. Reached via a rough track over the headland.
20077	Ffynnon y Wrach	II	Set back slightly from the SE side of the road below Holyhead mountain, SW of Holyhead.

Record Number	Name	Grade	Location
20081	Tan-y-Cytiau	II	In an elevated position on the slopes of Holyhead Mountain, approached from the lane that leads to South Stack Lighthouse.
87587	Cybi Building, Holyhead High School	II	North-west of the town centre, opposite the main buildings of Ysgol Uwchradd Caergybi.
87588	Boundary Wall to Cybi Building, Holyhead High School	II	Defines the boundary of the school grounds to South Stack Road and to the west, and encloses the former head-masters house (Gwynant) to the east.

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PRN	Site Name	Period	Type	NGR
Character Areas				
71224	Soldier's Point and Breakwater, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2463484185
71225	Porth-y-Felin Farm, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2385083229
71226	Porth-y-Felin, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2403083169
71227	Newry Beach Promenade, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2434783212
71228	Newry Beach, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2430783324
71231	Pen Bryn Madoch, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2436782970
71232	Llaingoch, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2386282944
71233	Cae Mawr, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2346083297
71234	Ynys Wellt, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2338183686
71235	Salt Island, Proposed Character Area, Holyhead	MULTIPERIOD	LANDSCAPE	SH2530783144
Documentary References				
3795	Hut Group, Site of, W Side of Breakwater Quarry	PREHISTORIC	HUT CIRCLE SETTLEMENT	SH23408331
16076	Breakwater Tramway, Holyhead	POST MEDIEVAL	TRAMWAY	SH23208346
34019	Breakwater, Salt Island	POST MEDIEVAL	BREAKWATER	SH2528683462
34024	Breakwater Tramway, Salt Island	POST MEDIEVAL	TRAMWAY	SH2358583476
34026	Battery, Soldier's Point	POST MEDIEVAL	BATTERY	SH2362483652
36139	Melin Ddwr, Former Site of, Holyhead	MEDIEVAL	WATERMILL	SH2357483080
36493	Tref-engan-bach, Ynys Gybi	POST MEDIEVAL	HOUSE	SH2340583311
36494	Structure, Former Site of, Ynys Gybi	UNKNOWN	STRUCTURE	SH2358983459
58710	Stanley Sailors Hospital, Holyhead	Post Medieval	HOSPITAL	SH2529583168

PRN	Site Name	Period	Type	NGR
58711	Holyhead Naval Base, Holyhead	MODERN	NAVAL BASE	SH250827
60179	Baker Street Baptist Mission Room, Baker Street, Holyhead	MODERN	CHURCH HALL	SH2441682845
60187	Marconi Wireless Station, Holyhead	MODERN	TELEGRAPH STATION	SH24428285
62334	Allotments, Holyhead Park	MODERN	ALLOTMENT	SH24058266
62669	Beach Auxiliary Hospital, Holyhead	MODERN	HOSPITAL	SH2446783118
Earthworks/Modified Surfaces				
34011	Beaching Ground, Holy Island	POST MEDIEVAL	BEACH ACCESS	SH2441283305
36491	Linear Scarps, Ynys Gybi	POST MEDIEVAL	FIELD BOUNDARY	SH2359983267
36492	Trackway, Ynys Gybi	POST MEDIEVAL	TRACKWAY	SH2347483226
74525	Footpath, Cae Fabli	POST MEDIEVAL	FOOTPATH	SH23208306
74526	Track, Tan y Bryn	POST MEDIEVAL	TRACKWAY	SH23178286
Settlement				
17116	Landscape, Holyhead Settlement, Anglesey	MULTIPERIOD	LANDSCAPE	SH2448782895
Buildings/Structures				
7166	Folly, Soldier's Point Holyhead	POST MEDIEVAL	FOLLY	SH23768366
7665	Porth-y-felin, Holyhead	POST MEDIEVAL	NONCONFORMIST CHAPEL	SH24018316
19171	Air Raid Shelter, Holyhead Maritime Museum, Holyhead	MODERN	AIR RAID SHELTER	SH24528320
29924	Field Barn, Tyddyn Bach	POST MEDIEVAL	FIELD BARN	SH23858276
29925	Field Barn, Remains of, Tyddyn Bach	POST MEDIEVAL	FIELD BARN	SH23878274
29926	Barn, Tyddyn Bach	POST MEDIEVAL	BARN	SH2379282701
29927	Granary, Tyddyn Bach	POST MEDIEVAL	GRANARY	SH2379982706
29928	Tyddyn Bach, Holy Island	POST MEDIEVAL	FARMSTEAD	SH2380082685

PRN	Site Name	Period	Type	NGR
34000	Quay, Holyhead Breakwater	POST MEDIEVAL	QUAY	SH23818388
34001	Engine Shed, Holy Island	POST MEDIEVAL	ENGINE SHED	SH23558359
34020	Boundary Wall, Holy Island	POST MEDIEVAL	BOUNDARY WALL	SH2429483184
34022	Boat Yard, Newry Beach, Holy Island	POST MEDIEVAL	BOAT YARD	SH2466883215
34023	Mackenzie Landing, Newry Beach, Holy Island	POST MEDIEVAL	LANDING PIER	SH2465783290
34025	Structure, Breakwater Landing Stage, Holyhead	POST MEDIEVAL	STRUCTURE	SH2386783893
34031	Lifeboat House, Salt Island	POST MEDIEVAL	LIFEBOAT STATION	SH2526783382
62320	Vicarage, Holyhead	Post Medieval	VICARAGE;workroom	SH2460483030
74528	Footbridge, Quarry Tramway, Holyhead	POST MEDIEVAL	FOOTBRIDGE	SH23358352
74529	Footbridge, Quarry Tramway, Holyhead	POST MEDIEVAL	FOOTBRIDGE	SH23068340

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NPRN	Name	Period	Broad Class	Type	DBA Category	NGR
417531	MARINA, NEW HARBOUR, HOLYHEAD	Post Medieval	MARITIME	MARINA	New Harbour Marina	SH24048365
41258	HOLYHEAD BREAKWATER	19th Century, Post Medieval	MARITIME	BREAKWATER	Breakwater	SH2405084150
519102	BEACHING GROUND, NEWRY BEACH, HOLYHEAD	Post Medieval	MARITIME	LANDING POINT	Beaching Ground	SH2450183250
519069	OUTER PLATTERS, HOLYHEAD BAY	Multiperiod	MARITIME	SEASCAPE	Navigational Hazard	SH2506583807
519083	SKINNERS ROCK, HOLYHEAD NEW HARBOUR	Multiperiod	MARITIME	SEASCAPE	Navigational Hazard	SH2530883701
519050	OUTER PLATTERS BUOY	Post Medieval	MARITIME	NAVIGATION AID	Documented Navigational Aid	SH2532883962
519068	FOG SIGNAL GUN, SALT ISLAND	Post Medieval	MARITIME	NAVIGATION AID	Documented Navigational Aid	SH2527583253
519080	PERCH, COASTGUARD SLIPWAY	Post Medieval	MARITIME	NAVIGATION AID	Documented Navigational Aid	SH2501583077
519082	BEACON, HOLYHEAD NEW HARBOUR	Post Medieval	MARITIME	NAVIGATION AID	Documented Navigational Aid	SH2416083446
519084	SKINNERS ROCK BUOY, HOLYHEAD NEW HARBOUR	Post Medieval	MARITIME	NAVIGATION AID	Documented Navigational Aid	SH2528283663
519006	CLIPPERAU ROCKS BUOY	Multiperiod	MARITIME	SEASCAPE	Documented Navigational Aid	SH2669085062
506968	SARO LONDON II K6927	Modern	DEFENCE	AIRCRAFT	Documented Loss (Aircraft)	SH2488883691
271958	ALBION	Post Medieval	MARITIME	WRECK	Documented Loss	SH2565984698
271957	WILLIAM POOLE	Post Medieval	MARITIME	WRECK	Documented Loss	SH2531284511
272022	VOLUNTEER	Post Medieval	MARITIME	WRECK	Documented Loss	SH2582884648
240713	ADELAIDE	Post Medieval	MARITIME	WRECK	Documented Loss	SH2338084003
271984	SCOTLAND	Post Medieval	MARITIME	WRECK	Documented Loss	SH2488883691
271923	DEVONIA	Post Medieval	MARITIME	WRECK	Documented Loss	SH2557684843
271929	CUBA	Post Medieval	MARITIME	WRECK	Documented Loss	SH2505784275
272015	ELLEN	Post Medieval	MARITIME	WRECK	Documented Loss	SH2488883691
272239	FANNY TRUSS	Post Medieval	MARITIME	WRECK	Documented Loss	SH2488883691

NPRN	Name	Period	Broad Class	Type	DBA Category	NGR
271900	BELT	Post Medieval	MARITIME	WRECK	Documented Loss	SH2498584400
272069	SUNSHINE	Post Medieval	MARITIME	WRECK	Documented Loss	SH2660084720
272050	BUSY	Post Medieval	MARITIME	WRECK	Documented Loss	SH2467884102
272000	JOFUR	Post Medieval	MARITIME	WRECK	Documented Loss	SH2536383456
272079	DEVONPORT	Post Medieval	MARITIME	WRECK	Documented Loss	SH2488883691
271988	CRONJE	Post Medieval	MARITIME	WRECK	Documented Loss	SH2608684516
272097	GLADYS	Post Medieval	MARITIME	WRECK	Documented Loss	SH2488883691
272197	KINNAIRD	Modern	MARITIME	WRECK	Documented Loss	SH2572285698
272112	SEAGULL	Post Medieval	MARITIME	WRECK	Documented Loss	SH2488483226
272126	NIKITA	Post Medieval	MARITIME	WRECK	Documented Loss	SH2371683890
272128	ELWOOD	Modern	MARITIME	WRECK	Documented Loss	SH2536983350
1006	SICCARDI	Post Medieval	MARITIME	WRECK	Documented Loss	SH2685
272139	HMS MANX LAD	Post Medieval	MARITIME	WRECK	Documented Loss	SH2603184651
272280	PERUANA	Post Medieval	MARITIME	WRECK	Documented Loss	SH2466384278
272134	BIDSIE AND BELL	Post Medieval	MARITIME	WRECK	Documented Loss	SH2568184743
272198	VARONS	Modern	MARITIME	WRECK	Documented Loss	SH2526283521
525222	MARY ANN	Post Medieval	MARITIME	WRECK	Documented Loss	SH2488883691
240448	DAHMONEY	Post Medieval	MARITIME	WRECK	Documented Loss	SH2272583604
240434	EDITH	Post Medieval	MARITIME	WRECK	Documented Loss	SH2488883691
240428	PLUTARCH	Post Medieval	MARITIME	WRECK	Documented Loss	SH2429783579
240438	WOODBINE	Post Medieval	MARITIME	WRECK	Documented Loss	SH2488883691
240415	CLERMONT	Post Medieval	MARITIME	WRECK	Documented Loss	SH2536683451

NPRN	Name	Period	Broad Class	Type	DBA Category	NGR
506414	UNNAMED WRECK	Post Medieval	MARITIME	WRECK	Dead' Wreck	SH2417183468
506416	UNNAMED WRECK	Post Medieval	MARITIME	WRECK	Dead' Wreck	SH2402183938
506417	UNNAMED WRECK	Modern	MARITIME	WRECK	Dead' Wreck	SH2386883820
506418	UNNAMED WRECK	Post Medieval	MARITIME	WRECK	Dead' Wreck	SH2397784249
240964	UNNAMED WRECK	Post Medieval	MARITIME	WRECK	Dead' Wreck	SH2550883323
240965	UNNAMED WRECK	Post Medieval	MARITIME	WRECK	Dead' Wreck	SH2556083479
240966	UNNAMED WRECK	Post Medieval	MARITIME	WRECK	Dead' Wreck	SH2528783613
240967	UNNAMED WRECK	Post Medieval	MARITIME	WRECK	Dead' Wreck	SH2514883340
240968	UNKNOWN COAL HULK	Modern	MARITIME	WRECK	Dead' Wreck	SH2502383409
240970	UNNAMED WRECK	Post Medieval	MARITIME	WRECK	Dead' Wreck	SH2442683366
240432	HOLYHEAD NEW HARBOUR MARITIME NAMED LOCATION	Multiperiod	MARITIME	SEASCAPE	Named Location	SH2488883691
240786	MORNING STAR	Post Medieval	MARITIME	WRECK	Wreck (Finds)	SH2296384286
271985	STAR OF THE SEA	Post Medieval	MARITIME	WRECK	Wreck (Finds)	SH2397383992
272109	ORIA	Post Medieval	MARITIME	WRECK	Wreck (Structure)	SH2513985104
271901	KIRKMICHAEL	Post Medieval	MARITIME	WRECK	Wreck (Structure)	SH2532984610
272227	OSSEO	Post Medieval	MARITIME	WRECK	Wreck (Structure)	SH2531584589
272401	HMS CAMPINA	Post Medieval	MARITIME	WRECK	Wreck (Structure)	SH2583584712

Appendix 19

WFD Compliance Assessment

Contents	
19.1	WFD Stage 3 Scoping Tables

1 WFD Stage 3 Scoping Tables

1.1 Construction

The following tables summarise the information relevant to the consideration of the requirements of the WFD for the construction and operational phase activities (tables taken from Clearing the Waters for All; Environment Agency, 2017). Note that although the answer to the question is yes in some instances, the evidence provided in the notes column has allowed the issue to be scoped out of requiring detailed assessment.

Table 1.1 Construction and operational activity information

Your activity	Description, notes or more information	
Applicant name	Isle of Anglesey County Council	
Name of activity	Construction of the refurbishment scheme	Presence of the refurbished Breakwater
Brief description of activity	The rock, concrete armour or ACBM will be placed on the existing rubble mound along the length of the Breakwater, around the roundhead, and along part of the leeward side. This will involve using a long-reach grabber on a jack-up barge which will be anchored to the Breakwater or to concrete anchor blocks placed on the seabed. Some minor regrading works may be required to create a level base for the concrete armour units, however this is only anticipated to be required on 1% of the length of the breakwater (0.00147km^2).	The operational phase considers the impact of the presence of the refurbishment scheme on the water bodies. The maximum width of the scheme is ~30m on the seaward side, and 25m on the leeward side. Due to the significant refurbishment required at the roundhead, the refurbishment scheme around this portion of the Breakwater will be 60m wide. The majority of the refurbishment will be placed on the existing rubble mound, however 0.0056km^2 of the seabed will be lost beneath the footprint.
Location of activity	See **Figure 18.1**	
Footprint of activity	Total direct footprint of the refurbishment is 0.147km^2, 0.0518km^2 is within the Holyhead Bay waterbody and 0.0812km^2 is within the Caernarfon Bay waterbody. Of this the majority is within the current footprint of the Breakwater rubble mound and will directly affect 0.0212km^2 of the seabed within the Holyhead Bay water body and 0.0034km^2 within the Caernarfon Bay water body.	
Timings of activity	1. Continuous construction over 2 years, or; 2. Undertaken in three phases, each lasting one year, with approximately two-year interval between each phase	The refurbishment scheme has a design life of 50 years.
Extent of activity	See **Figure 18.1**	
Use or release of chemicals	None.	None

Table 1.2 Holyhead Bay surface water compliance criteria

WFD compliance parameter	Consider if the activity is	Further assessment required?		Notes	
		Yes	No	Construction of the Breakwater refurbishment	Presence of the refurbished Breakwater
Hydromorphology	Capable of impacting on the hydromorphology of a water body with high status		✓	No, the water body is not at High status	
	Capable of significantly impacting on the hydromorphology of any waterbody		✓	Significant effects on hydromorphology and marine physical processes are not anticipated within Holyhead Bay water body. As set out in the impact section of the Coastal Processes chapter construction impacts, including suspension and deposition of sediment during armour placement would be minor and temporary. Operational impacts to tidal currents, wave regime and sediment distribution and transport were also concluded to be negligible. (**Section 9.11**).	
	Located in a water body that is heavily modified for the same purpose	✓		Yes, the water body is heavily modified for navigation, ports and harbours.	
Biology (Habitats)	0.5 km^2 or larger		✓	No, the total footprint of the refurbishment works within the waterbody is 0.0518km^2.	
	1% or more of a waterbody's area		✓	No, the footprint of the refurbishment represents 0.4% of the water body area.	
	Within 500m of any higher sensitivity habitat	✓		**Yes**, subtidal kelp habitat has been identified along the leeward side of the Breakwater. The proposed refurbishment will directly affect 0.014km^2 of kelp.	
	1% or more of any lower sensitivity habitat		✓	No, the proposed refurbishment will directly affect 0.0212km^2 of subtidal soft sediment which represents 0.36% of the habitat within the water body. It will also affect 0.0062km^2 of intertidal rock which represents 0.8% of the intertidal rock habitat within the water body.	

WFD compliance parameter	Consider if the activity is	Further assessment required?		Notes	
		Yes	No	Construction of the Breakwater refurbishment	Presence of the refurbished Breakwater
Biology (Fish)	In an estuary and could affect fish in the estuary, or outside the estuary but could delay or prevent fish entering it or affect migration		✓	This is considered on the basis that the coastal water body may support fish moving between transitional water bodies for which fish are a compliance parameter. The majority of the rock, concrete armour and ACBM placement will occur over the existing rubble mound and will therefore not release any sediment into the water column. Only a small proportion of the work (0.0212km^2) will be undertaken directly on the seabed which is sandy mud. Minor regrading works may be required however this anticipated to be required on 1% of the rubble mound (approximately 0.00147km^2) and as such any sediment released during these activities will be negligible. It is not expected that the placement of the refurbishment material will release large quantities of sediment into the water column, and any that is will be rapidly dispersed by wave action and currents and likely to be within baseline natural variation. It is therefore considered that this activity will not impact the waterbody and as such is **scoped out** of further assessment.	The operational phase of the breakwater will not have an impact on the movement or behaviour of fish.
	Capable of impacting on normal fish behaviour like movement, migration or spawning		✓		
	Capable of causing entrainment or impingement of fish		✓	The activities will not cause the entrainment or impingement of fish.	

WFD compliance parameter	Consider if the activity is	Further assessment required?		Notes	
		Yes	No	Construction of the Breakwater refurbishment	Presence of the refurbished Breakwater
Water Quality	Capable of affecting water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring-neap tidal cycle		✓	The refurbishment works will take place either in one phase over a 2-year period, or over three phases, each lasting one year, with approximately two-year interval between each phase. The majority of the rock, concrete armour and ACBM placement will occur over the existing rubble mound and will therefore not release any sediment into the water column. Only a small proportion of the work (0.0212km^2) will be undertaken directly on the seabed which is sandy mud. It is not expected that the placement of the refurbishment material will release large quantities of sediment into the water column, and any that is will be rapidly dispersed by wave action and currents. It is therefore considered that this activity will not impact the waterbody and as such is **scoped out** of further assessment.	The operational phase of the Breakwater refurbishment will not cause the release of sediment into the water column.
	Located in a water body with a phytoplankton status of moderate, poor or bad		✓	Phytoplankton status of Holyhead Bay waterbody is High	
	Located in a water body with a history of harmful algae		✓	There is no history of harmful algae in Holyhead Bay waterbody	
Chemical Contamination	The chemicals are on the Environmental Quality Standards Directive (EQSD) list		✓	The installation of the majority refurbishment will take place on top of the existing rubble mound and will not therefore disturb seabed	The operational phase of the Breakwater refurbishment will not cause the release of sediment with contaminants.

WFD compliance parameter	Consider if the activity is	Further assessment required?		Notes	
		Yes	No	Construction of the Breakwater refurbishment	Presence of the refurbished Breakwater
	It disturbs sediment with contaminants above Cefas Action Level 1			sediments. Any sediment resuspended during the works will be highly localised to vessel movements and small areas of the refurbishment which will be undertaken directly on the seabed (0.0212km^2) and will not be discernible above background levels of suspended sediment.	
Protected Areas	Located within 2 km of any WFD protected area (SAC, SPA, shellfish waters, bathing waters, nutrient sensitive areas)		✓	The activity is located within the North Anglesey Marine SAC and Anglesey Terns SPA. European designated sites are considered within the Shadow HRA (**Chapter 19**) therefore, these protected areas are scoped out of detailed assessment. No other protected areas are located within 2km, as such this parameter is scoped out.	
Invasive Non-native Species	Capable of spreading INNS		✓	Due to the international and port-level control measures in place this has been scoped out.	

Table 1.3 Caernarfon Bay North surface water compliance criteria

WFD compliance parameter	Consider if the activity is	Further assessment required?		Notes	
		Yes	No	Construction of the Breakwater refurbishment	Presence of the refurbished Breakwater
Hydromorphology	Capable of impacting on the hydromorphology of a water body with high status		✓	No, the water body is not at High status	
	Capable of significantly impacting on the hydromorphology of any waterbody		✓	Significant effects on hydromorphology and marine physical processes are not anticipated within Caernarfon Bay North water body. As set out in the impact section of the Coastal Processes chapter construction impacts, including suspension and deposition of sediment during armour placement would be minor and temporary. Operational impacts to tidal currents, wave regime and sediment distribution and transport were also concluded to be negligible (see Section 9.11).	
	Located in a water body that is heavily modified for the same purpose		✓	No, the water body is not classified as heavily modified.	
Biology (Habitats)	0.5 km^2 or larger		✓	No, the total footprint of the refurbishment works within the waterbody is 0.0812km^2.	
	1% or more of a waterbody's area		✓	No, the footprint of the refurbishment represents 0.06% of the water body area.	
	Within 500m of any higher sensitivity habitat	✓		**Yes**, subtidal kelp habitat has been identified along the seaward side of the Breakwater. Approximately 0.039km^2 of kelp habitat is within the footprint of the scheme.	
	1% or more of any lower sensitivity habitat		✓	No, the proposed refurbishment will directly affect 0.0034km^2 of subtidal soft sediment habitat, 0.0024km^2 of the gravel and cobbles habitat, 0.039km^2 of the intertidal rock habitat and 0.017km^2 of subtidal rock habitat within the water body. Areas of these habitats within the water body are not available however due to the size of the Caernarfon Bay water body these areas are not considered to be of concern at a water body scale given the small areas impacted.	

WFD compliance parameter	Consider if the activity is	Further assessment required?		Notes	
		Yes	No	Construction of the Breakwater refurbishment	Presence of the refurbished Breakwater
Biology (Fish)	In an estuary and could affect fish in the estuary, or outside the estuary but could delay or prevent fish entering it or affect migration		✓	This is considered on the basis that the coastal water body may support fish moving between transitional water bodies for which fish are a compliance parameter. The majority of the rock, concrete armour and ACBM placement will occur over the existing rubble mound and will therefore not release any sediment into the water column. Only a small proportion of the work (0.0034km^2) will be undertaken directly on the seabed which is sandy mud. As such any sediment released during these activities will be negligible. It is not expected that the placement of the refurbishment material will release large quantities of sediment into the water column, and any that is will be rapidly dispersed by wave action and currents. It is therefore considered that this activity will not impact the waterbody and as such is **scoped out** of further assessment.	The operational phase of the breakwater will not have an impact on the movement or behaviour of fish.
	Capable of impacting on normal fish behaviour like movement, migration or spawning		✓		
	Capable of causing entrainment or impingement of fish		✓	The activities will not cause the entrainment or impingement of fish.	
Water Quality	Capable of affecting water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring-neap tidal cycle		✓	The refurbishment works will take place either in one phase over a 2 year period, or over three phases, each lasting one year, with approximately two-year interval between each phase.	The operational phase of the Breakwater refurbishment will not cause the release of sediment into the water column.

WFD compliance parameter	Consider if the activity is	Further assessment required?		Notes	
		Yes	No	Construction of the Breakwater refurbishment	Presence of the refurbished Breakwater
				The majority of the rock and concrete armour placement will occur over the existing rubble mound and will therefore not release any sediment into the water column. Only a small proportion of the work (0.0034km^2) will be undertaken directly on the seabed which is sandy mud. It is not expected that the placement of the refurbishment material will release large quantities of sediment into the water column, and any that is will be rapidly dispersed by wave action and currents. It is therefore considered that this activity will not impact water quality within the waterbody and as such is **scoped out** of further assessment.	
	Located in a water body with a phytoplankton status of moderate, poor or bad		✓	No information is available on the Water Watch Wales website on the phytoplankton status of the water body however, due to the limited release of sediment it is considered that the activities will not affect the phytoplankton status of the water body.	
	Located in a water body with a history of harmful algae		✓	No information is available on the Water Watch Wales website on the history of harmful algae in the water body, however due to the limited release of sediment it is considered that the activities will not cause a bloom of harmful algae.	
Chemical Contamination	The chemicals are on the Environmental Quality Standards Directive (EQSD) list		✓	The installation of the majority refurbishment will take place on top of the existing rubble mound and will not therefore disturb seabed sediments. Any sediment resuspended during the works will be highly localised to vessel movements and small areas of the refurbishment which will be undertaken directly on the sea bed (0.0034km^2), and will not be	The operational phase of the Breakwater refurbishment will not cause the release of sediment containing contaminants.
	It disturbs sediment with contaminants above Cefas Action Level 1				

WFD compliance parameter	Consider if the activity is	Further assessment required?		Notes	
		Yes	No	Construction of the Breakwater refurbishment	Presence of the refurbished Breakwater
				discernible above background levels of suspended sediment.	
Protected Areas	Located within 2 km of any WFD protected area (SAC, SPA, shellfish waters, bathing waters, nutrient sensitive areas)		✓	The activity is located within the North Anglesey Marine SAC and Anglesey Terns SPA. European designated sites are considered within the Shadow HRA (**Chapter 26**) therefore, these protected areas are scoped out of detailed assessment. No other protected areas are located within 2km, as such this parameter is not considered further.	
Invasive Non-native Species	Capable of spreading INNS		✓	Due to the international and port-level control measures in place this has been scoped out.	