

Aberaeron Coastal Defence Scheme

Non-Technical Summary of the
Environmental Statement

Ceredigion County Council

June 2021



Notice

This document and its contents have been prepared for Ceredigion County Council for the sole purpose of supporting the planning application and marine licence application for the Aberaeron Coastal Defence Scheme. This document is the Non-Technical Summary of the Aberaeron Coastal Defence Scheme Environmental Statement.

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Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
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Client signoff

Client Ceredigion County Council
 Project Aberaeron Coastal Defence Scheme
 Job number 5182114

Client signature
 / date

Introduction and Background

Ceredigion County Council (CCC) has designed a scheme to improve flood defence to the town of Aberaeron. This will involve raising the flood walls in the harbour and installing a new flood gate at the entrance to Pwll Cam dock, re-building the head of South Pier, a new breakwater extending off of North Pier and improvements to the defences at South Beach (including replacement of the timber groynes and rock revetment, and replenishment of the beach with shingle recharge).

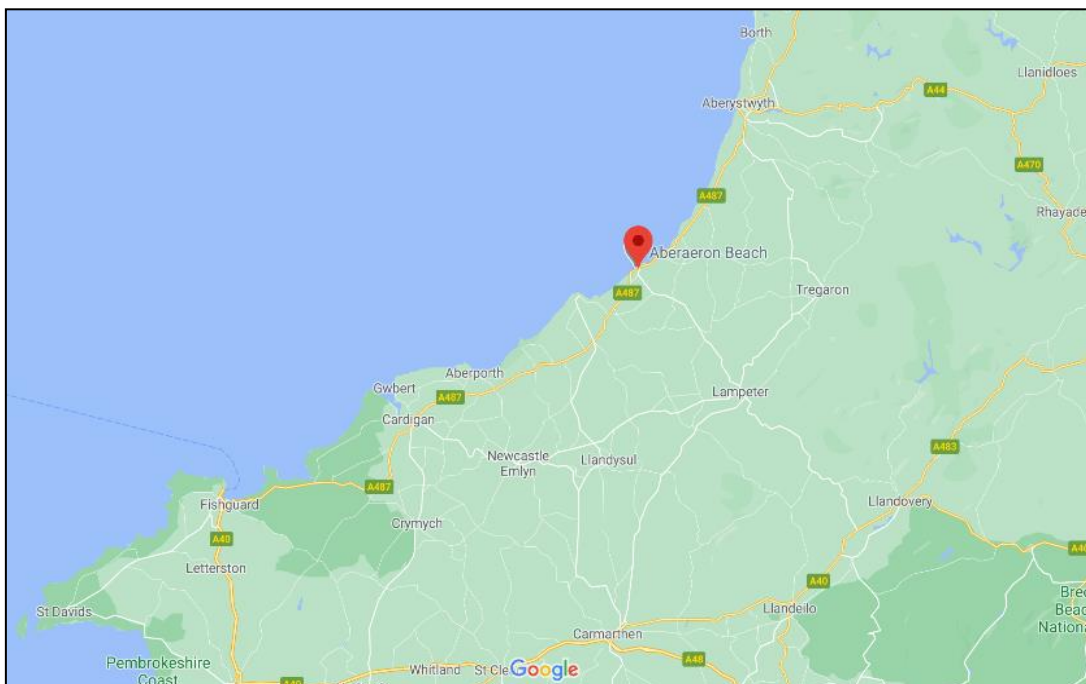
An Environmental Statement (ES) has been prepared in relation to the Environmental Impact Assessment (EIA) of the Aberaeron Coastal Defence Scheme (referred to as the 'Scheme'). A planning application for the project will be submitted to CCC, as the local planning authority for the area, as well as a marine licence application to Natural Resources Wales (NRW). The ES is submitted as a supporting document with these applications.

This non-technical summary provides a summary of the ES. It includes a summary of the existing environment, the Scheme, the alternatives considered and the potential significant effects of the scheme on the environment and local community.

Existing Environment

Aberaeron is situated on the west coast of Wales in Cardigan Bay, approximately 30km south of Aberystwyth. The town is centred around the harbour, with the coastline split into the North and South Beaches either side of the harbour entrance. A North Pier and a South Pier mark the entrance to the harbour. The River Aeron runs through the town and discharges into Cardigan Bay through the harbour. The main transport route to Aberaeron is the A487.

Figure 1 Site Location



Source: www.google.co.uk

Aberaeron is a popular tourist destination, particularly in the summer months and school holidays, with the harbour and beachfront a focal point for visitors.

The harbour lies directly at the mouth of the River Aeron with many boats moored using a series of 'trot moorings' which leave the boats beached in the harbour during low tide. In the north-east corner of the harbour is a smaller dock (Pwll Cam) in which water is maintained by a concrete cill on the seabed across the entrance to the dock, where shallow draft boats are moored on running moorings to the harbour wall.

The harbour is accessible to the public on all sides, with the most popular areas being along the promenade around Pwll Cam and along Quay Parade/Pen Cei on the northern side of the harbour. The houses surrounding the harbour are characterised by colourful Georgian houses including the Harbourmaster Hotel, many of which are listed buildings of historic interest. The Hive café is at the easternmost end of Quay Parade, where it meets Cadwgan Place. Also located at Pwll Cam is the harbour car park. The south side of the harbour is bordered by a grassed area on top of the river wall, with the properties of Belle Vue Terrace to the rear. A footbridge over the River Aeron located at Pwll Cam connects both sides of the harbour. Both piers at the harbour mouth are accessible to the public, although the seaward end (head) of South Pier is currently fenced off as it is at risk of collapse and in need of repair.

The beachfront comprises South Beach and North Beach, separated by the harbour mouth. Both beaches comprise a mixed shingle and sand beach. The defences on South Beach comprise six timber groynes in varying states of disrepair, and a rock revetment along the upper beach. Residential properties are located behind the beach on Beach Parade as well as the Aberaeron Yacht Club and its car park. Further south along South Beach, the immediate hinterland is characterised by coastal meadow and grassland. Along North Beach, a series of newer coast defences are in place, following the implementation of a coast defence scheme in 2009, comprising groynes, a rock revetment, sea wall and beach nourishment.

The coastline of Aberaeron lies within a number of ecological conservation sites; Cardigan Bay / Bae Ceredigion Special Area of Conservation (SAC), the West Wales Marine / Gorllewin Cymru Forol SAC and the Aberarth-Carreg Wylan Site of Special Scientific Interest (SSSI). Within the Scheme area, there are a number of listed building of historic interest, including South Pier, North Pier and the northwest and northeast quay walls. The Scheme is also partially located within the Aberaeron Conservation Area.

Development of the Design

Project Need

Aberaeron has a long history of flooding from a combined risk of flooding and erosion. Low-lying areas of Aberaeron are at risk of flooding generated by extreme tidal waters and wave overtopping from the harbour, and areas to the rear of South Beach are at risk of flooding resulting from beach erosion. The layout of the harbour entrance is such that during a north-easterly storm event, waves travelling across the Irish Sea are able to easily propagate into the harbour. The existing piers at the mouth of the harbour offer little protection from these large waves. During a storm event coupled with heavy rain, water levels also rise in the River Aeron, raising water levels in the harbour even further.

Figure 1 Flooding along Quay Parade



Engineering works were carried out at North Beach in 2009, which included the replacement of existing timber groynes, new rock groynes, a beach nourishment programme, reconstruction of the sea wall and construction of a rock revetment along the North Beach. These works have provided improved protection to the northern part of the town from overtopping inundation from the sea, reducing the level of flood risk to a 1 in 200 annual chance of occurrence.

Despite the improvements to flood risk management in the northern part of the town, parts of Aberaeron have continued to experience flooding; particularly in the harbour area (around Quay Parade, Pwll Cam and in the area between the Monachty Hotel and the A487 road bridge) and at South Beach (along Beach Parade and at the Aberaeron Yacht Club). Most recently, flooding occurred in 2017 during Storm Brian and in 2018 during Storm Callum, which caused a record increase in fluvial water levels along the River Aeron and led to property flooding and the loss of eight boats in the harbour through capsizing. The flooding is caused by waves entering the harbour, and wave overtopping of the harbour walls and shingle ridge on South Beach.

The harbour is currently only afforded protection by the two piers at the mouth of the harbour as well as from a flood wall along Quay Parade, which is set back from the edge of the quayside wall. Further into the harbour near the A487 road bridge, flood walls are located on both banks of the River Aeron.

Modelling results have indicated that the existing flood wall along Quay Parade has low standard of protection with a present day 1 in 5 annual chance of occurrence against wave overtopping. The current level of protection provided by the wall is predicted to reduce over time with climate change, rising sea levels and increased intensity of storms. Furthermore, the flood wall is not continuous around the harbour.

Although the two piers offer some shelter to the harbour, they do not provide enough protection from present day storm events, with waves able to overtop the structures and penetrate directly into the harbour. The piers were built over 200 years ago and over this period there have been changes to the coastline (erosion). The design based on empirical guidance at the time would not have been able to forecast the future needs and in addition development of the town has grown up around the harbour, and increased the number of properties at risk.

The South Pier is in a significant state of disrepair and at risk of imminent collapse. The head of the pier is currently fenced off from public access to maintain health and safety. Its loss would lead to a further reduction in the standard of protection of the harbour.

The collapse of the head of South Pier would soon lead to the collapse of the main body of the pier. The South Pier artificially maintains a wide beach crest at the northern end of South Beach, providing a defence against erosion and reduces the occurrence of tidal flooding landward onto Beach Parade. Should South Pier collapse, the retained beach material would be distributed across the harbour entrance. Loss of the pier would dramatically increase the risk of flooding and erosion to residential properties along Beach Parade and access to the harbour entrance would be lost, due to the distribution of beach material across the entrance. Further, the northern end of the South Beach would continue to erode.

The groynes along South Beach are also in poor condition and are predicted to collapse in the near future (within one to three years). Further loss of the rock revetment is predicted between five to 15 years. The loss of coastal defences along South Beach would result in the loss of shingle beach, and consequently, more regular flooding is predicted to occur as water inundates via Beach Parade.

The predicted loss of the existing coastal defences as well as the limited flood defences within the harbour, highlights the need for the Scheme in order to protect the harbour, town and South Beach from flooding and storm damage.

Alternative Options Considered

The need for improvement of the coastal defences at Aberaeron has been investigated over the last decade, with various engineering proposals investigated to address the remaining extents of coastal flood risk to Aberaeron.

In 2013, two separate studies were undertaken by Hyder Consulting. One study looked at the improvements required for Aberaeron Harbour and another looked at options for the remediating the South Pier. For the harbour, proposals for raising the flood defences along Quay Parade, Pwll Cam and up to the A487 road bridge were considered, as well as options to reduce the effect of waves by either significantly extending the South Pier or building a mounded offshore rock breakwater. Separately, the study on the South Pier looked at options to refurbish or rebuild the South Pier.

The outcome of the Hyder studies was that a recommendation was made for raising the height of the existing sea defences in the Harbour from Quay Parade up to the A487 road bridge, and to repair 10m of the head of the South Pier structure.

In 2014, a review of the Hyder studies was completed by Martin Wright Associates (MWA). MWA proposed that a single strategic scheme covering both the harbour and the South Beach be undertaken and this approach was found to be more economically robust in terms of the ratio of the cost of the construction compared to the benefits that would accrue by avoiding flooding. The MWA review also suggested that the Scheme considers the addition of an offshore structure such as a breakwater to reduce the impact of waves entering the harbour as well as carrying out works to stabilise the South Beach against the effects of erosion by repairing the groynes and rock revetment.

Subsequently in 2017, CCC commissioned Opus to produce a Design Strategy report to take forward the Scheme into detailed design leading to construction. The report confirmed a preferred option for the Scheme consisting of the aforementioned raising of the setback wall and works to the South Pier and South Beach.

In 2018, CCC commissioned Atkins Ltd. to undertake the detailed Scheme design. Atkins carried out further detailed analysis including computational modelling which demonstrated the need to include some significant changes to the scheme design to ensure that the objectives to avoid flooding were achieved. These changes included the addition of a new breakwater extending from the North Pier and a new flood gate at the entrance of Pwll Cam. It was also determined that the revetment on South Beach did not need extending up to the South Pier. The Scheme put forward for construction is shown in the Scheme Description below.

Scheme Description

Overview

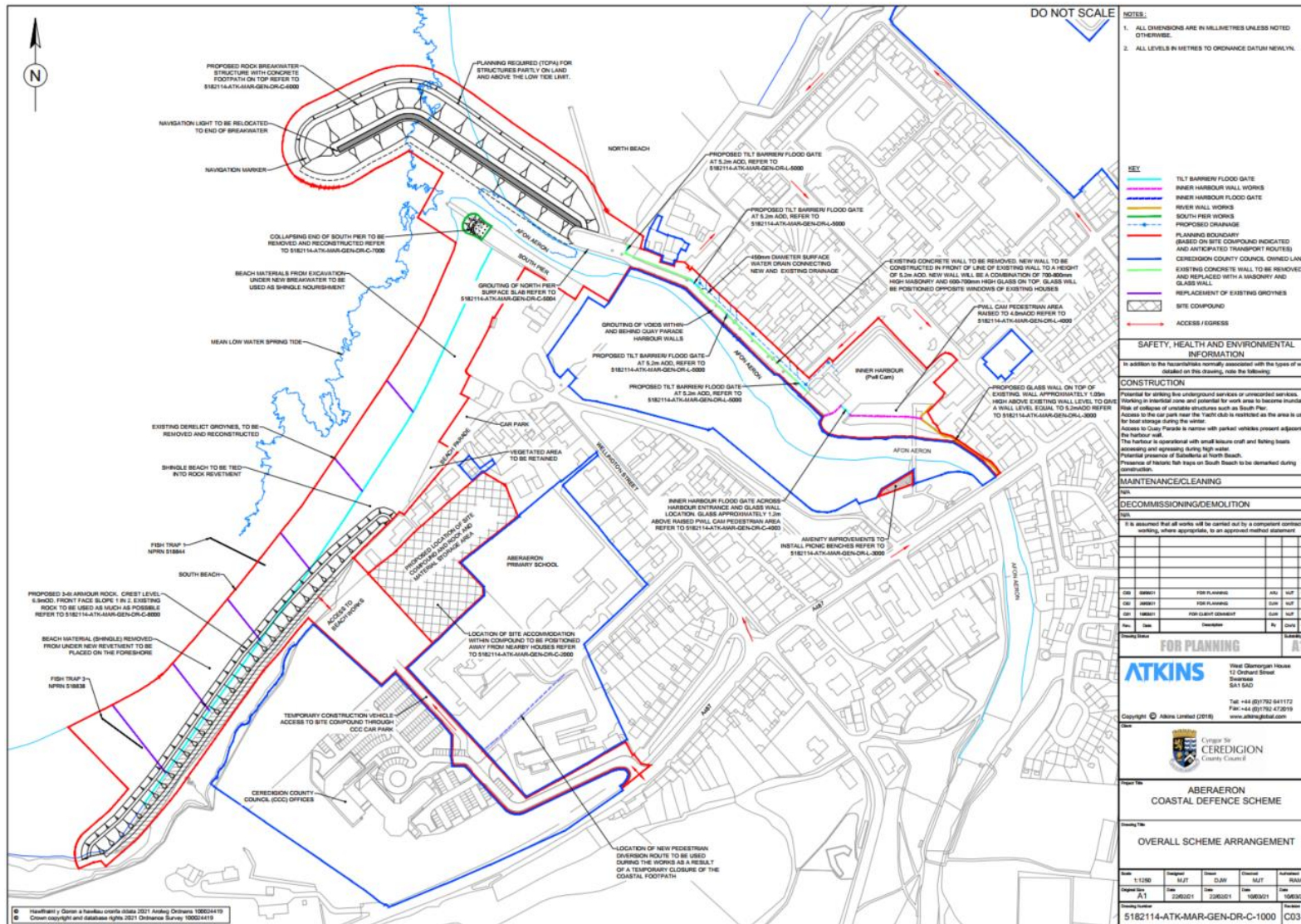
The Scheme comprises five elements, which are interlinked as integral parts to the overall flood defence scheme. The scheme elements are:

- Construction of a new rock breakwater extending out from the North Pier.
- Refurbishment and re-building of the pier-head of South Pier, including grouting repairs of the walls.
- Flood wall construction at the following locations:
 - Removal of the existing set back flood wall along Quay Parade/Pen Cei and reconstruction of a new masonry and glass wall, as well as grouting repairs of the existing quayside wall;
 - Raising of the existing River Aeron flood wall between the rear of the Monachty Hotel and the A487 referred to as the River Aeron wall; and
 - Construction of a new masonry and glass wall flood wall between Pwll Cam and the Monachty Hotel (and connecting with the existing adjacent River Aeron flood wall between the Monachty Hotel and A487).
- Construction of a flood gate at Pwll Cam inner harbour.
- Improvements to the existing defences on South Beach:
 - Replacement of existing timber groynes;
 - Replacement and extension of the existing rock revetment; and
 - Beach renourishment.

These elements are shown on Figure 2 overleaf.

The Scheme is designed to prevent wave overtopping within the harbour against a 1 in 200 annual chance of occurrence with the rock revetment on South Beach also having a 1 in 200 year standard of protection. The Scheme also provides 1 in 1,000 year standard of protection against extreme sea levels for the design life (100 years) of the Scheme. The design of the Scheme has been carried out in line with the requirements of the Welsh Government for the development of residential areas in relation to flood risk, as well as in line with guidance for flood and coastal erosion risk management and adaptation to climate change.

Figure 2 Overall Scheme Arrangement



Proposed Construction Activities

The following construction activities will be undertaken to complete each element of the Scheme.

Breakwater

- Excavation of the seabed in the footprint of the breakwater, with a geotextile mat laid on top of the excavated area. Excavated material will be re-used for the shingle renourishment on South Beach, with some of it used for the inner breakwater core.
- Placement of grey coloured rock on top of the mat to form the breakwater, which will be 243m in length and 10m wide on the top surface.
- A concrete footpath will be constructed along the top of the breakwater for public access and maintenance.
- Installation of navigation markers at the edges of the breakwater to ensure safe passage of vessels moving in and out of the harbour.
- Repair work to the surface slab of North Pier and removal of the low lying flood wall at the entrance to North Pier (where it meets Quay Parade). The wall will be replaced with a flood tilt barrier, which will be flush with the ground level, and only raised during a flood event to prevent flooding.

South Pier

- Demolition of a 10m length of the collapsing tip of South Pier and removal of material from site.
- Re-construction of the pier head into a semi-circular shape using pre-cast concrete units made in a factory and brought to site. Concrete or steel piles will be driven into the seabed to support the weight of the concrete units.
- A 5m wide layer of rock will be placed on the seabed around the new head of the pier to protect it from wave scour.
- The southern side of the pier wall will be repaired and reinforced with steel sheet piles placed into the ground to provide scour and abrasion protection. Grouting will also take place to stabilise the wall and fill any voids inside it.

Flood Walls

- Quay Parade:
 - Removal of the existing set back flood wall along Quay Parade/Pen Cei and excavation into the footway to create the new footings for the wall.
 - Reconstruction of wall using masonry with 600-700mm high glass panels on the top, supported by stainless steel columns. The overall wall level will be 5.2mOD (metres above Ordnance Datum) compared to the existing level which ranges between 4.45m and 4.81mOD along the wall.

- Four tilt barriers will be situated along the wall, recessed into the concrete ground and raised during flood events to form a solid wall. The tilt barrier locations will provide public access through the wall as the existing steps over the wall will not be replaced.
- Lamp posts will be relocated onto the road side of the wall to improve protection from water damage and to create more space for new benches on the quay side of the wall.
- Grouting will be carried out along the seaward face of the quay wall to help stabilise the wall.
- Pwll Cam to the Monachty Hotel:
 - A 55m section of new wall with a level of 5.2mOD will be constructed at the back of the existing rock revetment. The wall will be made of masonry and 700mm high glass on top.
 - To the west of the entrance channel to Pwll Cam, and adjacent to The Hive, a short 10m long section of wall will also be raised to 5.2mOD with glass panels fixed between stainless steel columns.
 - Installation of a tilt barrier at the northern end of the footbridge.
 - A raised terrace will be built behind the new wall to enable views over the wall. From this level, three steps will be constructed down to the existing quayside, with the existing access ramp retained for people with limited mobility. The existing concrete bollards will also be removed.
- Monachty Hotel to the A487:
 - Removal of a 15m section of existing wall from the footbridge to the Monachty Hotel and reconstruction of a new wall using masonry with glass panels on top to a level of 5.2mOD. Piles will be driven into the ground to stabilise the wall.
 - The existing wall between the Monachty Hotel up to the A487 road bridge will be raised with glass panels erected on top to a level of 5.2mOD. Currently the wall level is 3.8mOD.
 - The glass will be the same as that used for the wall raising at Quay Parade, the only difference being that the panels will be larger at 1,050mm high compared to 700mm high at Quay Parade. The new finished wall heights will however both be the same at 5.2m AOD.
 - A scaffold platform will be erected in the river channel to carry out the work on this section of the wall, due to the limited access on the landward side of the wall.

Flood Gate at Pwll Cam

- A new flood gate will be built across the entrance channel of Pwll Cam dock, so that during high tides and future storm events the gate can be closed, preventing overtopping into the car park and adjacent properties. The gate will be manufactured off site and will comprise a dark coloured steel structure. It will have a top level of 5.2m AOD and will measure 6m wide.
- A new concrete wall with masonry facing will be built onto both sides of the existing entrance channel walls to provide a structure on which to attach the gate. These wall abutments will have a top level of 5.4m AOD. Beneath the foundation will be a series of

concrete or steel piles which will be driven into the seabed to take the weight and forces involved with opening and closing of the gate and retaining water.

- The existing cill on the seabed at the dock entrance will be broken out and constructed in the location of the new gate so that when the gates are open, water in the dock is maintained at low tide. The cill will however, be lowered from 0.99mOD to 0.6mOD to allow for installation of the gate. This means that the water level in the dock at low tide, will be slightly lower than it is presently.
- To do the work, a cofferdam will be installed at the entrance to Pwll Cam to prevent water entering the dock, creating a dry working area for the construction period only. Any water that collects will be pumped out of the dock into the harbour to maintain a dry working area.
- Access to the gate location for machinery and plant will be created by constructing a temporary rock platform from the existing slipway. The contractor may also choose to bring in the gate by road and it would be lifted into its final position from this platform. The platform will be removed following construction.
- Another option for bringing the gate to site is by barge. A tug boat will guide the barge into the harbour, with a crane positioned on the barge used to lift the gate into position. Depending on the time taken to offload the gate from the barge, the barge may need to rest on the harbour bed until it can leave on the next high tide. Installation of the gate is the only aspect of the Scheme that may require some night-time working.
- The construction of the gate will also require some digging of service trenches using saw cutters and excavators or similar to bury electrical cables for the gate operation which will connect to mains services in Market Street. A control kiosk to house the gate operating equipment will be constructed in close proximity to the gate. It is likely to be located to the east of the entrance to Pwll Cam adjacent to the gate. The design of this structure is not yet confirmed, but could be housed within a small compound comprised of masonry walls to blend with the existing abutment and flood defence walls.
- Drilling and grouting of quay walls will also take place to repair cracks and holes in the entrance channel walls.

South Beach Improvements

- Removal of the existing six degrading timber groynes and replacement with six new timber groynes in the same locations and of a similar timber. The groynes will have a length of between 45-60m.
- The existing rock revetment rock which is in a poor condition and is not providing sufficient protection against erosion will be removed. The revetment will be rebuilt in the same footprint but will extend slightly further north along South Beach. The revetment will be 360m long compared to the existing 310m, and 20m wide. Larger rocks will be used to construct the new revetment as the existing rocks have been displaced by waves as they are too small. Some of the smaller rocks will be used however, for the inner core of the revetment.
- Excavation will be carried out in the footprint of the revetment and a geotextile mat laid down before the rocks are placed.
- The northern section of South Beach will be replenished with the shingle material excavated for the breakwater. Shingle material excavated from the revetment construction may also be used. Samples of the existing shingle has confirmed that it will

have a similar appearance and size as the existing beach material. The total volume of replenishment material to be used is approximately 16,848m³. This comprises 8,848m³ of shingle from the revetment excavation and 8,000m³ from the breakwater excavation.

Site Compound

The site compound will be located on a field in between Ysgol Gynradd Aberaeron Primary School and South Beach. The field is owned by CCC, whose offices are adjacent to the compound. Existing topsoil and grass will be removed in order to construct the compound. A temporary gravel access track will be constructed from the car park of CCC's offices to the compound area. A ramp will also be constructed from the site compound onto the beach to enable machinery to access South Beach. Both the site compound and gravel track will be removed following construction, and the area re-turfed and grassed, returning it to its existing condition. The ramp onto the beach will also be removed.

The site compound will be used to store construction materials, plant and machinery, site offices and basic welfare facilities for the contractors (kitchen/toilets). The site compound will be secured by a solid boundary fence comprising hoarding with plywood sheets around its perimeter and will be locked at night. The site office units will also be locked at night. Signs will be erected on the fences of the compound and around the site offices to inform the public of the works.

The site compound will also contain a storage area for diesel and fuels and all refuelling of plant will take place in the site compound. All fuels will be stored and handled in accordance with best practice procedures.

Construction Traffic

All materials for this scheme, will be delivered to site by road. There is a possibility however, that the rock for the breakwater and revetment may come by sea, as well as the Pwll Cam flood gate. The exact details are yet to be finalised and will be determined in conjunction with the appointed contractor.

Road access to the site will be by way of the A487, turning onto the unmarked entrance road to CCC's offices. A 10mph speed limit shall be in force and employees informed of the presence of heavy construction vehicles. Movement of plant to and from the site compound will be carried out between 7am and 7pm.

Should delivery of rock for the breakwater and revetment be by sea, the rock is likely to be sourced from a European quarry. The rock would be transported by ship, where it will anchor offshore of Aberaeron for approximately 1-2 weeks before setting sail for another load. A shallow draught tipper boat or barge will transfer the rock from the main ship onto the tipper boat using an on-board excavator equipped with a hydraulically operated grab. The tipper boat will transport the rock to the site of the breakwater or South Beach at high tide and tip the rock onto the sea bed. There will be no anchoring or beaching of the boat. A total of up to 4 return trips are estimated to be required by the main ship to and from the quarry.

For the construction of the new breakwater, South Pier refurbishment and South Beach improvements, construction vehicles will transport material and equipment from the site compound to these areas via South Beach. The contractors will track across the beach keeping to the upper beach area as far as is practical in order to reduce disturbance to the tidal area of the beach which could cause sediment to become washed into the sea. During construction, access to South Beach will be restricted to maintain public safety. Access to North Beach will be maintained throughout the construction period.

For the harbour wall raising at Quay Parade, materials will be transported from the site compound, along the A487, down Regent Street/Lower Regent Street, then along Tabernacle Street, turning

into Cadwgan Place and onto Quay Parade. Once on Quay Parade, vehicles will generally exit the site location in a loop, via Ship Street and turning onto Waterloo Street, then onto Tabernacle Street, before returning to the site compound via Market Street and the A487. Alternatively, they might do a three-point turn and exit via Cadwgan Place. Market Street is currently operating a one-way system, hence only being able to use this route on the return trip to the site compound, as is Regent Street, hence only being able to be used for transport to Quay Parade. These one-way systems are in place as part of CCC’s covid-19 Safe Zones to help maintain social distancing.

For the wall raising opposite the Monachty Hotel and up to the A487 road bridge, access to this area is likely to be via Market Street and the Harbour carpark.

The flood gate for Pwll Cam may be transported by a barge, pulled into the harbour by tug boat. Liaison will be carried out with CCC as the harbour authority with regards the need for preparing a Notice to Mariners informing them of this aspect of the works. In addition, a Notice to Mariners is also likely to be needed for the South Pier, South Beach and new breakwater works, due to the proximity of vessels moving in and out of the harbour.

Programme

The works are scheduled to commence in winter 2021 and be completed by winter 2022, a total duration of approximately 12 months. Construction will commence with the new breakwater with the other scheme elements overlapping over the 12 month period. It is estimated that the construction timescale for each phase of the works will be as follows:

Activity	Programme
New breakwater	12 months
Restoration of South Pier	6 months
Flood Walls	6 months
Pwll Cam flood gate	9 months
South Beach improvement works	9 months

These durations are weather dependent and will rely on the contractor appointed and their detailed method statement.

In order for the scheme to be completed in the shortest time possible, construction will be carried out Monday to Sunday from 7am to 7pm. Within these working hours, nearly all of the work will be restricted to periods of low tide only. Work that can take place at all tide states will include work to all three flood walls and the repair work to the surface slab at North Pier. There will be no work over Christmas, New Year and Easter public holiday and Bank Holidays.

Environmental Impacts and Proposed Mitigation Measures

Through the EIA process, a number of beneficial (i.e. positive) and adverse (i.e. negative) likely significant environmental impacts have been identified. Wherever possible, and as a first course

of action, measures have sought to reduce the significance of any adverse impacts during the development of the scheme designs. This has included altering or adapting the design of the scheme where necessary. However, where adverse impacts are still predicted, further measures (mitigation measures) have been identified to reduce their impact. The significance of the impact that remains after these mitigation measures are successfully implemented has then been determined (i.e. the residual significance).

The assessment has been supported by the collection of existing environmental data, and where necessary, the gathering of new data to inform the accurate assessment of impacts. The data used in the assessment has included:

- Studies of maps and figures;
- Gathering of existing ecological data; including an ecological walkover survey, marine subtidal ecological survey and data searches for protected species;
- Site visits by landscape architects, including photography of the relevant parts of the site; and
- Gathering of existing traffic data for local roads that would be affected by construction.
- Ground investigations involving boreholes into the ground to determine the underlying geology and soils, including testing for contaminated material.

Consultation has also been carried out with the public and relevant organisations, such as NRW, CCC and Cadw, to identify issues and concerns. Public consultation was carried out between 22 September 2020 and 20 October 2020. Due to Covid-19 restrictions the consultation was carried out digitally via a dedicated web page on CCC's website. The consultation period and website address were advertised in the local media including in the Cambrian News.

A summary of the residual environmental impacts of the Scheme is provided below, with an indication given as to whether the impact occurs during the construction or post construction phase of the scheme.

Recreation and Tourism

Aberaeron is a popular seaside destination along the Ceredigion coast, the main draw being the coastline and beach as well as the picturesque harbour surrounded by brightly painted Georgian townhouses. There are a number of hotels, bed and breakfasts, pubs, cafés and shops within walking distance of the harbour.

Activities enjoyed by visitors and residents include walks along the beach and coastline. Use of the West Wales Coast Path which provides a continuous route along the entire Welsh coastline is a popular route for walkers. The coastal waters provide an important area for recreation and nature enjoyment. The harbour quayside/promenade is a focal point for residents and visitors to the town for walking and taking in the sea views. The harbour itself is used for the mooring of boats and sailing and boating is a popular activity. Recreational fishing also takes place from the beach, piers, harbour and within the River Aeron. A number of local events take place throughout the year around the harbour such as the Town Carnival, Mackerel Festival, Aberaeron Feast and yachting events.

Visitors and residents will experience some disturbance as a result of the construction, from noise, visual/landscape impacts and the presence and movement of machinery and vehicles around the harbour and beach. South Beach will be closed to public access for the majority of the 12 month construction period to ensure public safety. Access along the Wales Coast Path will remain open. There will be no restrictions on North Beach which will provide an alternative site for recreation.

During the work around the harbour, there will be some temporary access restrictions to parts of Quay Parade and Pwll Cam in areas where work is taking place. Work will be carried out in discrete sections, so that areas where work has not started to take place remains accessible. Although these restrictions will cause some disturbance, they are localised and the majority of the harbour will be accessible at all times. Residents and visitors will still be able to walk along parts of the quayside throughout construction. The River Aeron footbridge will remain open for the majority of construction, however there will be some short periods of temporary closure with a diversion route over the A487 road bridge. A calendar of local events will be provided to the Contractor in order to reduce disruption to planned activities. For some of the events, adjustments may be required in order to enable the events to go ahead. For example, should the work on Quay Parade still be underway at the time of the Town Carnival, the parade could start at Market Street instead of Quay Parade.

Throughout the design of the scheme, consultation has been carried out with local businesses around the harbour; the Harbourmaster Hotel, Monachty Hotel, and the Hive and Cellar restaurants. Access to all local businesses will be maintained throughout construction and businesses within the working area will be informed of working hours and construction access routes.

Overall, the impact on recreation and tourism is not considered to be significant during construction. There will be temporary impacts on navigation from the closure of Pwll Cam dock during the installation of the flood gate, however, alternative moorings will be provided in the main harbour in consultation with boat owners. Navigation in and out of the harbour will be maintained throughout construction, with navigation markers provided around the works area to maintain safety.

Following construction, the Scheme will have significant long-term beneficial impacts for recreation and tourism at Aberaeron by reducing flood risk to the town and consequent damage from these events.

Human Health

Aberaeron lies within the rural county of Ceredigion with a small population and population density. It is not considered to be a deprived area in terms of health and life expectancy is slightly higher than the rest of Wales. Within the wider area of Ceredigion, people have generally healthier lifestyles than those typical across Wales. Aspects that are highly valued as contributing to wellbeing in Ceredigion include landscape and views, clean air and places to walk/cycle.

Flooding can have a serious impact on quality of life of residents and business owners, to both physical (loss of life) and psychological health (stress, depression and anxiety, and post-traumatic stress disorder). Following flooding events long-term psychological effects may be exacerbated by stresses such as having to move home, cleaning up flood damage and negotiating with insurers.

Disruption caused by floods negatively contributes to the quality of life of residents in Aberaeron. Flooding is experienced on an almost annual basis in recent years and has caused several thousand pounds worth of damage to boats and properties.

During construction no significant impacts are expected on human health, with measures to reduce impacts from noise, visual/landscape changes, access to areas for recreation incorporated into the construction method. The Scheme will, however, have a significant benefit on human health once constructed by reducing the physical and psychological effects of flood events.

Socio-Economics

Ceredigion's economy is heavily reliant on micro, small and medium-sized employers and self-employment, with employment rates similar to the Welsh average. Tourism and recreation make one of the largest economic contributions to the local community, in Ceredigion, providing income and generating jobs. Aberaeron is a key tourist destination in the county and offers an attractive coastline and harbour, independent hotels and restaurants, as well as shops. Despite the harbour location, commercial fishing is limited at Aberaeron and isn't a major contributor to the fishing income for the county.

There are a number of local businesses around the harbour and South Beach, these include hotels, restaurants and Aberaeron Yacht Club. These businesses are affected by flooding through the closure of premises during flood events and have had to invest in clean up operations following flood damage. Other major employers in the area are Ceredigion County Council, Aberaeron Police Station, Min y Môr residential care home, Ysgol Gynradd Aberaeron Primary School; and Ysgol Gyfun Aberaeron Comprehensive School.

Impacts on the local economy in Aberaeron are not considered to be significant during construction. There will be some disturbance to local businesses around the harbour from noise and the general presence of construction work in the area, however these impacts will be temporary and liaison with these businesses will continue through the construction phase.

Following construction the Scheme will have a significant beneficial impact on the local economy through the increased protection to local businesses surrounding the harbour from flooding.

Ecology

The coastline of Aberaeron lies within the Cardigan Bay / Bae Ceredigion SAC, the West Wales Marine / Gorllewin Cymru Forol SAC and the Aberarth-Carreg Wylan SSSI. There are no SPAs or Ramsar sites within 10km of the Scheme. The Cardigan Bay SAC is designated for populations of harbour porpoise, with the West Wales Marine SAC designated for reefs, sandbanks and caves, as well as dolphins, seals and lamprey. The SSSI is also cited for similar reasons as the SACs as well as species of birds. Of particular relevance to the coast at Aberaeron is the presence of *Sabellaria alveolata* (Honeycomb worm) reef. The worms form the reef and live in small tubes that they construct out of sand and shell. The reef is predominantly located offshore of North Beach. A subtidal ecology survey undertaken in 2019 for the Scheme, showed no *S.alveolata* within the footprint of the breakwater, but it is located in close proximity on North Beach.

Also located along North Beach in the intertidal area are large swathes of mussel beds, which provides an important feeding area for birds. Part of these beds extend into the footprint of the breakwater. It has been estimated that the breakwater will cause a very small 0.0006% of a 1km area of mussel bed. Given the large area of mussel beds extending north along North Beach and the small area of habitat loss, the impact is not considered to be significant.

The following measures will be implemented during construction to reduce the risk of indirect effects on the *S.alveolata* reef and mussel beds, such as smothering from sediment released into the water during excavation and building of the breakwater:

- There will be no work on North Beach.
- As much of the construction of the breakwater as possible will take place from the top of the breakwater i.e. building the breakwater seawards and using sections already built as a working platform.

- Prior to construction, a habitat survey of the *S. alveolata* reef will be undertaken on South Beach and in the footprint of the breakwater to confirm that there is no reef present. Should areas of reef be confirmed, the contractor will avoid unnecessary movement over newly established reef areas.
- There will be no anchoring or beaching of any marine vessels on the reef.
- The contractors will be informed of the presence of the reef and its protected status.

The new breakwater will cause a small loss of the two SACs and SSSI conservation sites as follows:

Table 1 Percentage Loss of Designated Sites from the Breakwater

Designated Site	Total area of site (km ²)	Area of site taken by breakwater (m ²)	Percentage loss (%)
Aberarth-Carreg Wylan SSSI	9.97	3,909	0.04
Cardigan Bay / Bae Ceredigion SAC	1460.35	10,820	0.00074
West Wales Marine SAC	7377.17	6,728	0.00009

The percentage lost is very small in comparison to the widespread extent of the protected sites and therefore the impact will not be significant. Nevertheless, monitoring of seabed levels will be undertaken following construction, as modelling of the Scheme has shown that there is the potential for sediment to build up off the tip of the breakwater, offshore of South Beach and in the V-shaped notch between the North Pier and the adjacent groyne on North Beach. Sediment accretion is already occurring in these areas, but it will be important to make sure that the breakwater is not excessively exacerbating it as it could have impacts on the reef and mussel beds if they were to become smothered. Should seabed levels be accreting at a rate that is considered to be detrimental to the reef, sediment would be removed and recycled onto South Beach.

A Habitats Regulations Assessment (HRA) has been carried out to assess the impact of the Scheme on the two SACS. The HRA has concluded that the scheme will not significantly impact on the integrity of the SACs.

Impacts on fish and marine mammals are also not expected to be significant during and after construction. The potential for dolphins, grey seals and harbour porpoises to be disturbed during construction, or harmed, will be managed by best practice as detailed in the ES.

Otters are also present on site and are known to use a ledge on the river wall on the northern bank of the River Aeron by the footbridge, as a commuting route to the harbour. The flood wall works at this location will implement the following measures to reduce disturbance to otters and to avoid significant impacts:

- Daily pre work survey to be carried out by an ecologist for otter resting places immediately prior to site works in the river.

- Any open trenches will be covered at night or a means of escape (such as a plank of wood) provided to prevent mammals becoming trapped, and safe overnight storage of plant, materials and equipment.
- Lighting during the hours of darkness will seek to avoid suitable habitats for this species, such as the banks of the River Aeron and adjacent intertidal habitat.

The Scheme will enhance otter migration by improving connectivity between the River Aeron and the sea, the latter of which provides an important foraging area for otters. This will be done by extending the existing wall ledge on the northern bank of the river further downstream. Provision of a ledge will enable otters to better migrate back upstream during periods of high water and reduce them being forced onto dry land and towards busy roads.

The area of coastal meadow proposed for use as the site compound will be stripped of its existing topsoil and grass as part of the compound set up. The turf will be stored for re-planting following construction and seeds will be harvested by CCC before construction and re-used for site reinstatement following construction. Seeds will also be sourced externally from the site for re-planting to encourage increased biodiversity. The re-planting measures and further enhancement of the site biodiversity with a greater variety of seeds means that damage to the meadow will be temporary only and not significant and in the long term could have a beneficial impact on this meadow.

Historic Environment

There are no World Heritage Sites, Scheduled Monuments, or Registered Parks and Gardens within the area of the Scheme. However, there are a number of listed buildings of historic interest, including South Pier, North Pier and the harbour quay walls, as well as the historic terraced buildings along Quay Parade. The Scheme is also partially located within the Aberaeron Conservation Area. There are no recorded remains of prehistoric, Romano-British or early medieval periods. There are three fish traps along South Beach, which although of no designated status, they are of historic interest.

During construction there will be some significant but temporary short term impacts on the way the Conservation Area derives value from its setting from noise and visual intrusion of the construction activities. These impacts will also occur for the historic piers, quayside, and along Quay Parade. The works will also negatively impact on the fish trap located at the southern-most end of South Beach. This fish trap abuts one of the timber groynes for removal and replacement, and it is likely that some of the boulders that form the fish trap will become displaced and permanently damaged.

Following construction there will be a permanent significant impact on the historic fabric of the South Pier. The pierhead will be demolished, therefore losing part of the historic structure. However, the pier head has been subject to repeated repair and rebuilding and therefore this area is likely to be of more limited value as compared with the historic stonework of the rest of the pier which will remain in situ. Historic stonework will be reclaimed where possible during construction, and the reclaimed stone used for repairs to the pier. Reconstruction of the pierhead will alter the fabric and form of the South Pier and the way the building is appreciated in views. However, the work will stop the ongoing degradation of the structure and the risk of structural failure, whilst ensuring it maintains its vital role in the coastal defences of Aberaeron Harbour and the South Beach.

For the North Pier, the presence of the breakwater will alter the setting of the pier, forming a prominent feature at the harbour entrance. This will change the way the historic pier is appreciated in views, and its role in defining the entrance to the harbour. The addition of the breakwater will result in a notable juxtaposition in the appearances of the existing and new structures that will negatively alter the character of the pier and the fortuitous aesthetic value the asset holds. The relationship between the historic and new structures will, however, be readily understood due to the differences in their construction and therefore the impact is not significant.

The proposed Scheme will result in permanent impacts to Aberaeron Conservation Area due to the presence of the breakwater extending from the North Pier and the new flood wall extending along the north side of the harbour from Quay Parade to Lower Bridge. This impact is not considered to be significant.

The Scheme will result in permanent adverse impacts to some of the historic terraces along Quay Parade due to the erection of the glazed panels along the quayside. This will change the way the quay is understood in the surrounding townscape as it will form a barrier between the quay and the town. However, the provision of openings through the flood wall at four locations will maintain permeability through the structure to some extent, preserving something of the close physical relationship between the harbour and town. The glazed panels of the wall have also been specifically chosen to maintain the visual connection to the surrounding harbour and seascape. This impact is therefore not considered to be significant.

Overall, the Scheme will provide increased protection from flooding within the conservation area, improving the long-term amenity and viability of historic buildings.

Landscape and Visual Impact

Aberaeron is set around the mouth of the River Aeron, embraced by steep and largely wooded valley slopes and coastal cliffs. The architecture of Aberaeron is unusual in this part of rural Wales as it is a planned settlement, constructed around a harbour of brightly painted Georgian style terraced buildings. The River Aeron discharges into the harbour, which is characterised by a stone wall promenade and moored boats with the two piers marking the harbour entrance. The piers are flanked by the shingle beaches of North and South Beach, both of which have flood defences along the beach. Site visits by landscape architects were made to identify key viewpoints and to identify which views could be impacted both during and following construction.

During construction there will be significant impacts on landscape and views around the harbour and beach caused by the construction work taking place. These impacts will however be temporary. Following construction there will be no significant impacts on the landscape character, as finishes to walls and structures have been carefully chosen to reflect materials already present within the area and to blend in with the surroundings.

Coastal Processes

The coastline at Aberaeron comprises a shingle beach separated into two sections, North Beach and South Beach, by the mouth of Aberaeron Harbour. The harbour entrance is marked by two piers; North Pier and South Pier. The River Aeron flows through the town and into the sea via the harbour entrance. The harbour has no water level control structures and at low tide, the seabed within the harbour is exposed. The exception is the small dock of Pwll Cam, which retains a shallow water level at low tide.

The coastline experiences erosion and flooding, and has a long history of coastal management intervention. In 2009, a coast defence scheme was constructed on North Beach. South Beach currently has a number of timber groynes and a rock revetment, but these are in a state of disrepair. The seaward end of South Pier is also severely degraded and at risk of collapse. Inside the harbour, flood walls of varying height provide some defence against flooding.

The dominant wave direction is from the southwest to west, however waves from the northwest can also be significant during storm conditions. Sources of beach sediment are limited along this stretch of coastline, predominantly due to the presence of headlands which reduce the amount of material able to bypass them into adjacent bays, as well as the more-resistant hard rock cliff outcrops which are less susceptible to erosion. Material that is available is transported in a predominant north-easterly direction.

South Pier has a significant influence on the coastal processes of the North and South beaches at Aberaeron. The pier retains a significant amount of material that is being transported in a north-east direction, enabling the harbour entrance channel to be maintained. Although it acts as a barrier to sediment movement along the coastline to the north, some nearshore movement beyond the influence of the pier is indicated, although this is limited to finer sediment. Monitoring of beach levels shows that the southern end of South Beach has eroded, with accretion at the northern end of the beach, towards the South Pier.

As described above in 'Ecology', areas of *S. alveolata* reef are present offshore of Aberaeron as well as a large area of mussel beds, both of which are dominant around North Beach. Any changes in coastal processes from the Scheme could impact on these protected areas.

The construction work will cause disturbance to South Beach from works taking place directly on the beach and from the movement of plant and machinery across the beach as well as storage areas of rock on the beach for the breakwater and revetment. The disturbance includes direct damage to the seabed as well as the release of sediment into the water that has been disturbed from the movement of machinery and from excavation. Mitigation measures described in the section on 'Ecology' will reduce the risk of damage to the reef and mussel beds during construction.

Numerical modelling has been used to predict the impacts from the Scheme, once it has been constructed, on coastal processes. Accretion of sediment has the potential to occur off the tip of the breakwater and offshore of South Beach as a result of the breakwater retaining more sediment than is currently retained by the piers. There may also be some accretion within the harbour. Evidence from existing data is that accretion is already occurring in these areas, but that possibly the breakwater could enhance these existing patterns.

Monitoring of seabed levels will be undertaken after construction and should accretion not be naturally managed by dispersal by waves and tides, dredging would be carried out. Dredging takes place within the harbour on an annual basis and this regime will continue following construction. With monitoring in place, and excess sediment removed if required, no significant impacts are expected on coastal processes as a result of the Scheme.

Overall, the Scheme will provide Aberaeron with greater protection from flooding by reducing flood risk from overtopping of water over the defences. It will also reduce erosion on South Beach, creating a significant beneficial impact.

Water Quality

Aberaeron Harbour is under both tidal and fluvial influence from Cardigan Bay and the River Aeron respectively. There are no designated Bathing Waters in the Scheme area, with the nearest one 7km away. There are also no designated Drinking Waters or Shellfish Waters within 17km of the Scheme. There are two designated surface water bodies which have the potential to be impacted by the Scheme.

- Cardigan Bay Central
- Aeron

The Cardigan Bay Central waterbody has 'Good' overall status as defined by the Water Framework Directive classification system. The Aeron waterbody is 'Moderate'. The groundwater body underlying Aberaeron is the Teifi and Coastal Ceredigion groundwater body, classified as 'Poor'.

During construction, impacts on water quality could occur from pollution arising from general construction activities, disturbance of sediment and re-mobilisation of contaminated sediment into

the water. Sediment samples taken from boreholes in the breakwater footprint, confirmed that the majority of material in this area comprises relatively large sediment sizes of sand/gravel/cobble, with a low percentage of finer material, meaning a reduced likelihood of fine material being released into the sea during the work.

To reduce turbidity, excavation will be carried out at low tide except for the for the sections of breakwater that will be below low water. A geofabric mat will be positioned onto the seabed in the excavated footprint of the breakwater, which will help reduce the washout of bed material beneath the rocks both during construction and in the future. Construction vehicles will use the upper beach as much as possible, to avoid beach materials being washed out into the sea. The tipping of rock from the barge and rock stockpiling on the beach will take place as high up the intertidal zone as possible to reduce wash out of fines into the sea. With these measures in place, any sediment released into the sea is likely to be in small quantities, which will dissipate within the water.

The presence of plant and machinery working near the water could create pollution risks should there be chemical leaks or spills. Pollution incidents could also impact on groundwater through seepage into the ground. With the exception of the breakwater, all works for the Scheme in intertidal areas will be carried out at low tide, reducing the risk of water pollution. Grouting works around the South Pier will include the use of additives in the mixture to reduce material falling into the water. For the flood gate work, a cofferdam will be in place and a geotextile mat used within the area of the cofferdam. Debris that has fallen onto the mat during the work will be collected and removed from site, along with the geofabric mat, before the cofferdam is removed and water allowed back into the Pwll Cam dock. For the flood wall walk in the River Aeron, a scaffold platform will be erected in the river channel with work on the wall taking place from the platform. A net will be placed under the scaffold to prevent materials falling into the water during the work.

Industry best practice measures to control pollution risks will be implemented by the contractor. This includes adherence to the Guidance on Pollution Prevention (GPPs) and the Construction Industry Research and Information Association (CIRIA) guidance on the control of water pollution from construction sites. These detail good practice advice for undertaking works which may have the potential to cause water pollution. The Contractor will also be expected to produce a method statement detailing pollution prevention measures and timing of works, specifically in relation to working near water.

A Water Framework Directive (WFD) assessment has been carried out of the Scheme. The WFD originates from the EU but has been retained in UK law following the UK's exit, via The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, as amended. For the purposes of the EIA, the assessment of the Scheme in relation to the Water Environment Regulations is continued to be referred to as a WFD Assessment. The WFD Compliance Assessment has considered the likely construction impacts of the Scheme against the quality elements of the Cardigan Bay Central and River Aeron waterbodies, as well as the Teifi and Coastal Ceredigion groundwater body. The Scheme will not result in deterioration to any water quality elements for these waterbodies as described in the sections above on surface water and groundwater.

Following construction, no significant changes in water quality are expected.

[Soil and Ground Conditions](#)

Ground investigations were undertaken in 2019 and 2020 to gain an understanding of the soil conditions below ground level. These surveys were carried out in the harbour, around the piers and along South Beach, with the borehole depths approximately 20m deep. The soil composition was predominantly a mix of silt, sand, gravel and occasional cobbles in all locations. There are no current waste management sites or operational landfill sites located within the immediate vicinity of the Scheme.

The potential for contaminated sediments being present was assessed by identifying potentially contaminative land uses within 500m of the Scheme. This included sources associated with the boating/yachting history of the harbour e.g. petrol, organic compounds, paints/varnishes, leaks and spills. However, no significant contaminants were obtained from the borehole samples.

No significant impacts on soil compaction, soil erosion or ground stability will result from the Scheme.

Traffic and Transport

Aberaeron is located on the A487, which is the main strategic route in this area of West Wales, linking Cardigan in the south with Aberystwyth in the north. The A487 runs through Aberaeron town centre, crossing over the River Aeron via a road bridge. Access to the harbour is via Market Street (the main high street) down to Quay Parade which terminates at the North Pier. Since July 2020, CCC introduced Safe Zones across the county, including in Aberaeron to ensure public safety from coronavirus infection during the re-opening of the town centres, including helping to maintain social distancing in public areas. These Safe Zones have been implemented via CCC's emergency powers and it has been assumed that they will still be in place when construction commences.

Automatic Traffic Count (ATC) was collected for the Scheme over a three week period in April 2019 at 5 locations. Given the recent Covid-19 pandemic in 2020/2021, more recent data has not been collected as traffic flows have been significantly reduced throughout Wales as a result of lockdowns and social distancing.

- ATC1: A487 (opposite the turning to the Council Offices)
- ATC2: Wellington Street (North of Penmaesglas)
- ATC3: Wellington Street (North of Wellington Gardens)
- ATC4: Market Street (close to the Monachty Hotel)
- ATC5: A487 North Road (just east of the junction with Regent Street)

The data was used to identify traffic volumes and peak travel times and thus identify impacts on the travel network from the construction traffic. Using estimates of predicted construction traffic, the effects on the network were shown not to be significant for the duration of the construction period.

Construction vehicles will arrive at the site compound via the A487 to offload materials. Secondary vehicles will travel across South Beach, transporting materials for the South Pier, breakwater and beach improvement works. Market Street will be the main route used to access Quay Parade and Pwll Cam for works in these areas. Part of the Harbour carpark at Pwll Cam will be used for machinery and storage during the Pwll Cam work, but this is not thought to cause significant issues for parking in the area given other parking areas available and the small space likely to be taken. Consideration will be given to construction vehicles using Wellington Street due to the presence of Aberaeron Primary School. Contractors will avoid using this route during school drop off and pick up times.

A number of spaces within three of the town car parks will be needed for use by the contractors. This includes 15 spaces at CCC's offices, 5 at the Harbour carpark (Pwll Cam) and 17 at Beach Parade carpark. During the works along Quay Parade, access and on-street parking along this road will be affected. This impact will be experienced by non-residents of Quay Parade as residents have parking at the rear of their properties along Drury Street. The Harbourmaster Hotel also has parking to the rear. Access to these properties and the hotel will therefore not be affected. Currently, Quay Parade is closed as part of the covid-19 Safe Zone measures described

in section 15.2.1 and no issues relating to congestion or lack of parking space has been observed by CCC.

A traffic management plan will be produced by the contractor to manage deliveries to the site compound as well as to manage movements of construction vehicles throughout the working area.

Should the rock for the breakwater and revetment arrive by sea, the amount of traffic generated by the construction will be much lower than that outlined above for delivery by land.

Noise and Vibration

Aberaeron is located within a rural setting on the coast. However, due to its attraction as a tourist destination, it sees seasonal variations in noise levels. Background noise levels include those generated by local traffic and sounds associated with coastal settlements (winds, waves, birds and amenity users (including dogs and boats)). Potential Noise Sensitive Receptors (NSRs) in the vicinity of the works have been identified to include:

- Residential and commercial properties along Quay Parade e.g. the Harbourmaster Hotel;
- Residential and commercial properties around Pwll Cam e.g. The Hive, Monachty Hotel and Toad Hall;
- Residents located directly behind South Beach;
- Residential and commercial properties close to the site compound;
- Min-Y- Môr nursing home; and
- Local schools e.g. Ysgol Gynradd Aberaeron Primary School.

A desktop review of the Welsh Noise Mapping identified no available noise map data for Aberaeron. This indicates no major road traffic or major transportation such as airports within the local area. Due to this and the nature of the area it is unlikely baseline noise levels for Aberaeron will exceed the $55\text{dB}_{\text{LAeq},16\text{hr}}$. Due to the Covid-19 pandemic and existing traffic flows not likely to be representative of typical conditions, a baseline noise survey has not been undertaken to confirm this.

Noise levels generated by different types of plant and machinery have been obtained to make predictions about the construction noise likely to be derived from the Scheme and potential noise impacts at various distances from the proposed works. Noise impacts will be significant to residents and visitors along Quay Parade, Pwll Cam and behind the River Aeron flood wall due to the proximity to the construction taking place. Liaison with residents at these locations will be carried out to inform them of noisy activities and timescales.

Best Practicable Means (BPM) will be implemented to minimise noise impacts as far as reasonably practicable for the Scheme. The contractor shall be instructed to ensure this shall be enforced when on site. The following site-specific BPMs have been identified for each phase of works:

1. Construction of a rock breakwater extending out from the North Pier - Vibration piling to be used where possible when installing piles for lighting and navigation structures.
2. Rebuilding of the seaward head of South Pier - Auger and vibration piling methods to be used where possible. Material from the site compound to be transported via the beach as much as possible, to reduce the need for use of Wellington Street.

3. Flood wall construction along Quay Parade and part of Pwll Cam - The existing flood wall will be removed in sections of approximately 5m in length rather than working along the full length of wall all at once. This will help to confine noisy activities in discrete locations and reduce the length of time that residents are affected by noise directly outside their property.
4. Construction of a flood gate at Pwll Cam - When installing the piles and anchors required for construction of the flood gate abutments, the contractor shall use vibratory or rotary piling methods where possible.
5. Flood wall construction Pwll Cam to A487 road bridge - Vibration piling to be used where possible to minimise noise impacts at nearby noise sensitive receptors.
6. Improvements to South Beach - As far as possible arisings from other activities such as the excavation of shingle from the seabed shall be used to minimise the amount of materials being transported or disposed from the site.
7. Site compound and access road - The site compound shall be enclosed within a solid plywood hoarding system to provide noise mitigation to noise sensitive receptors. The site compound access gate will be to the southwest away from sensitive receptors. The compound generator shall be enclosed within a noise attenuating unit to minimise noise impacts associated with continuous operation and shall be located as far from noise sensitive receptors as reasonably practicable.

Construction activities also have the potential to cause vibration from significant activities such as piling and ground compaction. There will be short term vibration impacts during daytime hours at sensitive receptors adjacent to some of the work areas. However, these receptors will not be exposed to vibration impacts over a significant time period (10 or more days in any 15 day period) and no significant adverse effects are anticipated. There are two locations, however, where piling will be required close to existing stone walls, however impacts are still not considered to be significant. These locations are The Hive during the flood gate work and the properties behind the river flood wall between Pwll Cam and the A487 road bridge.

BPM with respect to vibration generating activities will be incorporated into the construction methods. These are described as follows.

- It has been assumed that percussive piling will be avoided and lower vibration generating rotary/auger and vibration piling will be the preferred method.
- Concrete saws will be utilised to remove the flood wall along Quay Parade to minimise the use of a hydraulic breaker where possible.
- Where piling is required in close proximity with existing stone walls, a condition survey and continuous vibration monitoring should be undertaken by the contractor to ensure no structural damage to the existing wall.

Air Quality

CCC undertakes air quality monitoring as part of their commitment to local air quality management measures. The monitoring network focusses on areas which are most likely to be exposed to elevated pollution levels, namely principal roads through urban areas. There are no monitoring locations in the vicinity of the Scheme or Aberaeron.

Monitoring by CCC at other urban locations within the county shows pollutant levels to be low. Pollutant concentrations within Aberaeron are likely to be lower than those measured given its rural location. Defra air quality mapping also showed pollutants around Aberaeron to be low.

There are currently no Air Quality Management Areas in and immediately around Aberaeron, no exceedances of air quality objectives at sensitive locations, and background concentrations are well below their respective air quality objectives. Existing air quality in the vicinity of the Scheme can therefore be considered to be relatively good.

A construction dust assessment was carried out to assess impacts on air quality from dust generated from the construction. This could occur through demolition of the head of South Pier, excavation and construction works for the flood walls, flood gate, breakwater and beach works as well as from the movement of construction vehicles.

Mitigation measures given in the Institute of Air Quality Management's Guidance on the assessment of dust from demolition and construction will be implemented and the contractor will be expected to have effective control/minimisation measures in place for the duration of construction. With these measures in place, no significant impacts are expected.

Climate Change

Climate change is a large-scale, long-term shift in the Earth's weather patterns and average temperatures, primarily as a result of human-induced greenhouse gas emissions (GHG). Some of the impacts of climate change include increased storminess, more frequent extreme weather events, sea level rise (SLR) and ocean acidification. For Aberaeron the damaging effects of sea level rise and coastal erosion can be seen through the various flooding events which have impacted the town. In accordance with the Welsh Government guidance for adapting to climate change developments should allow for predictions in sea level rise.

An assessment of the Scheme's potential to contribute to the changing climate has been assessed in terms of GHG emissions and increased flooding.

The construction stage of the scheme will involve the consumption of natural resources to build the new structures, and the generation of GHG emissions during the production of construction materials, their transport to the Scheme location and construction activities. Although the construction activities are relatively large for works in a small town like Aberaeron, the Scheme itself is relatively small scale and its construction is unlikely to significantly add to climate change through the generation of emissions or the use of resources. CCC procurement policies and Welsh Government policies and guidance, including actions under the Well-being of Future Generations Act, require consideration of sustainability and climate change. Where possible, local and sustainable material choices will be considered, and transport options will consider climate impacts. No formal climate calculations have been carried out.

The Scheme has integrated sustainable management of resources where possible, in line with the Sustainable Management of Natural Resources in Wales. This includes recycling material excavated for the breakwater and revetment onto the beach for the shingle recharge, and re-using some of the demolition material from South Pier in the re-construction of the pier-head. A Site Waste Management Plan will also be developed prior to construction, which will set out how waste and materials will be managed on site during the construction process.

Consideration of future climate change, and adaptation to climate change have been incorporated into the design of the Scheme. The purpose of the proposed scheme is to improve climate change adaptation and resilience by reducing the risk of flooding to Aberaeron. The Scheme has taken into account predictions of future climate change and flood risk over the life of the Scheme.

Operation of the Scheme will be passive and will not require any power, apart from operation of the Pwll Cam gate during times of flood. Post construction, there will be no need for large scale repair or maintenance works for several years and any are likely to be small scale in nature and are not anticipated to result in significant generation of GHG or other emissions.

Impacts on climate change as a result of the construction and post construction phases are not considered to be significant.

Cumulative Effects

The potential for cumulative environmental effects of the Scheme to occur have been considered, both within the Scheme (intra-project cumulative effects), and with other relevant proposed developments (inter-project cumulative effects).

Although there are pathways for intra-project effects to occur, none of the cumulative effects identified are significant.

A search has been made of CCC's planning portal and the marine licence register. Two developments have been deemed necessary for further consideration in relation to inter-project cumulative effects. Both of these are located in the harbour area within 500m of the works and neither are considered to generate cumulative impacts with the Scheme.

Conclusions

An Environmental Impact Assessment has been undertaken of the proposal to improve flood protection at Aberaeron.

Long term beneficial impacts from the project have been identified in terms of the significant reduction in flood risk to Aberaeron. Safeguarding of the town from flooding will also have benefits for socio-economics, human health, and recreation and tourism.

During construction three significant but temporary short-term impacts have been identified. These are all short term and related to the impact of construction works. As these effects are fundamentally related to the presence of the construction works, there are no additional mitigation measures available that will reduce their significance. These impacts are on the historic Aberaeron Conservation Area from noise and visual intrusion of the construction activities, as well as the historic piers, quayside, and along Quay Parade and one of the fish traps; landscape and views around the harbour and beach caused by the construction work taking place; and noise impacts to residents and visitors along Quay Parade, Pwll Cam and behind the River Aeron flood wall due to the proximity to the construction taking place.

Following construction, Scheme will have significant long term adverse effects on the historic environment in relation to the quayside walls around the harbour in terms of the wall raising changing the way the quay is understood in the townscape and altering its appearance. There will also be a significant effect from the removal of surviving historic fabric from South Pier during the pier-head reconstruction. Given that these structures would be lost over time from flood and erosion damage without the Scheme, the effects are considered acceptable.

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