Cardiff Coastal Defences

Report to Inform a Habitats Regulations Assessment

September 2021

www.jbaconsulting.com

JBA Project Manager

Anne-Marie Moon
JBA Consulting
7-8 High Street
Newport
NP20 1QU

Revision History

Revision Ref/Date	Amendments	Issued to
August 2021	Draft Report	Cardiff County Council
August 2021	Final Report	Cardiff County Council

Contract

This report describes work commissioned by the City of Cardiff Council. Hannah Hepworth and Jonathan Harrison of JBA Consulting carried out this work.

Prepared by ..... Hannah Hepworth BSc MSc

Environmental Consultant

..... Jonathan Harrison BSc MSc MCIEEM

Senior Ecologist

Reviewed by ..... Rachael Brady BSc MSc PGCert CEcol MCIEEM

Principal Ecologist

Purpose

This document has been prepared as a Final Report for Cardiff Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared. JBA Consulting has no liability regarding the use of this report except to Cardiff Council.

Copyright

Carbon Footprint

JBA is aiming to reduce its per capita carbon emissions.

Contents

List of Figures

List of Tables

Abbreviations

HRA	Habitat Regulations Assessment
JNCC	Joint Nature Conservation Committee
NRW	Natural Resources Wales
PEA	Preliminary Ecological Appraisal
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

1 Introduction

1.1 Background

The Rhymney River is designated as a Site of Importance for Nature Conservation (SINC) and is one of the main rivers that runs through Cardiff, South Wales, starting in a hamlet called Rhymney, located just south of the Brecon Beacons National Park. When it reaches Cardiff, it flows along a wide, meandering course towards its confluence with the Severn Estuary. The Severn Estuary is one of the largest estuaries in Britain located between south Wales and southwest England. The Estuary is protected by UK legislation having been designated as a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar Site, and as a Site of Special Scientific Interest (SSSI) for a range of habitats and species.

In the past, flood defences were built along the Severn Estuary and part-way up the River Rhymney. These defences were composed of rock armour revetments, a sheet-pile wall, earth embankments, and blockstone defences. Today, these defences are severely eroded from tidal and fluvial forces and in some parts completely lost. The remaining defences are at significant risk of failure in the near future and no longer provide flood protection, especially with sea level rise predictions.

The proposed scheme is to improve and extend coastal and fluvial defences along the coastline between the Dwr Cymru Welsh Water (DCWW) Cardiff East Waste Water Treatment Works (WWTW) to the west and the eastern extent of the Lamby Way landfill site to the east. It is anticipated that the project will prevent breaches of the existing defences, reducing erosion and flooding of critical transport, waste management, and energy infrastructure located immediately landward of the scheme, and of extensive residential and commercial areas in the surrounding hinterland.

1.2 Scope of Assessment

This report is based on an examination of Natura 2000 Site Synopsis, Standard Data Forms and Conservation Objectives available from the Natural Resources Wales and Joint Nature Conservation Committee (JNCC), as well as other readily accessible internet resources, concerning the nature and wildlife value of the designated sites. The methodology used for this assessment is based upon the following guidance documents:

- The Habitats Regulations Assessment Handbook (DTA Publications, 2013)
- Assessment of plans and projects significantly affecting Natura 2000 sites (European Commission, 2001)
- Planning for the Protection of European Sites: Guidance for Regional Spatial Strategies and Local Development Documents (Department for Communities and Local Government, 2006)
- Planning Inspectorate's Guidance Note 10, Version 5 (August 2013)

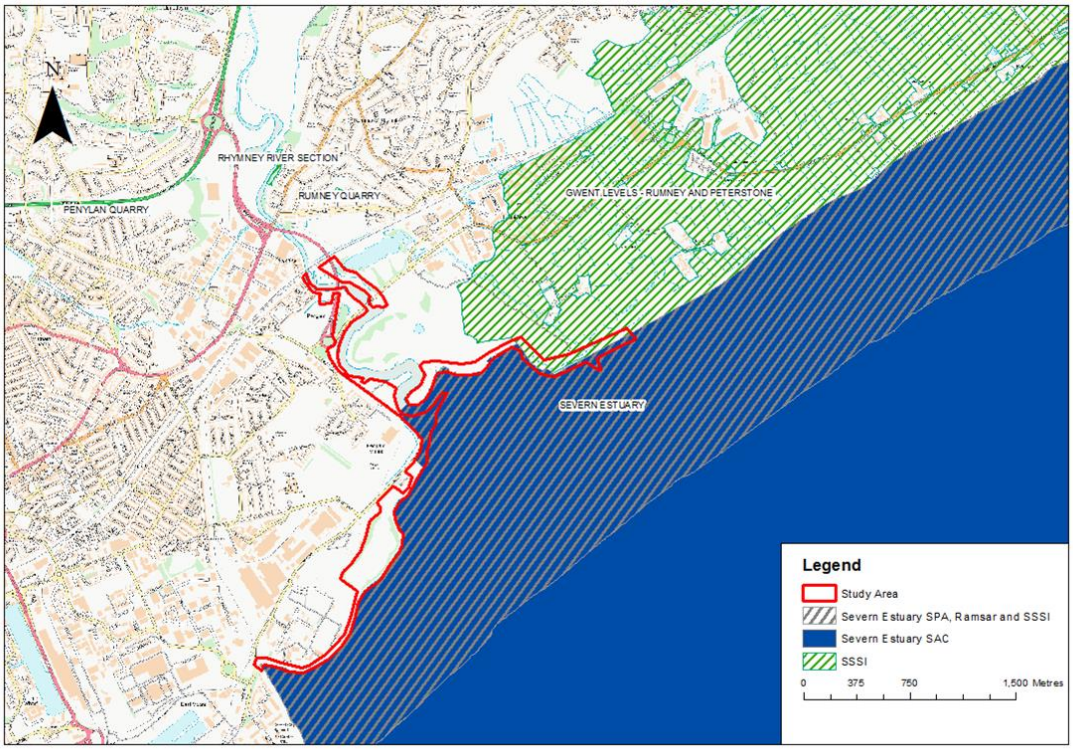

Figure 1-1: Protected sites in study area

2 Description of Project

2.1 Site Location

The proposed development comprises of new fluvial and coastal flood defences along both banks of the River Rhymney from where the A4232 crosses the river down to the confluence between the river and the Severn Estuary. The defences will then extend along the Severn Estuary coastline, east and west from the River Rhymney. This area includes the DCWW Cardiff East WWTW and northwards along the eastern extent of the Lamby Way landfill site (see Figure 1).

The scheme extends over an area of approximately 40ha. To the west of Rhymney River, landward of Rover Way road, land use is a mix of open land, residential land, commercial land, and industrial land. Rover Way itself runs parallel to the coastline and along the eastern bank of the river. It is an important transport route, linking Cardiff city centre with the eastern suburbs of the city and the A48. Along the coastline, west of Rover Way, the Celsa steelworks plant is situated with the adjacent area being used for storage of the waste generated by the plant.

To the east of the river Rhymney, Lamby Way landfill is situated where it extends along the eastern bank of the river and boarded by Lamby Way road to the north. The site has been remediated and landscaped with the majority of the land being developed as a solar farm by Cardiff Council.

The Rhymney River Motor Boat, Sail & Angling Club is located on a narrow bankside area on a large meander of the river close to its confluence with the Severn Estuary.

The Rhymney River flows along a wide, meandering course from the mainline railway line southwards to its confluence with the Severn Estuary. The channel is approximately 80m wide and contains extensive inter-tidal mudflats exposed at low tide. The Severn Estuary in this area contains a wide, shallow foreshore area, comprising extensive areas of inter-tidal mudflat and smaller areas of fringing saltmarsh habitat. Along the foreshore west of the river, immediately adjacent to higher ground, is a wide area of rocky rubble material, including remnants of building waste (e.g., bricks, slabs, concrete, rebar, etc) that is likely to have been eroded from the Frag Tip. To the east of the river, a rocky substrate is again present in the foreshore area adjacent to higher ground and includes the remnants of earlier rock revetment defences that have failed and eroded.

The defences along the Severn Estuary coastline to the west of the Rhymney River are in very poor condition with erosion occurring at a rapid rate. This is causing landfill material to be deposited into the Severn Estuary from the disused Frag Tip and the Traveller site to be at risk of erosion. Along the river bank, sea level rise is predicted to cause overtopping of the existing defences causing increased flood risk to properties and key infrastructure. In addition, the Lamby Way roundabout and Rover Way and associated utilities are at risk of being undermined and lost to erosion within 20 years.

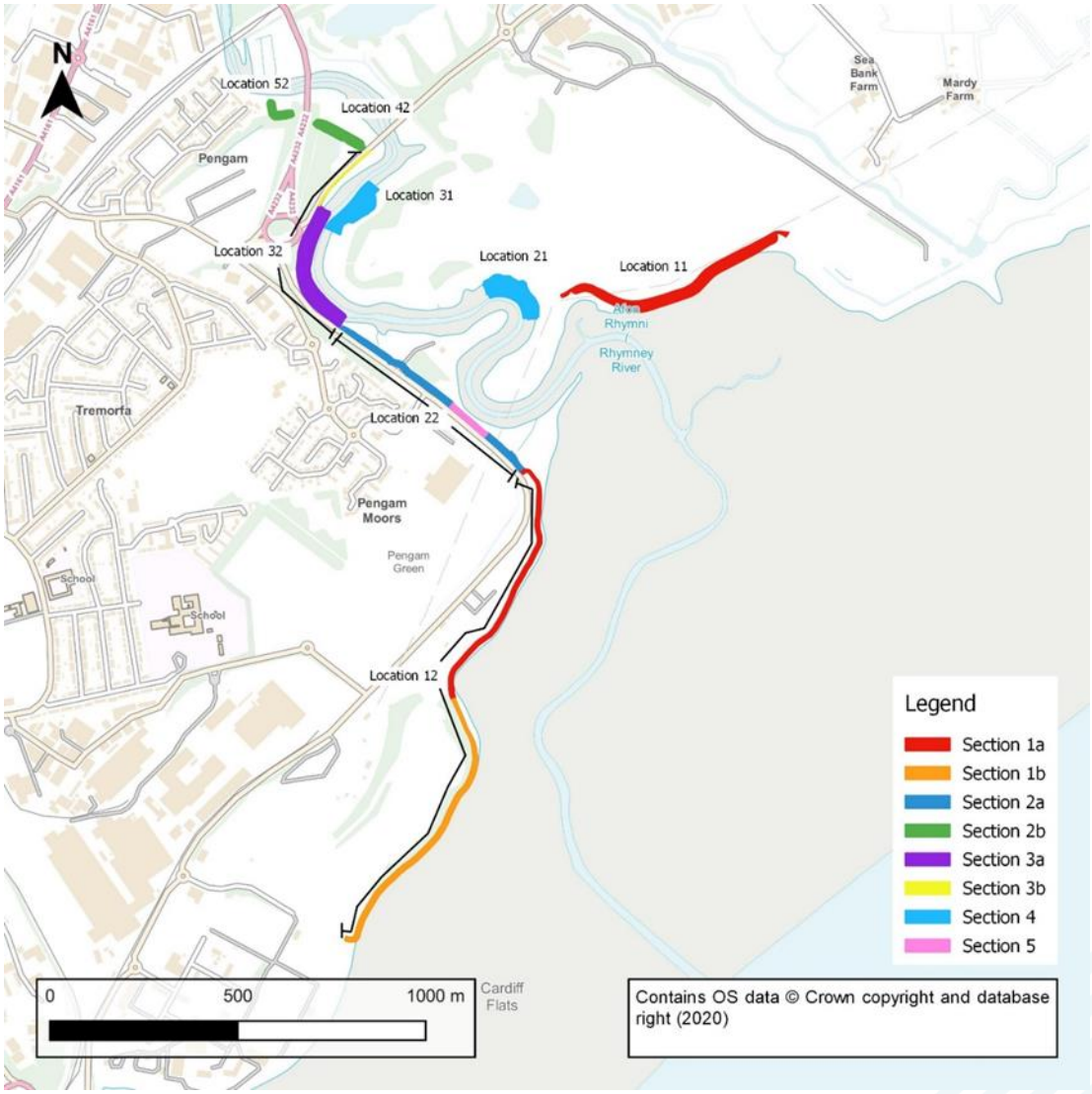

Figure 2-1: Site location

2.2 Proposed Works

Section 1a/Locations 11 & 12: Severn Estuary coastline east and west of the confluence with the Rhymney River

This section extends along much of the coastal reach of the Severn Estuary within the scheme area. The frontage includes the entire eastern coastal reach and approximately half the western reach. These areas are generally natural coastline, although there is a short length of existing defence.

The design cross-section includes a rock armour revetment on the foreshore area with an (imported) clay bund behind. To the east of the Rhymney, the bund is at approximately the same level of the existing ground, with rising levels behind. To the west of the Rhymney, the bund is at a higher level than existing, approximately 500mm above the rock crest. The bund will be covered in topsoil and where possible be allowed to self-seed from adjacent undisturbed habitats.

To construct the rock revetment, earthworks will be required to shape formation level. As part of this, some granular fill material import will be required. Additionally, various geotextiles and a turf reinforcement mat are included in the structure build-up.

Section 1b/Location 12: Severn Estuary coastline west of the confluence with the Rhymney River

This section extends along the coastal reach of the Severn Estuary within the scheme area. The frontage is in front of the old frag tip on the western coastal reach. This area is generally a natural coastline, although there is exposed manmade materials on the shallow cliff behind the beach.

The design cross-section includes a rock armour revetment set forward on the foreshore area with an (imported) fill material slope behind. The slope behind the new rock revetment slackens the existing slope and ties into existing ground levels with a termination detail. Earthworks will be required to construct both the rock armour and slope behind, requiring granular fill material import. Additionally, various geotextiles and a turf reinforcement mat are included in the structure build-up.

Section 2a/Location 22: Segment of the west bank of the Rhymney River from its confluence with the Severn Estuary northwards to the southern approach to the Rover Way/A4232/Lamby Way roundabout

This section generally comprises an existing earth bund that is located between Rover Way and the Rhymney River channel and extends northward to the roundabout. The proposed defence raises the existing bund (where present) to the required level, continuing the existing bund slope face adjacent to Rover Way up to the new crest level. The flood defence will be achieved using imported clay fill with a seeded topsoil finish. The crest of the embankment will provide pedestrian access alongside the Rhymney.

The frontage includes a double flood gate installed within a concrete housing structure to provide access to the Rhymney River Motor Boat Sail & Angling Club.

Section 2b Locations 42 & 52: West bank of the Rhymney River from the Lamby Way road bridge, northwards to Page Drive

This section generally comprises an existing earth bund running alongside the Rhymney. The proposed defence raises the existing bund (where present) to the required level, generally following the centreline of the existing where this is simply achieved. The flood defence will be achieved using imported clay fill with a seeded topsoil finish.

Section 3a/Location 32: West bank of the Rhymney River, from the southern approach of Rover Way up to Rover Way/A4232/Lamby Way roundabout.

This section is generally a natural riverbank alongside the Rover and Lamby Way although there are some old sheet piles present. There are signs of active erosion, and the sheet piles are at the end of their service life.

The design proposes that concrete erosion protection mats are installed on the riverbank. The toe of these mats will be buried into the riverbed below the low water line and secured by backfilling with rock armour units. On the lower portion of the bank, the mats will be exposed on the surface of the bank as required to manage scour action. The design proposes that at a suitable level, the erosion mats cut back into the bank and continue up under a depth of natural mud material. The risk of erosion of this mud layer is reduced, but over the service life there is the possibility that the erosion protection beneath may become exposed. At the transition point between buried and exposed erosion mats, wooden stakes and brushwood is proposed to facilitate establishment of the mud layer.

At the top of the bank, a sheet piled flood defence is proposed completed with concrete capping beam. This will provide to the flood defence level.

Section 3b/Location 32: West bank of the Rhymney River, from the Rover Way/A4232/Lamby Way roundabout, northwards to the Lamby Way road bridge

This section is generally a natural riverbank alongside Lamby Way. There are signs that this area is currently accreting and so no erosion protection is proposed. At the top of the bank, a sheet piled flood defence is proposed completed with concrete capping beam. This will provide to the flood defence level.

Section 4/Locations 21 & 31: Segments of the East bank of the River Rhymney at the Lamby Way road bridge and the large meander opposite the Rhymney River boat club

This section is generally a natural riverbank adjacent to a historic landfill. There are signs of active erosion. The design proposes that concrete erosion protection mats are installed on the riverbank. The toe of these mats will be buried into the riverbed below the low water line and secured by backfilling with rock armour units. On the lower portion of the bank, the mats will be exposed on the surface of the bank as required to manage scour action. The design proposes that at a suitable level, the erosion mats cut back into the bank and continue up under a depth of natural mud material. The risk of erosion of this mud layer is reduced, but over the service life there is the possibility that the erosion protection beneath may become exposed. At the transition point between buried and exposed erosion mats, wooden stakes and brushwood is proposed to facilitate establishment of the mud layer.

Section 5/Location 22: Segment of the west bank of the Rhymney River at the meander adjacent to Rover Way.

This section comprises an existing earth bund that is located between Rover Way and the Rhymney River channel. The proposed defence is a steel sheet pile wall complete with concrete capping beam. The sheet pile provides more resilience to erosion than a flood embankment in this location due to the restricted space between the highway and river channel.

2.3 Construction of the proposed development

The following section provides a high-level construction methodology. Construction is programmed to take approximately 18 months to complete and commence before spring 2022.

Location 11

The proposed construction sequence would be as follows:

1. Stockpile rock armour
2. Carry out initial excavation to form the crest
3. Install geotextile and sufficient depth of stone along the length crest to provide a running surface / access track for plant. This will be constructed in line with permanent construction specification but used as temporary access platform. Thereby most imported stone will be reused within the permanent works.
6. Construct embankment using long reach excavator situated on crest.
7. Complete crest construction
8. Install / tie in topsoil

This methodology may have to be amended in this section due to the presence of overhead national grid cables. Working restrictions may have to be imposed on the long reach excavator, including fitting restrictors to the excavator arm or utilising a smaller machine. Consultation with the National Grid will be required to agree the methodology prior to commencement of the works.

Location 12

For this location, the critical access path will be dictated by the supply of blockstone. Significant pre-construction works may be required in these locations. Stabilisation of the cliff line along the old frag tip may be required prior to the main works in order to allow plant movement. The basic sequence of works will be to install temporary access track into the works up to an approximate midpoint between access points and then to construct the permanent works on the way out.

The proposed construction sequence would be:

1. Stockpile rock armour

2. Carry out initial excavation to form the crest

3. Install geotextile and sufficient depth of stone along the length of the crest to provide a running surface / access track for plant movement. This will be constructed in line with permanent construction specification but used as temporary access platform. Therefore, most of the temporary imported stone will be reused within the permanent works.

6. Construct embankment using long reach excavator situated on crest.

7. Complete crest construction

8. Install embankment fill / topsoil.

Locations 21 & 31

The high-level construction sequence would be as follows:

1. Carry out initial excavation to provide access to mid platform level

2. Install geotextile and sufficient temporary stone along the width of this section to provide a running surface / access track for plant movement

3. Install scour protection from line of piles to mid-level platform.

4. Complete installation of scour protection. This will involve creating a trench which buries the toe of the scour protection. Ideally bulk bags will be utilised as a dewatering method, however this would be dependent on gaining access from the land side. Alternatively, working from the water may be required.

5. Construct embankment fill in over scour protection

6. Install timber stakes and brushwood

Location 22

The high-level construction sequence would be:

1. Carry out initial excavation to form benches

2. Install geotextile and sufficient depth of stone along the width of the embankment to provide a running surface / access track for plant movement. This would be carried out using the absolute minimum thickness of stone to provide a stable running surface, and that it could remain in place permanently, with cohesive material placed on top. Alternatively, the stone could be removed on the way out and replaced with the cohesive material.

3. Construct embankment fill in layers.

4. Complete topsoil

Location 32

The high level construction sequence would be:

1. Carry out initial excavation to provide access to mid platform level

2. Install geotextile and sufficient temporary stone along the width of this section to provide a running surface / access track for plant movement

3. Install sheet piles along line of top of embankment – adjacent to highway

4. Complete excavation and install scour protection from line of piles to mid-level platform.

5. Complete installation of scour protection. This will involve creating a trench which buries the toe of the scour protection. Ideally bulk bags will be utilised as a dewatering method, however this would be dependent on gaining access from the land side. Alternatively, working from the water may be required.

6. Construct embankment fill in over scour protection

7. Install timber stakes and brushwood.

Locations 42 & 52

Works to these areas will be carried out concurrently since a single point of access off Lamby Way is likely. The permanent works of Location 42 would be used to provide access to Location 52 – or an access route through the allotments.

1 Location 42 - Carry out initial excavation to form benches

2 Install geotextile and sufficient depth of stone along the width of the embankment to provide a running surface / access track for plant movement. This would be carried out using the absolute minimum thickness of stone to provide a stable running surface, and that it could remain in place permanently, with cohesive material placed on top. Alternatively, the stone could be removed on the way out and replaced with the cohesive material.This will be required to provide access through Location 42 towards Location 52. Temporary access underneath the A4232 will be extended to Location 52 or accessed through the allotments.

3 Location 52 - Carry out initial excavation to provide access

4 Install geotextile and sufficient temporary stone along the width of this section to provide a running surface / piling platform.

5 Install sheet piles along line of top of embankment

6 Complete excavation and Install scour protection.

7 Install timber stakes and brushwood

8 Location 52 / 42 - Construct embankment fill in layers.

9 Complete topsoil

2.3.1 Construction access

Access for all vehicle types to the west of Rhymney River will be via Rover Way initially and then via an existing access point onto the Frag Tip/motocross track to the west of the Traveller's site.

Access to the east of Rhymney River will be directly from Lamby Way or by turning off onto the existing vehicular entrance to Lamby Way Landfill. The construction vehicles will then access the river sections and Severn Estuary coastline via an existing vehicular access track across the landfill.

To access the construction areas north of the Lamby Way road bridge, vehicles will enter via a new access created off Lamby Way or via an existing vehicular route through the StarGarAllot Community Garden (Pengham allotments).

Most construction materials i.e., sheet piles, earth, rock etc, will be brought to the construction site via the existing highway network (primarily via Rover Way).

2.3.2 Construction traffic management

To enable certain works at Location 32, namely sheet piling adjacent to the A4232/Lamby Way/Rover Way roundabout, sufficient room will need to be provided in order to create a safe working zone/segregation area between the works and live traffic. This could be achieved by reducing the width of the central roundabout island and installing a temporary running surface to accommodate single width traffic. This may also involve taking up a section of the western verge of Lamby Way to provide a temporary running surface to move the north bound traffic, providing more traffic space. This would enable two lane traffic to be maintained throughout the construction period. This solution is possible as long as the temporary surface is no narrower than 3m wide in order to accommodate HGVs.

Work at this location would be carried out in the off-peak hours between 9.30 am and 3.30 pm, as it would not be feasible to reduce lane widths during the peak hours.

A detailed construction traffic management plan will be prepared prior to construction.

2.3.3 Construction site boundary

The construction site boundary for the proposed development is shown in Figure 2. This includes the footprint of the permanent works, the areas needed to accommodate construction compounds and storage facilities, and the construction access routes from the public highway to be used to facilitate access for construction plant, vehicles and staff.

The total area contained within the site boundary extends to approximately 40ha.

2.3.4 Proposed sequence of construction activities

Fencing will be installed around the perimeter of the construction site to prevent public access and ensure effective safety of visitors. The contractor will be required to register the project under the Considerate Constructors Scheme. The appointed contractor will provide a Community Liaison Officer to coordinate engagement with local communities and businesses and recreational users of the area to provide information on the construction method and programme and to ensure community questions or comments on the construction phase are effectively managed.

The appointed contractor will produce a Construction Environmental Management Plan (CEMP) that sets out the controls to be implemented during construction to effectively manage environmental risks. The CEMP will form a planning condition and will outline the methods to avoid, minimise and mitigate construction effects on the environment. The CEMP will be updated as the project progresses to enable the plan to be effective and account for any changes that occur during construction works.

An Environmental Clerk of Works (ECoW) will be appointed by Cardiff Council to support supervision of the construction phase and associated weekly environmental audits, advise the project team on ecological risks, and support the contractor to effectively manage any unforeseen ecological issues. The ECoW will also monitor adherence to the CEMP.

All environmental incidents or near misses will be reported at the earliest opportunity and will be recorded on a project-specific Environmental Incident Reporting system.

Following completion of construction of the main works, all construction plant, waste and unused materials will be removed from site. The construction compound and storage areas will be decommissioned and removed from site. All working areas will be reinstated to their former condition.

Table 2-1 Approximate Construction programme

Name	Start Date	Finish Date
Location 12	March 2022	April 2023
Location 22	May 2022	January 2023
Location 32	September 2022	August 2023
Location 11	December 2022	August 2023
Location 21	February 2023	August 2023
Location 31	March 2023	November 2023
Location 52	December 2022	April 2023
Location 42	December 2022	June 2023

2.3.5 Operation of the proposed development

The scheme will manage and reduce erosion along the coast to reduce the risk of failing coastal flood defences and the release of contaminated landfill material into the Severn Estuary from Lamby Way Tip and the Rover Way Frag Tip, in the immediate future and over the next 100 years. It will also reduce and manage the flood risk to 2,842 residential properties and 291 commercial properties over the same period.

Given the hard-engineered composition of the scheme the structure would require minimal maintenance over the 100-year design life of the scheme. Apart from occasional patch repairs, vegetation management and bi-annual condition assessments, it is unlikely that there would be any significant maintenance requirements during operation of the scheme.

3 Habitats Regulations Assessment

This assessment comprises an identification of the European sites of relevance to this assessment, the potential hazards associated with the proposed works and their relevance to these European sites (Table 5-1), the likelihood of these hazards having a significant effect on the qualifying features of the site (Table 5-2), and an assessment of whether these hazards would have a significant adverse effect on the site's integrity (Table 7-1).

3.1 Legislative Context

Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, known as the 'Habitats Directive' was adopted in 1992. The Directive establishes the requirement for a European ecological network of protected sites by designating SACs and Special Protection Areas (SPAs), which together make up the Natura 2000 network of designated sites. The Directive is transposed into law through the Conservation of Habitats and Species Regulations 2017 (as amended) (hereafter 'the Regulations'). The Regulations (HMSO, 2017) require that a HRA is undertaken by a Competent Authority prior to the issue of any consent to consider whether a proposed project is likely to have a significant effect on a Natura 2000 site. Government guidance also requires that Ramsar sites (listed under the Convention on Wetlands of International Importance [Ramsar Convention]) are included within an HRA (together, SACs, SPAs and Ramsar sites are known as 'European sites').

For all plans and projects, which are not necessary to the conservation management of the site's qualifying features, a formal screening for any likely significant effects on European sites is required. This screening assessment is based on available ecological information on the designated sites, other plans, projects and policies relevant to the area and details of the proposed works.

If the screening assessment concludes that the works may have a significant adverse effect on the conservation objectives of the sites, or that such an effect cannot be ruled out (adopting a precautionary approach) an Appropriate Assessment must be carried out. An Appropriate Assessment involves an assessment of the potential effects of a development on the conservation objectives of the site. If significant adverse effects are identified, mitigation or avoidance measures can be applied.

If it cannot be concluded that the proposed works will not adversely impact upon the integrity of the site, the project will not be able to proceed without further conditions and/or assessment.

3.2 HRA Assessment Methodology

A Habitats Regulations Assessment is an assessment of the potential effects of a proposed project on a European site both alone and in combination with other plans and projects. The Habitats Regulations promotes a hierarchy of avoidance, mitigation and compensatory measures. First, the project should aim to avoid any significant adverse effects by identifying potential measures to avoid these effects. Where adverse effects remain, mitigation measures should be applied to a point where these effects are no longer significant. If sufficient mitigation measures cannot be applied, the project should not be taken forward in its current form. In such a scenario, the project may require an assessment to identify alternative solutions that deliver the project in a form that avoids any significant adverse effects.

Where significant adverse effects remain, compensatory measures may be required. However, the application of such measures will only be permitted if no alternative

solutions exist and the project is required for Imperative Reasons of Overriding Public Interest (the 'IROPI' test).

There are four stages to the Habitats Regulations Assessment process as outlined in Table 3-1 below. This report comprises Stage 1 and Stage 2 of the process, namely a screening assessment to identify any likely significant effects of the project on a European site and an Appropriate Assessment to determine whether the works would have an adverse impact on the site, after mitigation measures have been applied.

Table 3-1: The HRA Process

HRA Stage	Description
Stage 1: Screening	This process identifies the likely significant effects upon a European site of a project or plan, either alone or in combination with other projects or plans, and determines whether these impacts are likely to be significant. If no likely significant effect is determined, the project or plan can proceed. If a likely significant effect is identified, stage 2 is commenced.
Stage 2: Appropriate Assessment	Stage 2 is subsequent to the identification of likely significant effects upon a European site in stage 1. This assessment determines whether a project or plan would have an adverse impact on the integrity of a European site, either alone or in combination with other projects or plans. This assessment is confined to the effects on the internationally important habitats and species for which the site is designated (i.e. the interest features of the site). If no adverse impact is determined, the project or plan can proceed. If an adverse impact is identified, stage 3 is commenced.
Stage 3: Assessment where no alternatives and adverse impacts remain	Where a plan or project has been found to have adverse impacts on the integrity of a European site, potential avoidance/mitigation measures or alternative options should be identified. If suitable avoidance/mitigation or alternative options are identified, that result in there being no adverse impacts from the project or plan on European sites, the project or plan can proceed. If no suitable avoidance/mitigation or alternative options are identified, as a rule the project or plan should not proceed. However, in exceptional circumstances, if there is an 'imperative reason of overriding public interest' for the implementation of the project or plan, consideration can be given to proceeding in the absence of alternative solutions. In these cases, compensatory measures will have to be put in place to offset any negative impacts.
Stage 4: Compensatory measures	Stage 4 comprises an assessment of the compensatory measures where, in light of an assessment of imperative reasons of overriding public interest, it is deemed that the project should proceed.

3.3 Consultations

This report is intended as a draft which will be submitted to Natural Resources Wales for comment. HRA is an iterative process and further consultations may be required.

4 The Severn Estuary European Marine Site

The proposed scheme is located immediately adjacent to the Severn Estuary European Marine Site. The Estuary in this area is designated as a, SPA, SAC, Ramsar site.

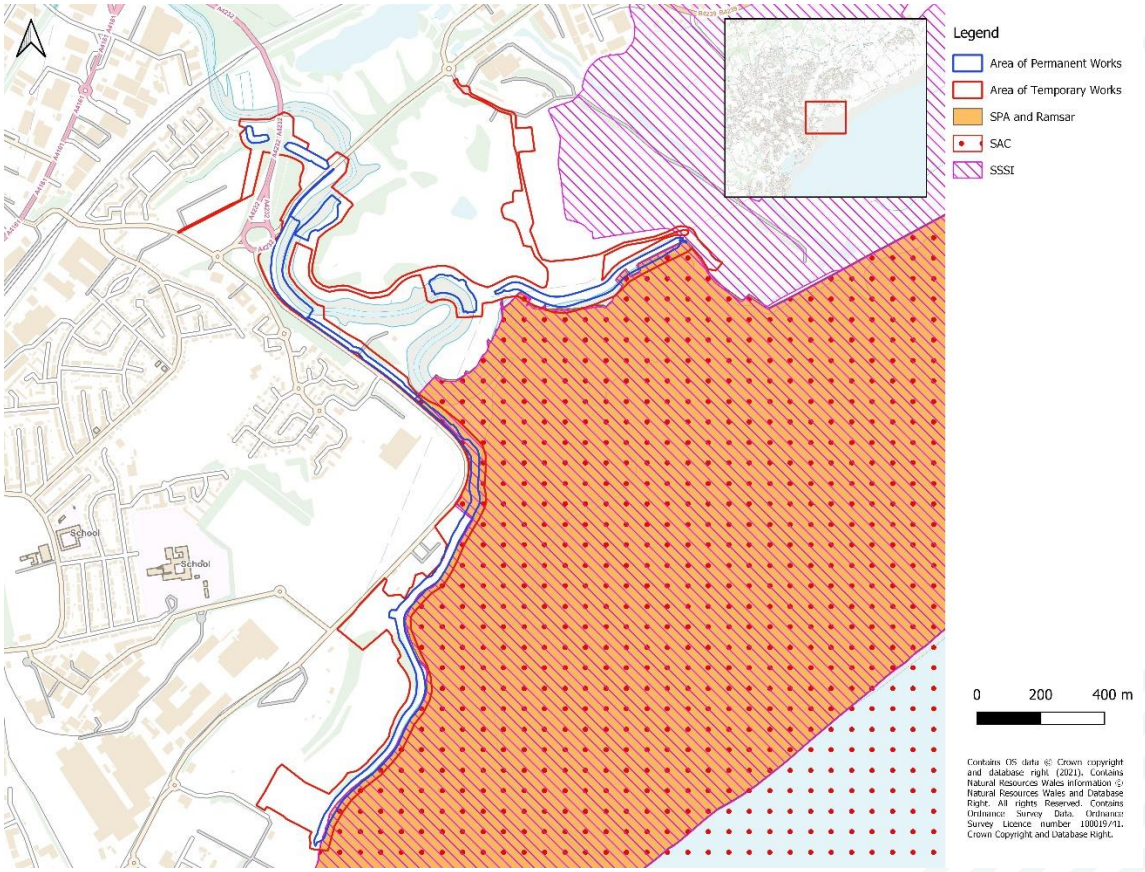

Figure 4-1: Study area in relation to the Severn Estuary European Marine Site

4.1 Qualifying Features of International Importance Severn Estuary SPA

The Severn Estuary is designated as a SPA and qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

Internationally important populations of regularly occurring Annex 1 species [under Article 4.1 of the EU Birds Directive].

- Bewick's Swan *Cygnus columbianus bewickii* (SPA interest feature 1). 222 individuals representing at least 3.2% of the wintering population in Great Britain (5-year peak mean: 2010/11 to 2014/15)

Internationally important populations of regularly occurring migratory bird species [under Article 4.2 of the EU Birds Directive]

- Curlew *Numenius arquata*, 3,654 individuals representing at least 2.6% of the wintering population in Great Britain (5-year peak mean: 2010/11 to 2014/15).
- European White-fronted Goose *Anser albifrons albifrons* (SPA interest feature 2). 307 individuals representing at least 12.8% of the wintering population in Great Britain (5-year peak mean: 2010/11 to 2014/15).

- Dunlin *Calidris alpina alpina* (SPA interest feature 3). 25,220 individuals representing at least 7.2% of the wintering population in Great Britain (5-year peak mean: 2010/11 to 2014/15).
- Pintail *Anas acuta*, 560 individuals representing at least 1.9% of the wintering population in Great Britain (5-year peak mean: 2010/11 to 2014/15).
- Redshank *Tringa totanus* (SPA interest feature 4). 3,995 individuals representing at least 3.3% of the wintering population in Great Britain (5-year peak mean: 2010/11 to 2014/15).
- Shelduck *Tadorna tadorna* (SPA interest feature 5). 3,570 individuals representing at least 5.8% of the wintering population in Great Britain (5-year peak mean: 2010/11 to 2014/15).
- Gadwall *Anas strepera* (SPA interest feature 6). 208 individuals representing at least 0.8% of the of the wintering population in Great Britain (5-year peak mean: 2010/11 to 2014/15).

Internationally important assemblage of waterfowl (wildfowl & waders) [under Article 4.2 of the EU Birds Directive].

Internationally important assemblage of waterfowl (Bewick's swan, European White-fronted Goose, Shelduck, Dunlin, Redshank, Gadwall, Ringed plover *Charadrius dubius*, Whimbrel *Numenius phaeopus*, Teal *Anas crecca*, Pintail, Wigeon *Anas penelope*, Pochard *Aythya ferina*, Tufted Duck *Aythya fuligula*, Grey Plover *Pluvialis squatarola*, Curlew *Numenius arquata*, Spotted Redshank *Tringa erythropus*) (SPA interest feature 7).

4.2 Qualifying Features of International Importance Severn Estuary SAC

The Severn Estuary SAC qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting habitats and species of European Importance listed on Annex I and Annex II of the Directive.

Table 4-1: Habitats present as primary and qualifying features of interest of the River Severn SAC

Ref no.	Qualifying interest features
Annex I Habitats: Primary feature of selection	
1130	Estuaries (including habitat and notable estuarine assemblages sub-features) (SAC interest feature 1)
1140	Mudflats and sandflats not covered by seawater at low tide (SAC interest feature 3)
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (SAC interest feature 4)
Annex I Habitats: Qualifying feature (not primary selection)	
1110	Sandbanks which are covered by seawater all the time (SAC interest feature 2)
1170	Reefs (SAC interest feature 5)

Table 4-2: Species present as primary reason for site selection

Ref no.	Qualifying interest features
Annex II Species: Primary feature of selection	
1095	Sea Lamprey (*Petromyzon marinus*) (SAC interest feature 7)
1099	River Lamprey (*Lampetra fluviatilis*) (SAC interest feature 6)
1103	Twaite Shad (*Alosa fallax*) (SAC interest feature 8)

4.3 Severn Estuary Ramsar - Qualifying Features of International Importance

The site is designated as a Ramsar site due to the presence of the following habitats and species (JNCC, 2008):

Ramsar Interest Feature 1: Estuaries - Habitat communities and species assemblages

Ramsar Criterion 1: Qualifies due to immense tidal range (second-largest in world), this affects both the physical environment and biological communities.

Ramsar Criterion 3: Qualifies due to unusual estuarine communities, reduced diversity and high productivity.

Ramsar Interest Feature 2: Assemblage of migratory fish species

Ramsar Criterion 4: Qualifies as an important run of migratory fish between the sea and river via the estuary. Species present include Salmon *Salmo salar*, Sea Trout *S. trutta*, Sea Lamprey *Petromyzon marinus*, River Lamprey *Lampetra fluviatilis*, Allis Shad *Alosa alosa*, Twaite Shad *A. fallax*, and European Eel *Anguilla anguilla*. It is also of particular importance for migratory birds during spring and autumn.

Ramsar Criterion 8: The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon, Sea Trout, Sea Lamprey, River Lamprey Allis Shad, Twaite Shad and European Eel use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. The site is important as a feeding and nursery ground for many fish species particularly Allis Shad and Twaite Shad which feed on mysid shrimps in the salt wedge.

Ramsar Interest Feature 3: Bewick's Swan

Ramsar Interest Feature 4: European White-fronted Goose

Ramsar Interest Feature 5: Dunlin

Ramsar Interest Feature 6: Redshank

Ramsar Interest Feature 7: Shelduck

Ramsar Interest Feature 8: Gadwall

Ramsar Criterion 6: Qualifies as it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Ramsar Interest Feature 9: Internationally important assemblage of waterfowl

Species are as follows: Bewick's Swan, European White-fronted Goose, Shelduck, Dunlin, Redshank, Gadwall, Ringed Plover, Whimbrel, Teal, Pintail, Wigeon, Pochard, Tufted Duck, Grey Plover, Curlew, and Spotted Redshank

Ramsar Criterion 5: Qualifies as it supports an assemblage of international importance - (1998/99-2002/2003 5-year peak mean was 70,919 waterfowl

Ramsar Criterion 6: Qualifies as it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Given the nature of the proposed works designated sites which are located upstream of the Severn Estuary have also been included.

4.3.1 River Usk SAC

Ref no.	Qualifying interest features
Annex I Habitats: Qualifying feature (not primary selection)	
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and

	Callitricho-Batrachion vegetation
Annex II Species: Primary feature of selection	
1095	Sea Lamprey *Petromyzon marinus*
1096	Brook Lamprey *Lampetra planeri*
1099	River lamprey *Lampetra fluviatilis*
1103	Twaite shad *Alosa fallax*
1106	Atlantic salmon *Salmo salar*
1163	Bullhead *Cottus gobio*
1355	Otter *Lutra lutra*
Annex II Species: Qualifying feature (not primary selection)	
1102	Allis shad *Alosa alosa*

4.3.2 River Wye Sac

Ref no.	Qualifying interest features
Annex I Habitats: Primary feature of selection	
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
Annex I Habitats: Qualifying feature (not primary selection)	
7140	Transition mires and quaking bogs
Annex II Species: Primary feature of selection	
1092	White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*
1095	Sea Lamprey *Petromyzon marinus*
1096	Brook Lamprey *Lampetra planeri*
1099	River lamprey *Lampetra fluviatilis*
1103	Twaite shad *Alosa fallax*
1106	Atlantic salmon *Salmo salar*
1163	Bullhead *Cottus gobio*
1355	Otter *Lutra lutra*
Annex II Species: Qualifying feature (not primary selection)	
1102	Allis shad *Alosa alosa*

4.4 Interest Features Present and likely to be impacted by the Scheme

An ecological survey of the site was undertaken by JBA Consulting in May 2020 which recorded the following information related to the SAC interest features:

Within the Severn Estuary SAC the works will largely be concentrated on areas of existing placed rock which hold little biodiversity value and impacts to this area during the construction of the scheme are not considered to be significant. However, the scheme will directly impact 0.45 ha of saltmarsh and has the potential to further impact intertidal mudflats in the Severn through the provision of access tracks.

Any impacts to habitats outside of the site boundary also has the potential to impact upon features of the site and this will be considered.

The intertidal mudflats and areas of saltmarsh described provide foraging and roosting habitat for a range of wintering wildfowl and wading bird species, many of which are qualifying features of the Severn Estuary EMS.

In order to inform this study, a request was made to the British Trust for Ornithology (BTO) for data from the Wetland Bird Survey (WeBS), a partnership survey between the BTO, the Royal Society for the Protection of Birds (RSPB) and the JNCC (the last on behalf of the statutory nature conservation bodies: Natural England, Natural Resources Wales, Scottish Natural Heritage and the Department of the Environment Northern Ireland) in association with the Wildfowl and Wetlands Trust. A request was made for data for the compartment that covers the areas of the proposed scheme, namely Rhymney Estuary and Great Wharf, this area is shown in Figure 4-2.

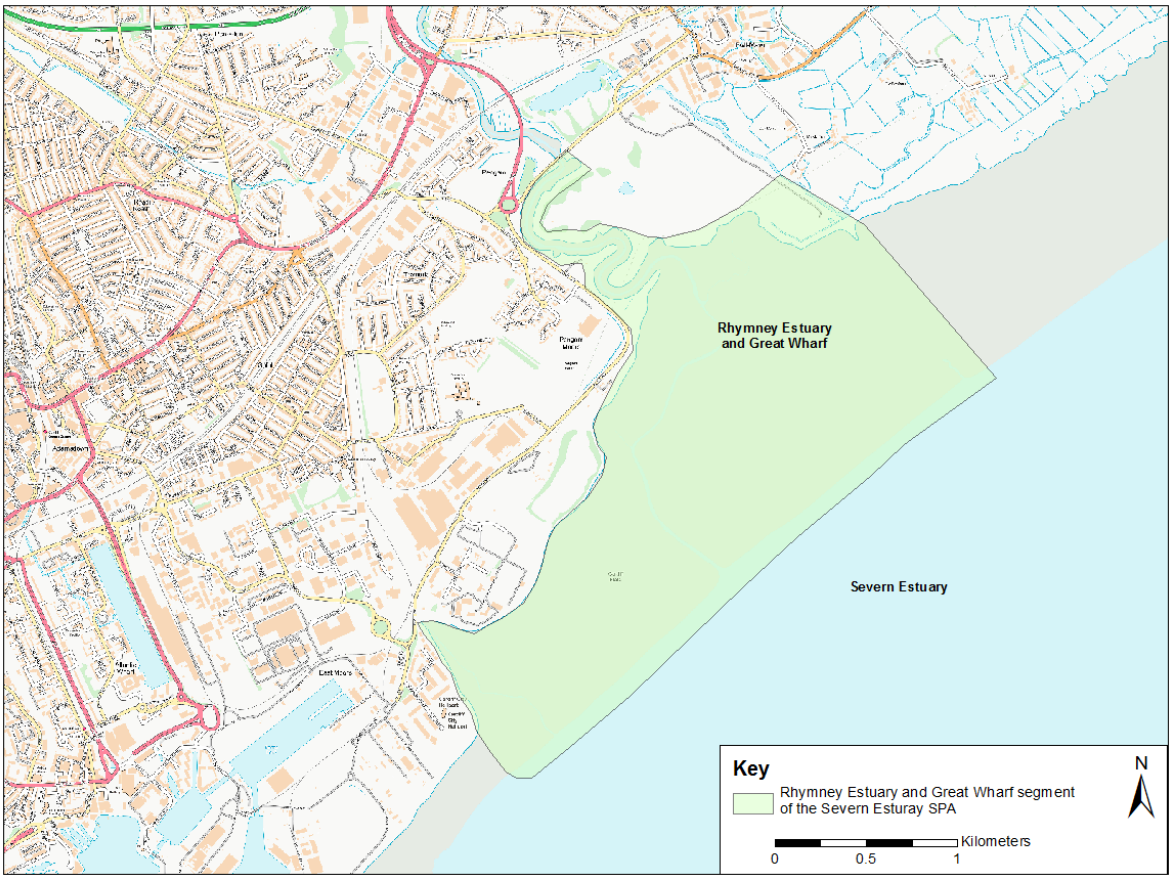

Figure 4-2:Rhymney Estuary and Great Wharf WeBS segment of the Severn Estuary SPA

BTO WeBS data revealed a total of 34 wading, wildfowl and gull species have been recorded utilising the habitats within the relevant compartment (the compartment is significantly larger than the works area). This data shows that the mudflats within and adjacent to the scheme area support significant populations of wintering birds associated with the Severn Estuary protected site. This data demonstrates that the Rhymney Estuary and Great Wharf section of the Severn Estuary supports substantial percentages of wetland birds, including 29.21% of all Redshank and 24.46% of Pintail populations in the Severn Estuary. Important numbers of Shoveler are also found and comprise 11.8% of the total Shoveler population using the Severn Estuary SPA. Data obtained from NRW show that the saltmarsh located on the northern bank of the Rhymney has been identified as an important high tide roost for Redshank as shown in Figure 4-3 taken from Welsh Coast Path Statement

for Appropriate Assessment prepared by Hyder. The other wildfowl species detailed above are associated with the intertidal mudflats and open water habitats of the Severn and large numbers have not been recorded within the Rhymney itself.

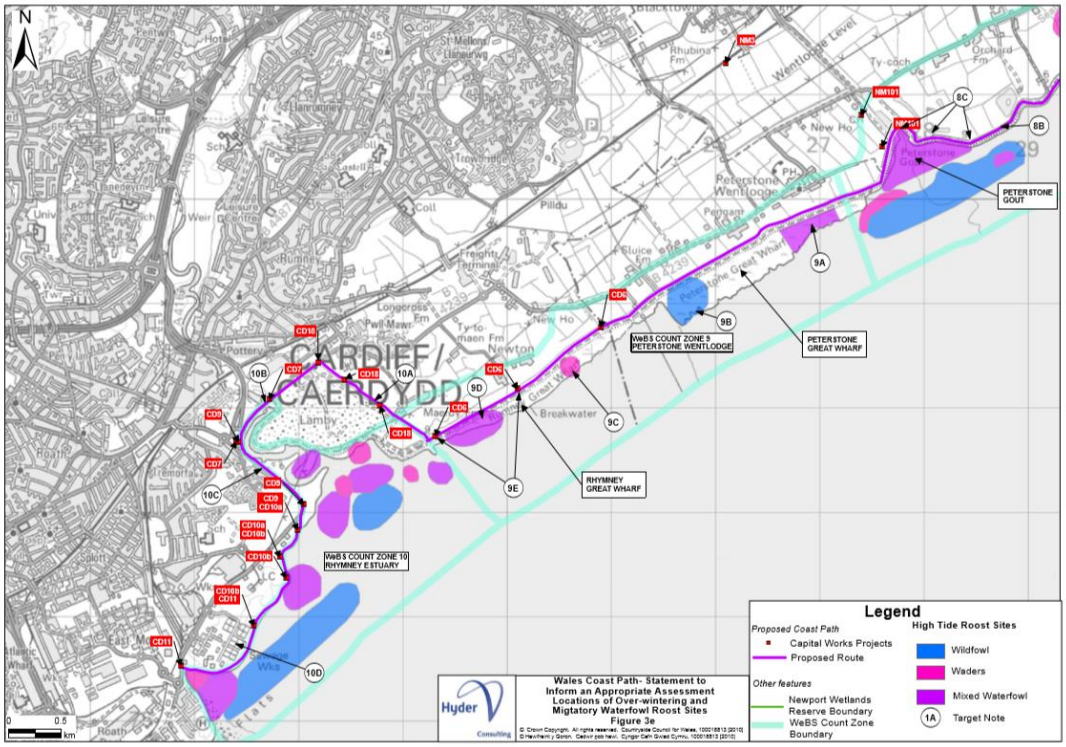

Figure 4-3:Rhymney Estuary and Great Wharf – Locations of Overwintering and migratory bird roost sites – taken from…Hyder Consulting West Coast Path – Statement to inform appropriate assessment...

Given the large amount of data available it was agreed in consultation with NRW that further bird surveys were not required. However, whilst no formal surveys have been carried out, a JBA Consulting ecologist was present on site at least once a month in a variety of tidal states between October 2020 and April 2021 and recorded the use of the Rhymney by wintering and migratory bird species. During this time the intertidal mudflats within the Rhymney were not well used by wading species with a peak count of 8 Common Ringed Plover *Charadrius hiaticula* recorded beneath the overhanging terrestrial vegetation on the final meander. No birds were recorded within the direct footprint of the proposed works and the steep nature of the banks where works are proposed mean that they do not have high potential for foraging bird species.

Maintaining the existing alignment of the coastline through the provision of new hard defences has the potential to cause coastal squeeze. By renewing the defence in this area, it can be considered that a 'hold the line' approach is being taken. As sea levels rise intertidal habitats 'migrate' landwards, there is the potential that this will lead to intertidal habitats being 'squeezed' against the hard defence and eventually lost. Calculations carried out by JBA Consulting have estimated the total intertidal habitat lost as a result of the scheme to be 1.75 Ha. These calculations were carried out using an inundation methodology as set out in Welsh Government guidance.

Direct habitat losses attributed to the footprint of permanent works and maximum potential direct habitat loss attributed to the works area (plant movement and site compounds) were calculated and are shown in table 4-1. The impact to saltmarsh

habitat was split between Annex I (Atlantic Salt Meadows) and non-Annex I (Other) communities.

Table 4-3: Total intertidal habitats impacted including construction impacts

	Total	Intertidal Annex 1 habitat (within SAC)	Intertidal Annex 1 habitat (outside SAC)	Atlantic Salt Meadows	Other saltmarsh	Other Estuarine Feature (existing flood defences and rubble)
Permanent works	7.96	1.41	0.94	0.91	0.68	4.02
Temporary Works	36.78	5.72	1.98	1.85	2.02	25.22

5 Screening Assessment

5.1 Potential Hazard to European Site

The proposed project, as detailed in Section **Error! Reference source not found.**, was assessed against the conservation objectives of each qualifying feature of the designated sites, listed in the Core Management Plans where available. These identify potential hazards that might arise to the interest features of the designated sites. Only attributes and hazards that were considered relevant to this project have been considered. The results of this assessment are shown in **Error! Reference source not found.** below.

Table 5-1: Assessment of potential hazards relevant to the works and significance

Feature	Assessment of likelihood of significant effect		
	I Relevant conservation objectives Reference relevant conservation objectives from Natura 2000 site Core Management Plan, or NRW Regulation 35/37 advice (as applicable)	II Potential impact pathway For each row assign appropriate colour (as above) and give short explanation as required	Potential Impact
Severn Estuary SPA			
SPA interest feature 1: Internationally important populations of regularly occurring Annex 1 species [under Article 4.1 of the EU Birds Directive]. Bewick's Swan	(i) the 5 year peak mean population size for the Bewick's Swan population is no less than 289 individuals (i.e. the 5 year peak mean between 1988/9 - 1992/3); (vi) aggregations of Bewick's Swan at feeding, roosting and refuge sites are not subject to significant disturbance.	Data obtained from British Trust for Ornithology (BTO) Wetland Bird Surveys (WeBS), using 5- year peak mean individual counts (taken between 2014 and 2019) show that this species is not present within the project area or within intertidal habitats directly in front of the project area. Therefore, whilst it is possible that this species may be present in the project area, effects on this species are not likely to be significant.	**No likely significant impact**
SPA interest feature 2: Internationally important population of regularly occurring migratory species: European White-Fronted Goose	i) the 5 year peak mean population size for the wintering European White-Fronted Goose population is no less than 3,002 individuals (ie the 5 year peak mean between 1988/9-1992/3); (vi) aggregations of European White-Fronted Goose at feeding or roosting sites are not subject to significant disturbance.	Data obtained from BTO WeBS surveys, using 5-year peak mean individual counts (taken between 2014 and 2019) show that a single individual of this species has been recorded within the project area or within intertidal habitats directly in front of the project area. Therefore, whilst this species is known to be present in the project area, it is likely to be present in very low numbers only, and as such effects on this species are not likely to be significant.	**No likely significant impact**
SPA interest feature 3: Internationally important population of regularly	(i) the 5 year peak mean population size for the wintering Dunlin population is no less than 41,683 individuals (ie the 5 year	Disturbance to Dunlin could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along	**Potential significant impact**

occurring migratory species: Dunlin	peak mean between 1988/9 - 1992/3); (ii) the extent of saltmarsh and associated strandlines is maintained; (iii) the extent of intertidal mudflats and sandflats is maintained; (iv) the extent of hard substrate habitats is maintained; (ix) aggregations of Dunlin at feeding or roosting sites are not subject to significant disturbance. Data obtained from British Trust for Ornithology (BTO) Wetland Bird Surveys (WeBS), using 5-year peak mean individual counts (taken between 2014 and 2019) show that this species is present in significant numbers in the project area.	the Rhymney River in the project area.	
		Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Dunlin foraging and roosting behaviour.	**Potential significant impact**
		Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect Dunlin foraging and roosting behaviour, and could lead to reduced feeding opportunities. The impact of coastal squeeze will be considered with regard to the loss of habitats, however it is not considered that the small scale loss of habitats will have a significant impact upon Dunlin numbers.	**No likely significant impact**
		Increased risk of disturbance to Dunlin through increased use of the Wales Coast Path following the completion of the flood defence scheme.	**Potential significant impact**
SPA interest feature 4: Internationally important population of regularly occurring migratory species: Redshank	(i) the 5 year peak mean population size for the wintering Redshank population is no less than 2,013 individuals (ie the 5 year peak mean between 1988/9 - 1992/3); (ii) the extent of saltmarsh and associated strandlines is maintained; (iii) the extent of intertidal mudflats and sandflats is maintained; (iv) the extent of hard substrate habitats is maintained; (ix) aggregations of Redshank at feeding or roosting sites are not subject to significant disturbance. Data obtained from British Trust for Ornithology (BTO) Wetland	Disturbance to Redshank could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	**Potential significant impact**
		Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Redshank foraging and roosting behaviour.	**Potential significant impact**
		Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect Redshank foraging and roosting behaviour, and could lead to reduced feeding opportunities. The impact of coastal squeeze will be considered with regard to the loss of habitats, however it is not	**No likely significant impact**

	Bird Surveys (WeBS), using 5-year peak mean individual counts (taken between 2014 and 2019) show that this species is present in significant numbers in the project area.	considered that the small scale loss of habitats will have a significant impact upon Redshank numbers.	
		Increased risk of disturbance to Redshank through increased use of the Wales Coast Path following the completion of the flood defence scheme.	**Potential significant impact**
SPA interest feature 5: Internationally important population of regularly occurring migratory species: Shelduck	(i) the 5 year peak mean population size for the wintering Shelduck population is no less than 2,892 individuals (ie the 5 year peak mean between 1988/9 - 1992/3); (ii) the extent of saltmarsh is maintained; (iii) the extent of intertidal mudflats and sandflats is maintained; (iv) the extent of hard substrate habitats is maintained; (v) the abundance and macro-distribution of suitable invertebrates in intertidal mudflats and sandflats is maintained; (vi) unrestricted bird sightlines of >200m at feeding and roosting sites are maintained; (vii) aggregations of Shelduck at feeding or roosting sites are not subject to significant disturbance. Data obtained from British Trust for Ornithology (BTO) Wetland Bird Surveys (WeBS), using 5-year peak mean individual counts (taken between 2014 and 2019) show that this species is present in significant numbers in the project area.	Disturbance to Shelduck could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	**Potential significant impact**
		Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Shelduck foraging and roosting behaviour.	**Potential significant impact**
		Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect Shelduck foraging and roosting behaviour, and could lead to reduced feeding opportunities.	**No likely significant impact**
		Increased risk of disturbance to Shelduck through increased use of the Wales Coast Path following the completion of the flood defence scheme.	**Potential significant impact**
SPA interest feature 6: Internationally important population of regularly	(i) the 5 year peak mean population size for the wintering gadwall population is no less than 330 (ie the 5 year peak mean	Disturbance to Gadwall could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and	**Potential significant impact**

occurring migratory species: Gadwall	between 1988/9 - 1992/3); (ii) the extent of intertidal mudflats and sandflats is maintained; (iii) unrestricted bird sightlines of >200m at feeding and roosting sites are maintained; (iv) aggregations of gadwall at feeding or roosting sites are not subject to significant disturbance. Data obtained from British Trust for Ornithology (BTO) Wetland Bird Surveys (WeBS), using 5-year peak mean individual counts (taken between 2014and 2019) show that this species is present in significant numbers in the project area.	coastline, and along the Rhymney River in the project area.	
		Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Gadwall foraging and roosting behaviour.	**Potential significant impact**
		Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect Gadwall foraging and roosting behaviour, and could lead to reduced feeding opportunities.	**No likely significant impact**
		Increased risk of disturbance to Gadwall through increased use of the Wales Coast Path following the completion of the flood defence scheme.	**Potential significant impact**
SPA interest feature 7: Internationally important assemblage of waterfowl	(i) the 5 year peak mean population size for the waterfowl assemblage is no less than 68,026 individuals (ie the 5 year peak mean between 1988/9 - 1992/3); (ii) the extent of saltmarsh and their associated strandlines is maintained; (iii) the extent of intertidal mudflats and sandflats is maintained; (iv) the extent of hard substrate habitats is maintained; (v) extent of vegetation of 500m at feeding and roosting sites are maintained; (x) waterfowl aggregations at feeding or roosting sites are not subject to significant disturbance.	Disturbance to waterfowl species could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	**Potential significant impact**
		Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect species foraging and roosting behaviour.	**Potential significant impact**
		Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect foraging and roosting behaviour, and could lead to reduced feeding opportunities.	**No likely significant impact**
		Increased risk of disturbance to waterfowl species through increased use of the Wales Coast Path following the completion of the flood defence scheme.	**Potential significant impact**
Severn Estuary SAC			

SAC interest feature 1: Estuaries	(i) The total extent of the estuary is maintained; (ii) The characteristic physical form (tidal prism/cross sectional area) and flow (tidal regime) of the estuary is maintained; (iii) The characteristic range and relative proportions of sediment sizes and sediment budget within the site is maintained; (iv) The extent, variety and spatial distribution of estuarine habitat communities within the site is maintained; (v) The extent, variety, spatial distribution and community composition of hard substrate habitats and their notable communities is maintained; (vi) The abundance of the notable estuarine species assemblages is maintained or increased; (vii) The abundance of fish species assemblages are maintained or increased; (viii) The physico-chemical characteristics of the water column support the ecological objectives described above; (ix) Toxic contaminants in water column and sediment are below levels which would pose a risk to the ecological objectives described above; (x) Airborne nutrient and contaminant loads are below levels which would pose a risk to the ecological objectives described above.	Damage and loss of estuary habitats could occur during construction of new flood defences. The scheme will directly impact 3.4ha of intertidal habitats within the Severn Estuary.	**Potential significant impact**
		Damage to and loss of coastal habitats in the future as a result of coastal squeeze due to sea level rise.	**Potential significant impact**
		Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats.	**Potential significant impact**
	Impact pathways for assemblage of fish species to be considered*		
	Impact pathways for migratory	Water quality in the Severn Estuary	**Potential Significant**

	fish (river & sea lamprey & twaite shad) to be considered*	could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats and species.	**Impact**
		The works will not block migration routes or destroy foraging or nursery grounds.	**No likely significant impact**
		Noise and vibration during piling works could cause disturbance to fish populations.	**Potential significant impact**
	Impact pathways for migratory fish (Salmon, Eel, Sea Trout and Allis Shad) need to be considered*	Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats and species.	**Potential Significant Impact**

		The works will not block migration routes or destroy foraging or nursery grounds.	**No likely significant impact**
		Noise and vibration during piling works could cause disturbance to fish populations.	**Potential significant impact**
SAC interest feature 2: Subtidal sandbanks which are covered by sea water all the time (subtidal sandbanks)	(i) The total extent of the subtidal sandbanks within the site is maintained; (ii) The extent and distribution of the individual subtidal sandbank communities within the site is maintained; (iii) The community composition of the subtidal sandbank feature within the site is maintained; (iv) The variety and distribution of sediment types across the subtidal sandbank feature is maintained; (v) The gross morphology (depth, distribution and profile) of the subtidal sandbank feature within the site is maintained.	A geomorphological assessment has been undertaken which has concluded that the proposed project is not likely to effect subtidal habitats.	**No likely significant impact**
SAC interest feature 3: Mudflats and sandflats not covered by seawater at low tide (mudflats and sandflats)	(i) The total extent of the mudflats and sandflats feature is maintained; (ii) The variety and extent of individual mudflats and sandflats communities within the site is maintained; (iii) The distribution of individual mudflats and sandflats communities within the site is maintained; (iv) The community composition of the mudflats and sandflats feature within the site is maintained; (v) The topography of the intertidal flats and the morphology (dynamic processes of sediment	Damage to and loss of mudflat habitat.	**Potential significant impact**
		Damage to and loss of coastal habitats in the future as a result of coastal squeeze due to sea level rise.	**Potential significant impact**
		Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new	**Potential significant impact**

	movement and channel migration across the flats) are maintained.	pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats.	
SAC interest feature 4: Atlantic salt meadow	(i) The total extent of Atlantic salt meadow and associated transitional vegetation communities within the site is maintained; (ii) The extent and distribution of the individual Atlantic salt meadow and associated transitional vegetation communities within the site is maintained; (iii) The zonation of Atlantic salt meadow vegetation communities and their associated transitions to other estuary habitats is maintained; (iv) The relative abundance of the typical species of the Atlantic salt meadow and associated transitional vegetation communities is maintained; (v) The abundance of the notable species of the Atlantic salt meadow and associated transitional vegetation communities is maintained; (vi) The structural variation of the salt marsh sward (resulting from grazing) is maintained within limits sufficient to satisfy the requirements of conditions iv and v above and the requirements of the Ramsar and SPA features; (vii) The characteristic stepped morphology of the salt marshes and associated creeks, pills, drainage ditches and pans, and the estuarine processes that enable their development, is	Damage to coastal habitats could occur during construction of new flood defences. The scheme will directly impact 0.45 Ha of saltmarsh habitat.	**Potential significant impact**
		Damage to and loss of coastal habitats in the future as a result of coastal squeeze due to sea level rise.	**Potential significant impact**
		Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats.	**Potential significant impact**

	maintained; (viii) Any areas of Spartina anglica salt marsh (National Vegetation Classification community SM6) are capable of developing naturally into other saltmarsh communities.		
SAC interest feature 5: Reefs	(i) The total extent and distribution of Sabellaria reef is maintained; (ii) The community composition of the Sabellaria reef is maintained; (iii) The full range of different age structures of Sabellaria reef are present; (iv) The physical and ecological processes necessary to support Sabellaria reef are maintained.	The closest identified Sabellaria reef is located over 2km from the project area. Therefore, the proposed project is not likely to effect reef habitats.	**No likely significant impact**
SAC interest feature 6: River lamprey *Lampetra fluviatilis*	(i) The migratory passage of both adult and juvenile river lamprey through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality; (ii) The size of the river lamprey population in the Severn Estuary and the rivers which drain into it, is at least maintained and is at a level that is sustainable in the long term; (iii) The abundance of prey species forming the river lamprey's food resource within the estuary, is maintained; (iv) Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.	Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats and species.	**Potential significant impact**
		The works will not block migration routes or destroy foraging or nursery grounds.	**No potential significant impact**
		Noise and vibration during piling works could cause disturbance to River Lamprey populations.	**Potential significant impact**

SAC interest feature 7: Sea Lamprey *Petromyzon marinus*	(i) The migratory passage of both adult and juvenile sea lamprey through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality; (ii) The size of the sea lamprey population in the Severn Estuary and the rivers which drain into it, is at least maintained as is at a level that is sustainable in the long term; (iii) The abundance of prey species forming the sea lamprey's food resource within the estuary, is maintained; (vi) Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.	Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats and species.	**Potential significant impact**
		The works will not block migration routes or destroy foraging or nursery grounds.	**No potential significant impact**
		Noise and vibration during piling works could cause disturbance to Sea Lamprey populations.	**Potential significant impact**
SAC interest feature 8: Twaite Shad *Alosa fallax*	(i) The migratory passage of both adult and juvenile twaite shad through the Severn Estuary between the Bristol Channel and their spawning rivers is not obstructed or impeded by physical barriers, changes in flows or poor water quality; (ii) The size of the twaite shad population within the Severn Estuary and the rivers draining into it is at least maintained and is at a level that is sustainable in the long term; (iii) The abundance of prey species forming the twaite shad's food resource within the estuary,	Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats and species.	**Potential significant impact**

	in particular at the salt wedge, is maintained; (iv) Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.		
		The works will not block migration routes or destroy foraging or nursery grounds.	
		Noise and vibration during piling workscould cause disturbance to Twaite shad populations.	**Potential significant impact**
Severn Estuary Ramsar Site			
Ramsar interest feature 1: Estuaries	See Severn Estuary SAC features and conservation objectives and impact assessment.		
Ramsar interest feature 2: Assemblage of migratory fish species	See Severn Estuary SAC features and conservation objectives and impact assessment.		
Ramsar interest feature 3: Internationally important populations of waterfowl Bewick's Swan	See Severn Estuary SPA features and conservation objectives and impact assessment.		
Ramsar interest feature 4: Internationally important populations of waterfowl European White-Fronted Goose	See Severn Estuary SPA features and conservation objectives and impact assessment.		
Ramsar interest feature 5: Internationally important populations of waterfowl Dunlin	See Severn Estuary SPA features and conservation objectives and impact assessment.		
Ramsar interest feature 6: Internationally important populations of waterfowl Redshank	See Severn Estuary SPA features and conservation objectives and impact assessment.		
Ramsar interest feature 7: Internationally important populations of waterfowl Shelduck	See Severn Estuary SPA features and conservation objectives and impact assessment.		
Ramsar interest feature 8: Internationally important populations of waterfowl Gadwall	See Severn Estuary SPA features and conservation objectives and impact assessment.		

Ramsar interest feature 9: Internationally important assemblage of waterfowl	See Severn Estuary SPA features and conservation objectives and impact assessment.		
Ramsar Criterion 8: Migration route for Salmon, Sea Trout, Sea Lamprey, River Lamprey Allis Shad, Twaite Shad and European Eel. Feeding and nursery grounds for many fish species particularly Allis Shad and Twaite Shad	*Impact pathways to be considered*		
River Wye SAC			
SAC interest feature 4: Twaite shad	The population of Twaite shad in the SAC is stable or increasing over the long term. The natural range of Twaite shad in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. There is, and will continue to be, a sufficiently large habitat to maintain the Twaite shad's population in the SAC on a long-term basis.	Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats and species. The works will not block migration routes or destroy foraging or nursery grounds.	**Potential significant impact**
SAC interest feature 5: Allis shad	The population of Allis shad in the SAC is stable or increasing over the long term. The natural range of Allis shad in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. There is, and will continue to be, a	Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface	**Potential significant impact**

	sufficiently large habitat to maintain the Allis shad's population in the SAC on a long-term basis.	waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats and species. The works will not block migration routes or destroy foraging or nursery grounds.	
River Usk SAC			
SAC interest feature 4: Twaite shad	The population of Twaite shad in the SAC is stable or increasing over the long term. The natural range of Twaite shad in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. There is, and will continue to be, a sufficiently large habitat to maintain the Twaite shad's population in the SAC on a long-term basis.	Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised, washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats and species. The works will not block migration routes or destroy foraging or nursery grounds.	**Potential significant impact**
SAC interest feature 5: Allis shad	The population of Allis shad in the SAC is stable or increasing over the long term. The natural range of Allis shad in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future.	Water quality in the Severn Estuary could be adversely affected during construction through the following three mechanisms: Potentially contaminating construction materials (i.e., fuel, oils, concrete constituents, soils, etc) are mobilised,	**Potential significant impact**

	There is, and will continue to be, a sufficiently large habitat to maintain the Allis shad's population in the SAC on a long-term basis.	washing chemical pollutants into surface waters and affecting coastal habitats. Construction activities cause the mobilisation of soils and silt, which are washed into the river. Construction activities create new pathways linking ground contamination with underlying groundwater, which in turn migrates to surface waters and affects coastal habitats and species. The works will not block migration routes or destroy foraging or nursery grounds.	

5.2 Assessment of Likely Significant Effects

Assessment of the potential hazards identified in **Error! Reference source not found.** was undertaken to determine whether they would be likely to have a significant effect on the qualifying features of the Severn Estuary European Marine Site and their supporting habitats as a consequence of the proposed flood defence works. The results of this assessment are shown in **Error! Reference source not found.**.

.

Table 5-2: Assessment of likely significant effects of hazards on interest features

Natura 2000 site feature (	Impact pathway(s)	Description of impacts	Assessment in view of conservation objectives	Can adverse effect on site integrity be ruled out?
Severn Estuary SPA - Construction				
SPA interest feature 3: Internationally important population of regularly occurring migratory species: Dunlin	Disturbance to Dunlin could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	Construction activity will cause an increased amount of noise and activity which may disturb the Dunlin. Sensitive areas adjacent to the Rhymney and Severn Estuaries have been identified as locations 11, 21 and 22. In these areas the following construction activities have been identified as having the potential to impact to disturb wading birds - Initial excavations - Placement of rock within the intertidal zone - Plant movements through the intertidal zone. There is also the potential for contractors 'wandering' away from the work zone to cause disturbance to birds in the wider area.	This will have an effect on 'aggregations of Dunlin at feeding or roosting sites' within this section of the Estuary which may in turn affect the '5 year peak mean population size for the wintering Dunlin population'.	No
	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Dunlin foraging and roosting behaviour.	Construction activity may cause damage to coastal habitats that could affect Dunlin foraging and roosting behaviour. The amount of habitat to be directly lost has been calculated in section 4. The scheme has sought to minimise intertidal habitats directly impacted by the scheme by identifying only the most at risk sections of the Rhymney. These sections comprise steep sections of the river bank on the outside of the bends and it is not considered that these areas provide foraging or roost potential for bird	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Dunlin population'.	No

		species associated with the protected site. The permanent works within the SPA boundary will be limited to the replacement of existing imported rock with similar artificial rock. However, plant movement in the intertidal area has the potential to negatively impact intertidal habitats through compaction of the foreshore.		
SPA interest feature 4: Internationally important population of regularly occurring migratory species: Redshank	Disturbance to Redshank could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	Construction activity will cause an increased amount of noise and activity which may disturb the Redshank. There is a high tide roost for Redshank identified adjacent to the proposed works. Works locations 11, 21 and 22 have been identified as having the potential to disturb the high tide roost. In these areas the following construction activities have been identified as having the potential to impact to disturb wading birds - Initial excavations - Placement of rock within the intertidal zone - Plant movements through the intertidal zone. There is also the potential for contractors wandering away from the work zone to cause disturbance to birds in the wider area.	This will have an effect on 'aggregations of Redshank at feeding or roosting sites' which may in turn affect the '5 year peak mean population size for the wintering Redshank population'.	No
	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Redshank foraging and roosting behaviour.	Construction activity may cause damage to coastal habitats that could affect Redshank foraging and roosting behaviour. The scheme has sought to minimise intertidal habitats directly impacted by the scheme by identifying only the most at risk sections of the Rhymney. These sections comprise steep sections of the river bank on the outside of the bends and it is not considered that these areas provide foraging or roost potential for bird species associated with the protected site. The permanent works within the SPA boundary will be limited to the replacement of existing imported rock with similar artificial rock. However, plant movement in the intertidal area has the potential to negatively impact intertidal	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Redshank population'.	No

		habitats through compaction of the foreshore.		
SPA interest feature 5: Internationally important population of regularly occurring migratory species: Shelduck	Disturbance to Shelduck could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	Construction activity will cause an increased amount of noise and activity which may disturb the Shelduck. Sensitive areas adjacent to the Rhymney and Severn Estuaries have been identified as locations 11, 21 and 22. In these areas the following construction activities have been identified as having the potential to disturb wading birds - Initial excavations - Placement of rock within the intertidal zone - Plant movements through the intertidal zone. There is also the potential for contractors wandering away from the work zone to cause disturbance to birds in the wider area.	This will have an effect on 'aggregations of Shelduck at feeding or roosting sites' which may in turn affect the '5 year peak mean population size for the wintering Shelduck population'.	No
	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Shelduck foraging and roosting behaviour.	Construction activity may cause damage to coastal habitats that could affect Shelduck foraging and roosting behaviour. The scheme has sought to minimise intertidal habitats directly impacted by the scheme by identifying only the most at risk sections of the Rhymney. These sections comprise steep sections of the river bank on the outside of the bends and it is not considered that these areas provide foraging or roost potential for bird species associated with the protected site. The permanent works within the SPA boundary will be limited to the replacement of existing imported rock with similar artificial rock. However, plant movement in the intertidal area has the potential to negatively impact intertidal habitats through compaction of the foreshore.	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Shelduck population'.	No
SPA interest feature 6: Internationally important population of	Disturbance to Gadwall could occur during construction of new flood defences as a result of increased noise	Construction activity will cause an increased amount of noise and activity which may disturb Gadwall. Sensitive areas adjacent to the Rhymney and Severn Estuaries have been identified as	This will have an effect on 'aggregations of Gadwall at feeding or roosting sites' which may in turn affect the '5 year peak mean population size for	No

regularly occurring migratory species: Gadwall	and activity on the foreshore and coastline, and along the Rhymney River in the project area.	locations 11, 21 and 22. In these areas the following construction activities have been identified as having the potential to impact to disturb wading birds - Initial excavations - Placement of rock within the intertidal zone - Plant movements through the intertidal zone. There is also the potential for contractors wandering away from the work zone to cause disturbance to birds in the wider area.	the wintering Gadwall population'.	
	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Gadwall foraging and roosting behaviour.	Construction activity may cause damage to coastal habitats that could affect Gadwall foraging and roosting behaviour. The scheme has sought to minimise intertidal habitats directly impacted by the scheme by identifying only the most at risk sections of the Rhymney. These sections comprise steep sections of the river bank on the outside of the bends and it is not considered that these areas provide foraging or roost potential for bird species associated with the protected site. The permanent works within the SPA boundary will be limited to the replacement of existing imported rock with similar artificial rock. However, plant movement in the intertidal area has the potential to negatively impact intertidal habitats through compaction of the foreshore.	This will have an effect on 'the extent of saltmarsh mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Gadwall population'.	No
SPA interest feature 7: Internationally important assemblage of waterfowl	Disturbance to waterfowl species could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	Sensitive areas adjacent to the Rhymney and Severn Estuaries have been identified as locations 11, 21 and 22. In these areas the following construction activities have been identified as having the potential to disturb waterfowl - Initial excavations - Placement of rock within the intertidal zone - Plant movements through the intertidal zone. There is also the potential for contractors wandering away from the work zone to cause	This will have an effect on 'aggregations of waterfowl at feeding or roosting sites' which may in turn affect the '5 year peak mean population size for the wintering waterfowl assemblages population'.	No

		disturbance to birds in the wider area.		
	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect species foraging and roosting behaviour.	Construction activity may cause damage to coastal habitats that could affect internationally important waterfowl species foraging and roosting behaviour.	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering waterfowl assemblages population'.	No
Severn Estuary SAC - Construction				
SAC interest feature 1: Estuaries	Damage to coastal habitats could occur during construction of new flood defences.	Construction activity may cause damage to estuarine habitats.	Construction activities will also affect the extent, variety, spatial distribution, and community composition of hard substrate habitats and the abundance of notable estuarine species.	No
	Pollution events during the works have the potential to damage coastal habitats	Construction activity may cause damage to estuarine habitats.	There will be machinery present on site to carry out the scour protection works. Accidental spillages of fuel, oil and hydraulic fluid could contaminate the watercourse and surrounding area.	No
	Introduction and spread of marine INNS	Imported rock material may provide a distinct pathway for the introduction of marine INNS.	It is planned that material will be brought in by road. Reducing the risk of marine INNS. However, a INNS management plan will also be developed.	No
SAC interest feature 1: Fish features and sub-features of Estuaries feature.	Damage to coastal habitats could occur during construction of new flood defences.	Construction activity may cause damage to estuarine habitats.	Construction activities will also affect the extent, variety, spatial distribution, and community composition of hard substrate habitats and the abundance of notable estuarine species.	No

Assemblage of fish species Migratory fish (river & sea lamprey & twaite shad)	Pollution events during the works have the potential to cause damage to fish species	Construction activity may cause damage to estuarine habitats and fish species	There will be machinery present on site to carry out the scour protection works. Accidental spillages of fuel, oil and hydraulic fluid could contaminate the watercourse and surrounding area.	No
Migratory fish (salmon, eel, sea trout and Allis Shad)	Disturbance of fish species through vibration of the water column during construction	If percussive piling within close proximity of the river is utilised this can cause a barrier to migration or disturbance to fish.		No
SAC interest feature 3: Mudflats and sandflats not covered by seawater at low tide (mudflats and sandflats)	Damage to mudflats and sandflats could occur during construction of new flood defences.	Construction activity may cause damage to mudflats and sandflats.	This will have an effect as the 'total extent of the mudflats and sandflats' will not be maintained and may also affect the extent, variety, spatial distribution, and composition of mudflat and sandflat communities. In addition, construction activity may also affect 'the topography of the intertidal flats and the morphology' of the area.	No
SAC interest feature 4: Atlantic salt meadow	Damage to coastal habitats could occur during construction of new flood defences.	Construction activity may cause damage to Atlantic salt meadow.	This will have an effect as the 'total extent of the Atlantic salt meadow and associated transitional vegetation communities' will not be maintained and may also affect the extent and distribution of individual Atlantic salt meadow communities. In addition, construction activity may also result in the loss of 'relative abundance of the typical species of the Atlantic salt meadow', 'abundance of notable species', 'structural variation of the salt marsh sward', and 'any areas of *Spartina anglica* salt marsh	No

			capable of developing naturally into other saltmarsh communities'.	
Severn Estuary Ramsar Site - Construction				
Ramsar interest feature 1: Estuaries	Damage to estuarine habitats could occur during construction of new flood defences.	Construction activity may cause damage to estuarine habitats .	This will have an effect as the 'total extent of the mudflats and sandflats' will not be maintained and may also affect the extent, variety, spatial distribution, and community composition of mudflat and sandflat communities and the community composition. In addition, construction activity may also affect 'the topography of the intertidal flats and the morphology' of the area.	No
Ramsar interest feature 1: Estuaries sub-feature Assemblage of fish species	Pollution events during the works have the potential to cause damage to fish species	Construction activity may cause damage to estuarine habitats and fish species	There will be machinery present on site to carry out the scour protection works. Accidental spillages of fuel, oil and hydraulic fluid could contaminate the watercourse and surrounding area.	No
	Disturbance of fish species through vibration of the water column during construction	If percussive piling within close proximity of the river is utilised this can cause a barrier to migration or disturbance to fish.		No
Ramsar interest feature 5: Internationally important populations of waterfowl Dunlin	Disturbance to Dunlin could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	Construction activity will cause an increased amount of noise and activity which may disturb Dunlin.	This will have an effect on 'aggregations of Dunlin at feeding or roosting sites' which may in turn affect the '5 year peak mean population size for the wintering Dunlin population'.	No

	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Dunlin foraging and roosting behaviour.	Construction activity may cause damage to coastal habitats that could affect Dunlin foraging and roosting behaviour.	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Dunlin population'.	No
Ramsar interest feature 6: Internationally important populations of waterfowl Redshank	Disturbance to Redshank could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	Construction activity will cause an increased amount of noise and activity which may disturb the Redshank.	This will have an effect on 'aggregations of Redshank at feeding or roosting sites' which may in turn affect the '5 year peak mean population size for the wintering Redshank population'.	No
	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Redshank foraging and roosting behaviour.	Construction activity may cause damage to coastal habitats that could affect Redshank foraging and roosting behaviour.	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Redshank population'.	No
Ramsar interest feature 7: No Internationally important populations of waterfowl Shelduck	Disturbance to Shelduck could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	Construction activity will cause an increased amount of noise and activity which may disturb the Shelduck.	This will have an effect on 'aggregations of Shelduck at feeding or roosting sites' which may in turn affect the '5 year peak mean population size for the wintering Shelduck population'.	No
	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Shelduck	Construction activity may cause damage to coastal habitats that could affect Shelduck foraging and roosting behaviour.	This will have an effect on 'the extent of saltmarsh…mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Shelduck population'.	No

	foraging and roosting behaviour.			
Ramsar interest feature 8: Internationally important populations of waterfowl Gadwall	Disturbance to Gadwall could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	Construction activity will cause an increased amount of noise and activity which may disturb Gadwall.	This will have an effect on 'aggregations of Gadwall at feeding or roosting sites' which may in turn affect the '5 year peak mean population size for the wintering Gadwall population'.	No
	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect Gadwall foraging and roosting behaviour.	Construction activity may cause damage to coastal habitats that could affect Gadwall foraging and roosting behaviour.	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Gadwall population'.	No
Ramsar interest feature 9: Internationally important assemblage of waterfowl	Disturbance to waterfowl species could occur during construction of new flood defences as a result of increased noise and activity on the foreshore and coastline, and along the Rhymney River in the project area.	Construction activity will cause an increased amount of noise and activity which may disturb internationally important waterfowl species.	This will have an effect on 'aggregations of waterfowl at feeding or roosting sites' which may in turn affect the '5 year peak mean population size for the wintering waterfowl assemblages population'.	No
	Damage to coastal habitats (saltmarsh and mudflat) could occur during construction of new flood defences that could affect species foraging and roosting behaviour.	Construction activity may cause damage to coastal habitats that could affect internationally important waterfowl species foraging and roosting behaviour.	This will have an affect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering waterfowl assemblages population'.	No

Ramsar Criterion 8: Migration route for Salmon, Sea Trout, Sea Lamprey, River Lamprey Allis Shad, Twaite Shad and European Eel. Feeding and nursery grounds for many fish species particularly Allis Shad and Twaite Shad	Pollution events during the works have the potential to cause damage to fish species	Construction activity may cause damage to estuarine habitats and fish species	There will be machinery present on site to carry out the scour protection works. Accidental spillages of fuel, oil and hydraulic fluid could contaminate the watercourse and surrounding area.	No
	Disturbance of fish species through vibration of the water column during construction		If percussive piling within close proximity of the river is utilised this can cause a barrier to migration or damage to fish.	No
River Wye SAC - Construction				
SAC interest feature 4: Twaite shad	As described above for the Severn Estuary SAC and Ramsar			
SAC interest feature 5: Allis shad				
River Usk SAC - Construction				
SAC interest feature 4: Twaite shad	As described above for the Severn Estuary SAC and Ramsar			
SAC interest feature 5: Allis shad				
Severn Estuary SPA – Operation				
SPA interest feature 3: Internationally important population of	Increased risk of disturbance to Dunlin through increased use of the Wales Coast Path following the completion of the flood defence	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Dunlin.	This will have a potential effect on 'aggregations of Dunlin at feed or roosting sites' and therefore may affect the '5 year peak mean population size for the wintering Dunlin	No

regularly occurring migratory species: Dunlin	scheme.		population'.	
SPA interest feature 4: Internationally important population of regularly occurring migratory species: Redshank	Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect Redshank foraging and roosting behaviour, and could lead to reduced feeding opportunities.	Coastal squeeze will cause a loss of coastal habitat which in turn may affect Redshank foraging and roosting behaviour and lead to reduced feeding opportunities.	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Redshank population'.	No
	Increased risk of disturbance to Redshank through increased use of the Wales Coast Path following the completion of the flood defence scheme.	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Redshank.	This will have a potential effect on 'aggregations of Redshank at feed or roosting sites' and therefore may affect the '5 year peak mean population size for the wintering Redshank population'.	No
SPA interest feature 5: Internationally important population of regularly occurring migratory species: Shelduck	Increased risk of disturbance to Shelduck through increased use of the Wales Coast Path following the completion of the flood defence scheme.	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Shelduck.	This will have a potential effect on 'aggregations of Shelduck at feed or roosting sites' and therefore may affect the '5 year peak mean population size for the wintering Shelduck population'.	No
SPA interest feature 6: Internationally important population of regularly occurring	Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect Gadwall	Coastal squeeze will cause a loss of coastal habitat which in turn may affect Gadwall foraging and roosting behaviour and lead to reduced feeding opportunities.	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Gadwall population'.	No

migratory species: Gadwall	foraging and roosting behaviour, and could lead to reduced feeding opportunities.			
	Increased risk of disturbance to Gadwall through increased use of the Wales Coast Path following the completion of the flood defence scheme.	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Gadwall.	This will have a potential effect on 'aggregations of Gadwall at feed or roosting sites' and therefore may affect the '5 year peak mean population size for the wintering Gadwall population'.	No
SPA interest feature 7: Internationally important assemblage of waterfowl	Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect foraging and roosting behaviour, and could lead to reduced feeding opportunities.	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to internationally important waterfowl.	This will have a potential effect on 'aggregations of waterfowl at feed or roosting sites' and therefore may affect the '5 year peak mean population size for the wintering waterfowl assemblage population'.	No
Severn Estuary SAC – Operation				
SAC interest feature 1: Estuaries	Damage to and loss of coastal habitats in the future as a result of coastal squeeze due to sea level rise.	Coastal squeeze will cause a loss of coastal habitat due to sea level rise.	This will have an effect as the 'total extent of the estuary' will not be maintained and may also affect the characteristic physical form and flow of the estuary. Coastal squeeze will also affect the extent, variety, spatial distribution, and community composition of hard substrate habitats and the abundance of notable estuarine species.	No
SAC interest feature 3: Mudflats and sandflats not covered by seawater at low tide	Damage to and loss of coastal habitats in the future as a result of coastal squeeze due to sea level rise.	Coastal squeeze will cause a loss of coastal habitat due to sea level rise.	This will have an effect as the 'total extent of the mudflats and sandflats' will not be maintained and may also affect the extent, variety, spatial distribution, and community composition of mudflat and	No

(mudflats and sandflats)			sandflat communities and the community composition. In addition, coastal squeeze may also affect 'the topography of the intertidal flats and the morphology' of the area.	
SAC interest feature 4: Atlantic salt meadow	Damage to and loss of coastal habitats in the future as a result of coastal squeeze due to sea level rise.	Coastal squeeze will cause a loss of coastal habitat due to sea level rise.	This will have an effect as the 'total extent of the Atlantic salt meadow and associated transitional vegetation communities' will not be maintained and may also affect the extent and distribution of individual Atlantic salt meadow communities. In addition, coastal squeeze may also result in the loss of 'relative abundance of the typical species of the Atlantic salt meadow', 'abundance of notable species', 'structural variation of the salt marsh sward', and 'any areas of *Spartina anglica* salt marsh capable of developing naturally into other saltmarsh communities'.	No
Severn Estuary Ramsar Site - Operation				
Ramsar interest feature 1: Estuaries	Damage to and loss of coastal habitats in the future as a result of coastal squeeze due to sea level rise.	Coastal squeeze will cause a loss of coastal habitat due to sea level rise.	This will have an effect as the 'total extent of the estuary' will not be maintained and may also affect the characteristic physical form and flow of the estuary. Coastal squeeze will also affect the extent, variety, spatial distribution, and community composition of hard substrate habitats and the abundance of notable estuarine species.	No
Ramsar interest	Damage to and loss of coastal habitats	Coastal squeeze will cause a loss of coastal habitat which in turn may affect Dunlin	This will have an effect on 'the extent of saltmarsh, mudflats	No

feature 5: Internationally important populations of waterfowl Dunlin	(saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect Dunlin foraging and roosting behaviour, and could lead to reduced feeding opportunities.	foraging and roosting behaviour and lead to reduced feeding opportunities.	and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Dunlin population'.	
	Increased risk of disturbance to Dunlin through increased use of the Wales Coast Path following the completion of the flood defence scheme.	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Dunlin.	This will have a potential effect on 'aggregations of Dunlin at feed or roosting sites' and therefore may affect the '5 year peak mean population size for the wintering Dunlin population'.	No
Ramsar interest feature 6: Internationally important populations of waterfowl Redshank	Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect Redshank foraging and roosting behaviour, and could lead to reduced feeding opportunities.	Coastal squeeze will cause a loss of coastal habitat which in turn may affect Redshank foraging and roosting behaviour and lead to reduced feeding opportunities.	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Redshank population'.	No
	Increased risk of disturbance to Redshank through increased use of the Wales Coast Path following the completion of the flood defence scheme.	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Redshank.	This will have a potential effect on 'aggregations of Redshank at feed or roosting sites' and therefore may affect the '5 year peak mean population size for the wintering Redshank population'.	No
Ramsar interest feature 7: Internationally important populations of waterfowl Shelduck	Damage to and loss of coastal habitats (saltmarsh and mudflat) in the future as a result of coastal squeeze due to sea level rise, which could affect Shelduck foraging and roosting behaviour, and could	Coastal squeeze will cause a loss of coastal habitat which in turn may affect Shelduck foraging and roosting behaviour and lead to reduced feeding opportunities.	This will have an effect on 'the extent of saltmarsh, mudflats and sandflats' which may in turn affect the '5 year peak mean population size for the wintering Shelduck population'.	No

	lead to reduced feeding opportunities.			
	Increased risk of disturbance to Shelduck through increased use of the Wales Coast Path following the completion of the flood defence scheme.	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Shelduck.	This will have a potential effect on 'aggregations of Shelduck at feed or roosting sites' and therefore may affect the '5 year peak mean population size for the wintering Shelduck population'.	No
Ramsar interest feature 8: Internationally important populations of waterfowl Gadwall	Increased risk of disturbance to Gadwall through increased use of the Wales Coast Path following the completion of the flood defence scheme.	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Gadwall.	This will have a potential effect on 'aggregations of Gadwall at feed or roosting sites' and therefore may affect the '5 year peak mean population size for the wintering Gadwall population'.	No

5.3 Potential In-combination Effects

The Cardiff planning portal was searched for any potential plans or projects that may run concurrently with the proposed scheme and that may have the potential for in-combination effects.

No plans or projects were found that were considered to have the potential to create in-combinations effects.

No elements of the local plan likely to cause in-combination effects were identified.

6 Screening Statement and Conclusion

6.1 Assumptions and Limitations

The screening assessment necessarily relies on some assumptions and was inevitably subject to some limitations. These are not considered to affect the conclusion, but the following points are recorded in order to ensure the basis of the assessment is clear:

- Cumulative impacts are based on published documentation and assumptions and no consultation has taken place with the project or plan proposers.
- Information on the works and conditions on site are based on current knowledge at the time of writing. Changes to the site since surveys were undertaken cannot be accounted for.

6.2 Conclusions

There is the potential for the construction of the flood defences to impact upon the features of the Severn Estuary European Marine Site through direct loss of habitats, disturbance or changes in water quality. Any impacts to habitats outside of the site boundary also have the potential to impact upon features of the site and this is also been considered.

The intertidal mudflats and areas of saltmarsh provide foraging and roosting habitat for a range of wintering wildfowl and wading bird species, many of which are qualifying features of the Severn Estuary protected site. Data obtained from the BTO indicate that the mudflats and saltmarsh surrounding the works area are utilised by significant populations of bird species that are qualifying features of the Severn Estuary protected sites. There is, therefore, the potential to disturb these species associated with the Severn Estuary Ramsar and SPA if the works are carried out in the wintering period. Higher risk areas have been identified as works locations 11, 21 and 22. There is a significant construction phase risk in these areas of disturbance to birds using the saltmarsh that have been identified as high tide roosts.

In these areas the following construction activities have been identified as having the potential to disturb wading birds

- Initial excavations
- Placement of rock within the intertidal zone
- Plant movements through the intertidal zone.

There is also the potential for contractors wandering away from the work zone to cause disturbance to birds in the wider area.

At Mean Low Water Spring (MLWS), mudflats are exposed approximately 2 miles out into the Severn Estuary and relatively low numbers of birds have been recorded utilising the intertidal habitats within 500m of the proposed scheme during this time. Given the abundance of intertidal habitat it is considered that disturbance impacts will only be significant 2 hours either side of high tide. However, wading birds are more sensitive to disturbance whilst subjected to periods of low temperature during the winter. Low temperatures increase energy expenditure of wintering birds and disturbance and during prolonged periods of cold weather, birds may also become reluctant to fly to maintain energy reserves. During these periods there is an increase in the potential impact of a disturbance.

The scheme has sought to minimise intertidal habitats directly impacted by the scheme by identifying only the most at risk sections of the Rhymney. These sections comprise steep sections of the river bank on the outside of the bends and it is not considered that these areas provide foraging or roost potential for bird species associated with the protected site. The permanent works within the SPA boundary will be limited to the replacement of existing imported rock with similar artificial rock. However, plant movement in the intertidal area

has the potential to negatively impact intertidal habitats through compaction of the foreshore.

The loss of intertidal habitats within the Rhymney have the potential to impact birds utilising this area in bad weather. The permanent works within the SAC boundary will be limited to the replacing existing imported rock with similar artificial rock. However, plant movement in the intertidal area has the potential to negatively impact intertidal habitats through compaction of the foreshore.

There is the potential to negatively impact intertidal and subtidal habitats through pollution incidents.

The Severn Estuary and Rhymney River SINC are designated for a range of migratory fish species and a number of these were for migratory species that are likely to spawn further up the Rhymney River or in other rivers higher up in the Severn Estuary.

Mobilisation of sediments and changes to the turbidity of the water column during the construction works have the potential to impact upon fish species.

Pollution incidents such as fuel spills and release of ground contaminants during the construction of the scheme have the potential to impact fish species.

Whilst no piling will take place below Highest Astronomical Tide (HAT) there is the potential risk of disturbance to migratory fish from working practices that will cause vibrations within the water column e.g. percussive piling.

7 Appropriate Assessment

7.1 Introduction

Stage 2 of the HRA process is an Appropriate Assessment, which is required because likely significant effects caused by the proposed works have been identified on the Severn Estuary European Marine Site. The Appropriate Assessment determines whether a project or plan would have an adverse impact on the integrity of a European site. In this assessment, avoidance or mitigation measures are applied to a point where the effects identified are no longer significant. If no significant impact on site integrity can be demonstrated beyond reasonable scientific doubt, the project or plan can proceed. If sufficient avoidance or mitigation measures cannot be applied, the project should not be taken forward in its current form unless there is a demonstration of no suitable alternatives and there are reasons of overriding public interest.

7.2 Assessment of Potential Hazards and Mitigation

The hazards identified in Table 5-1 are assessed below in Table 7-1 against the Annex I and Annex II features which were evaluated in Table 5-2 as likely to be significantly affected by the works. Avoidance and mitigation measures are presented and an assessment is made on whether an adverse impact remains after the mitigation is applied.

Table 7-1: Appropriate Assessment of hazards and mitigation on site integrity.

Interest Feature (from Table 4.1 – 'NO' rows only)	Description of adverse effect(s)	Can adverse effect(s) be mitigated?	Description of mitigation measures, and how they would be applied (e.g. contractual obligations, consent conditions)	Can adverse effect on site integrity be ruled out?
Severn Estuary SPA - Construction				
SPA interest feature 3: Internationally important population of regularly occurring migratory species: Dunlin	Construction activity will cause an increased amount of noise and activity which may disturb Dunlin.	Yes	Along the coastline, the rock armour will be kept as close to the original footprint as possible to reduce damage to coastal habitats. Sensitive habitats such as saltmarsh and reedbeds have been identified during the design process and removed from the red line boundary that would allow construction plant to enter these areas.	Yes
	Construction activity may cause damage to coastal habitats that could affect Dunlin foraging and roosting behaviour.	Yes	There is the potential to disturb this species if the works are carried out in the wintering period. Higher risk areas have been identified as works locations 11, 21 and 22. Any works identified above as having the potential to cause disturbance adjacent to identified high tide roosts will be restricted during a 2 hour window either side of high tide.	Yes
SPA interest feature 4: Internationally important population of regularly occurring migratory species: Redshank	Construction activity will cause an increased amount of noise and activity which may disturb Redshank.	Yes	There is the potential to disturb this species if the works are carried out in the wintering period. Higher risk areas have been identified as works locations 11, 21 and 22. Any works identified above as having the potential to cause disturbance adjacent to identified high tide roosts will be restricted during a 2 hour window either side of high tide.	Yes
	Construction activity may cause damage to coastal habitats that could affect Redshank foraging and roosting behaviour.	Yes	Direct impacts to habitats suitable for wading birds have been avoided as much as possible. Sensitive habitats such as saltmarsh and reedbeds have been identified during the design process and removed from the red line boundary that would allow construction plant to enter these areas.	Yes

			To further mitigate the hard engineering approach, soft engineering will be used on the upper banks of the River Rhymney sections. This will involve replacing mud and using brushwood to keep it in place. Along the coastline, the rock armour will be kept as close to the original footprint as possible to reduce damage to coastal habitats.	
SPA interest feature 5: Internationally important population of regularly occurring migratory species: Shelduck	Construction activity will cause an increased amount of noise and activity which may disturb Shelduck.	Yes	There is the potential to disturb this species if the works are carried out in the wintering period. Higher risk areas have been identified as works locations 11, 21 and 22. Any works identified above as having the potential to cause disturbance adjacent to identified high tide roosts will be restricted during a 2 hour window either side of high tide.	Yes
	Construction activity may cause damage to coastal habitats that could affect Shelduck foraging and roosting behaviour.	Yes	To mitigate the hard engineering approach, soft engineering will be used on the upper banks of the River Rhymney sections. This will involve replacing mud and using brushwood to keep it in place. Along the coastline, the rock armour will be kept as close to the original footprint as possible to reduce damage to coastal habitats.	Yes
SPA interest feature 6: Internationally important population of regularly occurring migratory species: Gadwall	Construction activity will cause an increased amount of noise and activity which may disturb the Gadwall.	Yes	There is the potential to disturb this species if the works are carried out in the wintering period. Higher risk areas have been identified as works locations 11, 21 and 22. Any works identified above as having the potential to cause disturbance adjacent to identified high tide roosts will be restricted during a 2 hour window either side of high tide.	Yes
	Construction activity may cause damage to coastal habitats that could affect Gadwall foraging and roosting behaviour.	Yes	To mitigate the hard engineering approach, soft engineering will be used on the upper banks of the River Rhymney sections. This will involve replacing mud and using brushwood to keep it in place. The success of this proposed mitigation will be monitored and adaptive management implemented if needed. Along the coastline, the rock armour will be kept as close to the original footprint as possible to reduce damage to coastal habitats.	Yes

SPA interest feature 7: Internationally important assemblage of waterfowl	Construction activity will cause an increased amount of noise and activity which may disturb internationally important waterfowl species.	Yes	There is the potential to disturb this species if the works are carried out in the wintering period. Higher risk areas have been identified as works locations 11, 21 and 22. Any works identified above as having the potential to cause disturbance adjacent to identified high tide roosts will be restricted during a 2 hour window either side of high tide.	
Severn Estuary SAC - Construction				
SAC interest feature 1: Estuaries	Construction activity may cause damage to estuarine habitats.	Yes	The scheme will result in the small scale direct loss of Annex 1 intertidal habitats, including intertidal mudflat and intertidal rocky shore habitat. The scheme will directly impact approximately 7.96ha of intertidal habitat in the Severn Estuary 3.34 ha of which is considered to qualify as annex 1 habitat. However, there is the potential for impacts to intertidal habitats outside of this area through plant movement and site compounds.	Yes
SAC interest feature 1: Fish features and sub-features of Estuaries feature. Assemblage of fish species Migratory fish (river & sea lamprey & twaite shad) Migratory fish (salmon, eel, sea trout and Allis Shad)	Disturbance of fish species through vibration of the water column during construction	Yes	No piling will take place below highest astronomical tide (HAT) Vibration piling is the preferred methodology and percussive piling will only be used when this fails to break through ground. In this case, percussive piling works within 30m of the River during the migration period will only be undertaken during the falling tide of the river (high tide plus one hour and low tide minus one hour). Should percussive piling be required during the migration period outside of this timing, it will be necessary to agree mitigation measures with NRW prior to any such works taking place.	Yes
	Pollution events during the works have the potential to cause damage to fish species	Yes	The following pollution prevention measures will be employed on the site: - All works will be carried out in accordance with the Pollution Prevention And Control Act 1999. - Plant nappies will be in place at all times during the works. - A spill response contractor on call at all times	Yes

			throughout the works. - Any chemicals will be stored on impermeable surfaces within secure storage containers. - All plant will be equipped with biodegradable hydraulic oil. - Drip trays will be kept underneath standing machinery to prevent pollution events by oil/fuel leaks, with any refuelling of vehicles or machinery carried out on an impermeable surface well away from the river or any other drainage channels. - Spill kits will be available on site at all times and staff trained in their use. - Vehicles and machinery will be checked on a daily basis for any leakages, with any found reported immediately and the equipment removed from site. - Regular checks will be made of all on-site equipment/machinery, with any faulty equipment removed from site/taken out of use immediately.	
SAC interest feature 3: Mudflats and sandflats not covered by seawater at low tide (mudflats and sandflats)	Construction activity may cause damage to mudflats and sandflats.	Yes	Along the coastline, the rock armour will be kept as close to the original footprint as possible to reduce damage to coastal habitats. Direct and indirect habitat losses will be compensated through the Welsh Government NHCP. Plant movement in the intertidal area also has the potential to negatively impact intertidal habitats through compaction of the foreshore. To minimise disturbance and habitat degradation plant should keep to agreed haul routes and not stray outside of these areas. It is considered that in this case the haul routes will rapidly recover following the completion of the works.	Yes
SAC interest feature 4: Atlantic salt meadow	Construction activity may cause damage to coastal habitats like Atlantic salt meadow.	Yes	The works footprint will directly impact approximately 0.91ha of Atlantic Salt meadow with a further 1.85ha potentially impacted upon during the works Direct and indirect habitat losses will be compensated through the Welsh Government NHCP. The redline boundary has been amended to avoid	Yes

			impacts to saltmarsh through plant movement. All saltmarsh not directly impacted by the scheme will be avoided.	
Severn Estuary Ramsar Site - Construction				
Ramsar interest feature 1: Estuaries	Construction activity may cause damage to coastal habitats like estuaries.	Yes	See Mitigation Measures for Severn Estuary SPA and SAC	Yes
Ramsar interest feature 5: Internationally important populations of waterfowl Dunlin	Construction activity will cause an increased amount of noise and activity which may disturb the Dunlin.	Yes		Yes
	Construction activity may cause damage to coastal habitats that could affect Dunlin foraging and roosting behaviour.	Yes		Yes
Ramsar interest feature 6: Internationally important populations of waterfowl Redshank	Construction activity will cause an increased amount of noise and activity which may disturb the Redshank.	Yes		Yes
	Construction activity may cause damage to coastal habitats that could affect Redshank foraging and roosting behaviour.	Yes		Yes
Ramsar interest feature 7: No Internationally important populations of waterfowl Shelduck	Construction activity will cause an increased amount of noise and activity which may disturb the Shelduck.	Yes		Yes
	Construction activity may cause damage to coastal habitats that could affect Shelduck foraging and roosting	Yes		Yes

	behaviour.			
Ramsar interest feature 8: Internationally important populations of waterfowl Gadwall	Construction activity will cause an increased amount of noise and activity which may disturb the Gadwall.	Yes		Yes
	Construction activity may cause damage to coastal habitats that could affect Gadwall foraging and roosting behaviour.	Yes		Yes
Ramsar interest feature 9: Internationally important assemblage of waterfowl	Construction activity will cause an increased amount of noise and activity which may disturb internationally important waterfowl species.	Yes		Yes
	Construction activity may cause damage to coastal habitats that could affect internationally important waterfowl species foraging and roosting behaviour.	Yes		Yes
Ramsar Criterion 8: Migration route for Salmon, Sea Trout, Sea Lamprey, River Lamprey Allis Shad, Twaite Shad and European Eel. Feeding and nursery grounds for many fish species particularly Allis Shad and Twaite Shad	Disturbance of fish species through vibration of the water column during construction	Yes	No piling will take place below highest astronomical tide (HAT) Vibration piling is the preferred methodology and percussive piling will only be used when this fails to break through ground. In this case percussive piling works within 30m of the River during the migration period will only be undertaken during the falling tide of the river (high tide plus one hour and low tide minus one hour). Should percussive piling be required during the migration period outside of this timing, it will be necessary to agree mitigation measures with NRW prior to any such works taking place.	Yes
	Pollution events during the works have the	Yes	The following pollution prevention measures will be employed on the site:	Yes

	potential to cause damage to fish species		- All works will be carried out in accordance with the Pollution Prevention And Control Act 1999. - Plant nappies will be in place at all times during the works. - A spill response contractor on call at all times throughout the works. - Any chemicals will be stored on impermeable surfaces within secure storage containers. - All plant will be equipped with biodegradable hydraulic oil. - Drip trays will be kept underneath standing machinery to prevent pollution events by oil/fuel leaks, with any refuelling of vehicles or machinery carried out on an impermeable surface well away from the river or any other drainage channels. - Spill kits will be available on site at all times and staff trained in their use. - Vehicles and machinery will be checked on a daily basis for any leakages, with any found reported immediately and the equipment removed from site. - Regular checks will be made of all on-site equipment/machinery, with any faulty equipment removed from site/taken out of use immediately.	
River Wye SAC -Construction				
SAC interest feature 4: Twaite shad	It is considered that mitigation for fish species outlined in the above sections will protect these species			
SAC interest feature 5: Allis shad				
River Usk - Construction				
SAC interest feature 4: Twaite shad	It is considered that mitigation for fish species outlined in the above sections will protect these species			
SAC interest feature 5: Allis shad				
Severn Estuary SPA – Operation				
SPA interest feature 3: Internationally important	Coastal squeeze will cause a loss of coastal habitat which in turn may affect Dunlin	No	Direct and indirect losses of habitat will be compensated through the NHCP (Welsh Government habitat creation scheme).	Yes

population of regularly occurring migratory species: Dunlin	foraging and roosting behaviour and lead to reduced feeding opportunities.			
	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Dunlin.	Yes	During construction the Wales Coast Path will be diverted or closed. After completion of the scheme, the WCP will be along the toe of the embankment to reduce the disturbance to Dunlin from breaking the skyline.	Yes
	Loss of foraging habitat within the Rhymney	Yes	The scale of the works within the Rhymney has been minimised to only the most at risk sections that do not hold value for foraging or resting bird species at present. To mitigate the hard engineering approach, soft engineering will be used on the upper banks of the River Rhymney sections. This will involve replacing mud and using brushwood to keep it in place.	Yes
SPA interest feature 4: Internationally important population of regularly occurring migratory species: Redshank	Coastal squeeze will cause a loss of coastal habitat which in turn may affect Redshank foraging and roosting behaviour and lead to reduced feeding opportunities.	No	As detailed above the scheme has been designed to avoid all direct impacts to the Redshank high tide roost. Although it should not be counted as mitigation or compensation it should be noted that to enhance the available habitat an area of saltmarsh identified as degraded in the NVC survey will have grazing horses removed. This will allow the saltmarsh to regenerate naturally creating up 0.2ha of functioning saltmarsh. This has the potential to provide further roosting habitat immediately adjacent to the existing high tide roost.	Yes
	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Redshank.	Yes	During construction the Wales Coast Path will be diverted or closed. After completion of the scheme, the WCP will be along the toe of the embankment to reduce the disturbance to Redshank from breaking the skyline.	Yes
SPA interest feature 5: Internationally important population of	Coastal squeeze will cause a loss of coastal habitat which in turn	No	Direct and indirect losses of habitat will be compensated through the NHCP (Welsh Government habitat creation scheme).	No

regularly occurring migratory species: Shelduck	may affect Shelduck foraging and roosting behaviour and lead to reduced feeding opportunities.			
	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Shelduck.	Yes	During construction the Wales Coast Path will be diverted or closed. After completion of the scheme, the WCP will be along the toe of the embankment to reduce the disturbance to Shelduck from breaking the skyline.	Yes
SPA interest feature 6: Internationally important population of regularly occurring migratory species: Gadwall	Coastal squeeze will cause a loss of coastal habitat which in turn may affect Gadwall foraging and roosting behaviour and lead to reduced feeding opportunities.	No	Direct and indirect losses of habitat will be compensated through the NHCP (Welsh Government habitat creation scheme).	No
	An increased use of the Wales Coast Path following the completion of the scheme may cause disturbance to Gadwall.	Yes	During construction the Wales Coast Path will be diverted or closed. After completion of the scheme, the WCP will be along the toe of the embankment to reduce the disturbance to Gadwall from breaking the skyline.	Yes
Severn Estuary SAC – Operation				
SAC interest feature 1: Estuaries	Coastal squeeze will cause a loss of coastal habitat due to sea level rise.	No	The scheme will result in the direct loss of Annex 1 intertidal habitats, including intertidal mudflat and intertidal rocky shore habitat. Intertidal habitat is a priority habitat nationally and is also a feature of the Severn Estuary SAC. The works footprint will directly impact approximately 3.4ha of intertidal habitat within the SAC, 2.9 ha of this consists of existing rock defences and discarded building materials which has little biodiversity value. However, 0.45 ha consists of existing scattered saltmarsh. Direct and indirect losses of habitat will be compensated through the NHCP (Welsh Government habitat creation scheme).	Yes

SAC interest feature 1: Fish features and sub-features of Estuaries feature. Assemblage of fish species Migratory fish (river & sea lamprey & twaite shad) Migratory fish (salmon, eel, sea trout and Allis Shad)	The flood defence will not impact fish species throughout its operation			
SAC interest feature 3: Mudflats and sandflats not covered by seawater at low tide (mudflats and sandflats)	Coastal squeeze will cause a loss of coastal habitat due to sea level rise.	No	Direct and indirect habitat losses will be compensated through the NHCP. The small scale loss of the habitat in this location is not considered significant,	Yes
SAC interest feature 4: Atlantic salt meadow	Coastal squeeze will cause a loss of coastal habitat due to sea level rise.	No	Direct and indirect habitat losses will be compensated through the NHCP.	Yes
Fish features and sub-features	The flood defence will not impact fish species throughout its operation			
Severn Estuary Ramsar Site – Operation				
Refer to mitigation measures detailed for the SAC and SPA				

7.3 Implementation of Mitigation

The mitigation measures listed above are to be included in the Method Statement produced by the contractor who will be undertaking the works. The appointed contractor will therefore be responsible for ensuring that all on-site mitigation measures are implemented effectively.

7.4 Cumulative Effects

No cumulative impacts have been identified.

8 Summary

It is not considered that the replacement of artificial structures with further rock revetments will have a significant impact upon features of the Severn Estuary SAC.

However, maintaining the existing alignment of the coastline through the provision of new hard defences has the potential to cause coastal squeeze. By renewing the defence in this area, it can be considered that a 'hold the line' approach is being taken. As sea levels rise intertidal habitats 'migrate' landwards, there is the potential that this will lead to intertidal habitats being 'squeezed' against the hard defence and eventually lost. The Habitat compensation will occur off-site under the Welsh Habitat compensation programme.

The loss of intertidal mud habitats within the Rhymney has the potential to impact bird features of the Severn Estuary SPA, Ramsar. To minimise impacts, alignment of the scheme has been designed to minimise habitat removal and fragmentation - the scheme has identified only the 'most at risk' sections of the river and concentrated works efforts on these areas. JBA Consulting and NRW ecologists have been involved in the design from the outset and the areas identified as most at risk are also the least suitable for wintering and migratory bird species, being much steeper and undercut than the rest of the mudflats within the river. A soft engineering approach had been adopted for as many of these sections as possible with the aim to recreate the intertidal mud at a shallower angle. If this is achieved there is the potential to create more suitable habitat for wading birds in this area, however, the timeframe to achieve this is uncertain. Given the unsuitability of the works sections for foraging and roosting birds it is not considered that the potential long term impact to these sections will have a significant impact upon bird features of the SPA and Ramsar.

Areas of saltmarsh that have been identified as high tide roosts by NRW will not be impacted upon by the scheme.

The intertidal mudflats and areas of saltmarsh provide foraging and roosting habitat for a range of wintering wildfowl and wading bird species, many of which are qualifying features of the Severn Estuary protected site. There is, therefore, the potential to disturb species associated with the Severn Estuary Ramsar, SPA if the works are carried out in the wintering period . Higher risk areas have been identified as works locations 11, 21 and 22. There is a significant construction phase risk in these areas of disturbance to birds using the saltmarsh that have been identified as high tide roosts.

In these areas the following construction activities have been identified as having the potential to impact to disturb wading birds

- Initial excavations
- Placement of rock within the intertidal zone
- Plant movements through the intertidal zone.

These operations in works locations 11, 21 and 22 will be subject to a tidal constraint 2 hours either side of high tide. It is likely that these operations could not take place at this time anyway.

There is also the potential for contractors wandering away from the work zone to cause disturbance to birds in the wider area. All contractors will be briefed on the importance of staying within designated works areas during the winter period.

All Piling works will be undertaken in the dry above HAT.

Vibration piling (using a variable moment vibrator and a 'soft start' approach) should be used wherever possible. It is proposed that this will be the preferred method of piling and percussive piling will only be used where this method has failed.

Percussive piling works within 30m of the HAT during the migration period will only be undertaken during the falling tide of the river (high tide plus one hour and low tide minus one hour). Should percussive piling be required during the migration period outside the

time constraint identified, it will be necessary to agree mitigation measures with NRW prior to any such works taking place.

With the implementation of the mitigation proposed no adverse impacts on the integrity of the Severn Estuary EMS.

References

CIEEM (2013), *Guidelines for Preliminary Ecological Appraisal*. CIEEM. Winchester

CIEEM (2015), *Guidelines for Ecological Report Writing*. CIEEM, Winchester.

EMODnet - European Marine Observation Data Network (EMODnet) Seabed Habitats project (http://www.emodnet-seabedhabitats.eu/)

Frost,T.M., Austin, G.E., Calbrade,N.A., Holt, C.A., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton,S.R. and Balmer, D.E. (2016). Waterbirds in the UK 2014/15: The Wetland Bird Survey. BTO/RSPB/JNCC. Thetford. Available at: <http://www.bto.org/volunteer-surveys/webs/publications/ webs-annual-report> [Accessed January 2017

HMSO (Her Majesty's Stationery Office) (1981), *Wildlife and Countryside Act* (as amended by the Countryside and Rights of Way Act 2000). [online] Available at: <http://www.legislation.gov.uk/ukpga/1981/69> [Accessed July 2015]

HMSO (1992), *The Protection of Badgers Act 1992*. [online] Available at: <http://www.legislation.gov.uk/ukpga/1992/51/contents> [Accessed July 2015]

HMSO (2006), *Natural Environment and Rural Communities Act*. [online] Available at: <http://www.legislation.gov.uk/ukpga/2006/16/contents> [Accessed July 2015]

HMSO (2012), *Conservation of Habitat and Species Regulations* [online] Available at: <http://www.legislation.gov.uk/uksi/2010/490/contents/made> [Accessed July 2015]

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
Follow us:

Jeremy Benn Associates Limited

Registered in England 3246693

JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
OHSAS 18001:2007