

Cardiff Coastal Defences

Environmental Impact Assessment Screening and Scoping Report

Final Report

February 2020



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Revision history

Revision Ref/Date	Amendments	Issued to
v1-1 / 18 February 2021	N/A	Cardiff Council

Contract

This report describes work commissioned by the County Council of the City and County of Cardiff ('Cardiff Council'). David Revill, Louise Martin, Mark Willy, Jonathan Harrison, Matt Hemsworth, Jenny Broomby, Anne-Marie Moon, Mike McDonald, and Tim Carter of JBA Consulting carried out this work.

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Purpose

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Abbreviations

AADF	Average Annual Daily Flow
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
BGL	Below Ground Level
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Innovation Association
CMS	Construction Method Statement
CPRE	Campaign to Protect Rural England
CRTN	Calculation of Road Traffic Noise
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EC	European Commission
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EMS	Environmental Management System
ES	Environmental Statement
EU	European Union
GEP	Good Ecological Potential
GES	Good Ecological Status
GHG	Greenhouse Gas
FRA	Flood Risk Assessment

HER	Historic Environment Record
HGV	Heavy Goods Vehicles
HRA	Habitat Regulations Assessment
HTL	Hold the Line
IAQM	Institute of Air Quality Management
IEMA	Institution of Environmental Management and Assessment
LBAP	Local Biodiversity Action Plan
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LWS	Local Wildlife Site
MA	Management Area
MAGIC	Multi-Agency Geographical Information for the Countryside
NAI	No Active Intervention
NERC	Natural Environment and Rural Communities Act
NMP	National Mapping Programme
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NRHE	National Record of the Historic Environment
NRW	Natural Resources Wales
NTS	Non-Technical Summary
PDA	Proposed development Areas
PEA	Preliminary Ecological Appraisal
PPS	Planning Policy Statement
PU	Policy Unit
RC	Reinforced Concrete
SAC	Special Area of Conservation
SINC	Site of Importance for Nature Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UKCP09	United Kingdom Climate Projections 2009
UKCP18	United Kingdom Climate Projections 2018
WFD	Water Framework Directive
WG	Welsh Government

1 Introduction

1.1 Background to the proposed development

This Environmental Impact Assessment (EIA) Screening and Scoping report assesses the EIA requirements in relation to proposals being developed by Cardiff Council to improve and extend coastal and fluvial defences in an area of Cardiff to the east of Cardiff Docks, adjacent to the Severn Estuary and Rhymney River (see Figure 1-1).

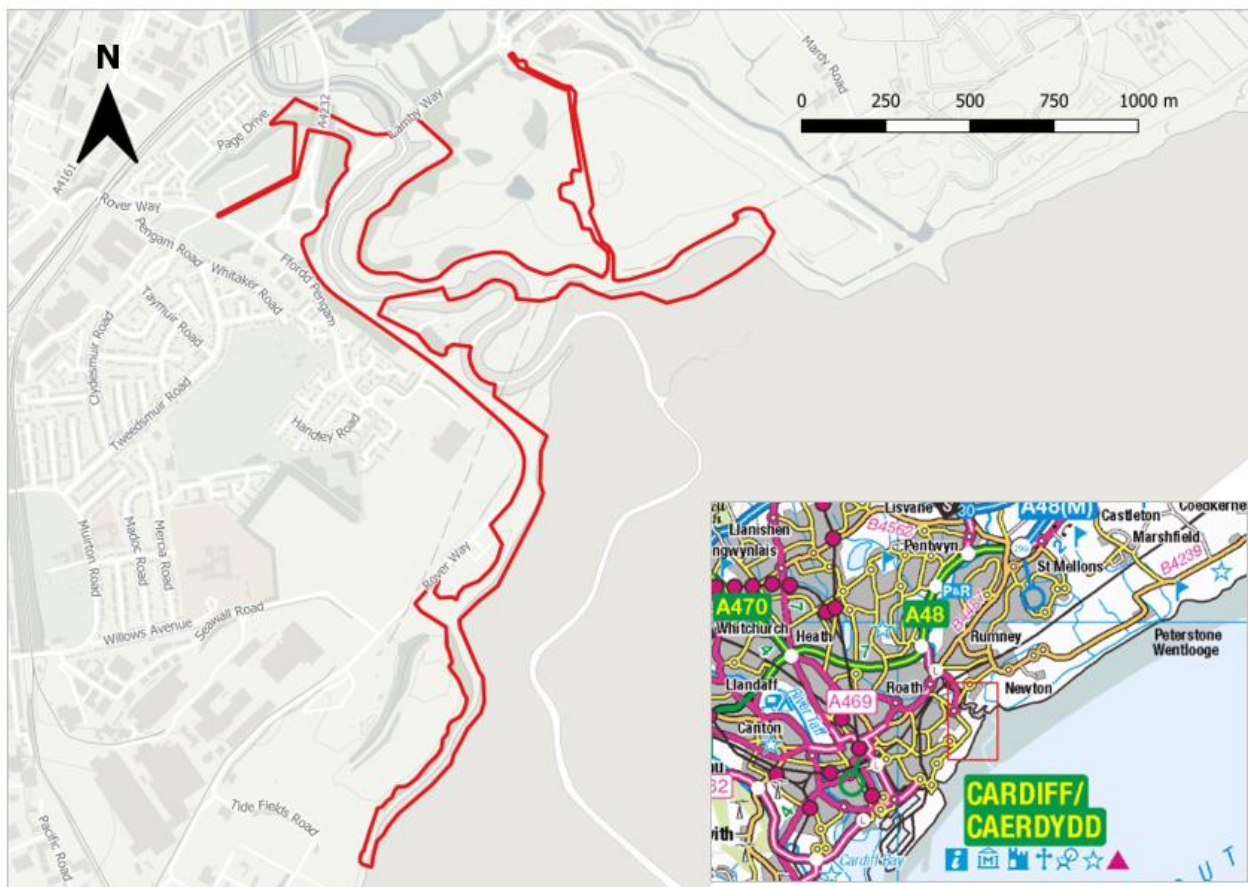


Figure 1-1: Location of the proposed development

Existing flood defences in this area comprise the remnants of rock armour revetments along the Severn Estuary, a sheet-pile wall, earth embankment, and a section of severely eroded blockstone defences along the western bank of the Rhymney River. Tidal and fluvial erosion of these defences and the associated coastline has taken place to the extent that extensive sections of defences have either been completely lost or are in very poor condition and are at significant risk of failure in the near future. With sea-level projected to rise in the future due to climate change, there is a significant risk of a breach in the defences leading to erosion and/or widespread flooding of critical transport, waste management, and energy infrastructure located immediately landward of the defences, and extensive residential and commercial areas in the surrounding hinterland.

The proposed development aims to provide increased flood protection for residents and critical infrastructure in the area and prevent further erosion of two landfill sites – the Lamby Way landfill site, operated and maintained by Cardiff Council, and the 'Frag Tip', an area of reclaimed land forming the coastline of the Severn Estuary to the west of the Rhymney River.

See drawing CCD-JBAU-00-00-DR-EN-1001-A1-C01-Site_Extent for the Site Boundary Plan for the proposed development and drawings CCD-JBAU-00-00-SK-Z-0001-A1-C01 to CCD-JBAU-00-52-SK-Z-0009-A1-C01 for details of the proposed General Arrangement.

1.2 Legislative basis of EIA

EIA is defined as *"a systematic process to identify, predict and evaluate the environmental effects of proposed actions and projects"*¹, undertaken by the developer where the characteristics and/or location of a proposed development project would result in likely significant effects on the environment. UK Government guidance² defines the aim of Environmental Impact Assessment *"to protect the environment by ensuring that a local planning authority when deciding whether to grant planning permission for a project, which is likely to have significant effects on the environment, does so in the full knowledge of the likely significant effects, and takes this into account in the decision-making process."*

EIA Screening and Scoping are undertaken to identify the likely significant environmental effects associated with the emerging development proposals and to recommend an appropriate scope of EIA that will be required to inform development consent applications.

The circumstances under which the development project is subject to the EIA, and the way in which likely significant effects are assessed and reported, are a statutory requirement, the scope of which is considered herein. The EIA Screening and Scoping Opinion request has been submitted to both Cardiff Council and the Marine Licencing Team at Natural Resources Wales (NRW) to seek agreement on the requirement for and scope of an EIA.

The requirement for assessment of the effects of certain public and private projects on the environment is set out in European and UK law. European Council (EC) Directive No. 85/337/EEC³ as amended by EC Directive No. 97/11/EC⁴, EC Directive No. 2011/92/EU⁵ and EC No. Directive 2014/52/EU⁶ (hereafter collectively referred to as 'the EIA Directive') under Article 2(a)(1): *"Member States shall adopt all measures necessary to ensure that, before development consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects on the environment."*

The EIA Directive is transposed into UK law through the EIA Regulations. These are a series of statutory instruments that set out regulations for implementing the EIA Directive through specific UK consenting regimes. The development proposals are likely to require consent under the Town & Country Planning Act 1990 and the Marine & Coastal Access Act 2009, and therefore fall within the requirements of both the Town & Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (W136), and the Marine Works (Environmental Impact Assessment) Regulations 2007 (SI 2007/1518) (as amended).

The EIA process begins with EIA Screening, whereby the appropriate consenting authority determines whether EIA is required for the proposed project. The consenting authority issues its formal EIA Screening Opinion, which sets out whether the proposed development is considered EIA development and whether it is likely to have significant effects on the environment. If the authority determines such effects are likely, a statutory EIA is required for the project. Where a statutory EIA is required, the developer may then submit a request to the consenting authority to provide its formal EIA Scoping Opinion. Through this process, the consenting authority sets out the required scope of the EIA and confirms the associated reporting requirements. The EIA is then undertaken on the basis of the EIA Scoping Opinion

¹ Sadler B. & Fuller K. (2002). UNEP Environmental Impact Assessment Training Resource Manual. 2nd Edition.

² <https://www.gov.uk/guidance/environmental-impact-assessment>

³ EC Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, Official Journal of the European Union No. L 175, 05/07/1985.

⁴ EC Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. Official Journal of the European Union No. L 073, 14/03/1997.

⁵ EC Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of effects of certain public and private projects on the environment. Official Journal of the European Union L 26, 28/1/2012.

⁶ EC Directive 2014/52/EU of 6 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, Official Journal of the European Union No. L 124/1, 25/4/2014.

response, with further detailed baseline information collected to inform detailed impact assessments.

The results of the EIA process are documented in an Environmental Statement (ES), which should be well structured, proportionate and concise document. The ES is supplemented with a Non-Technical Summary, which is intended to communicate the findings of EIA using non-technical language.

Where EIA Screening is likely to return an outcome where statutory EIA is required, it is often appropriate that EIA Scoping is undertaken at the same time. This combined approach makes use of environmental baseline information collated for the EIA Screening Opinion request, to inform consideration of the scope of any further detailed environmental impact assessment work required.

This combined approach has been adopted for this proposed development and this report comprises a joint EIA Screening and Scoping Report to be submitted to Cardiff Council (as Local Planning Authority) and NRW (as Marine Licencing authority) to gain their formal screening opinions, and, if an EIA is considered necessary, their formal scoping opinion.

2 Site characteristics

2.1 Site description

The proposed development comprises new coastal flood defences along the Severn Estuary, west and east of its confluence with the Rhymney River, and sections of new fluvial defences along both banks of the Rhymney River from its confluence with the Severn Estuary to the mainline railway crossing of the river near Parc Tredelerch.

The scheme area broadly comprises 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 (see Figure 2-1).

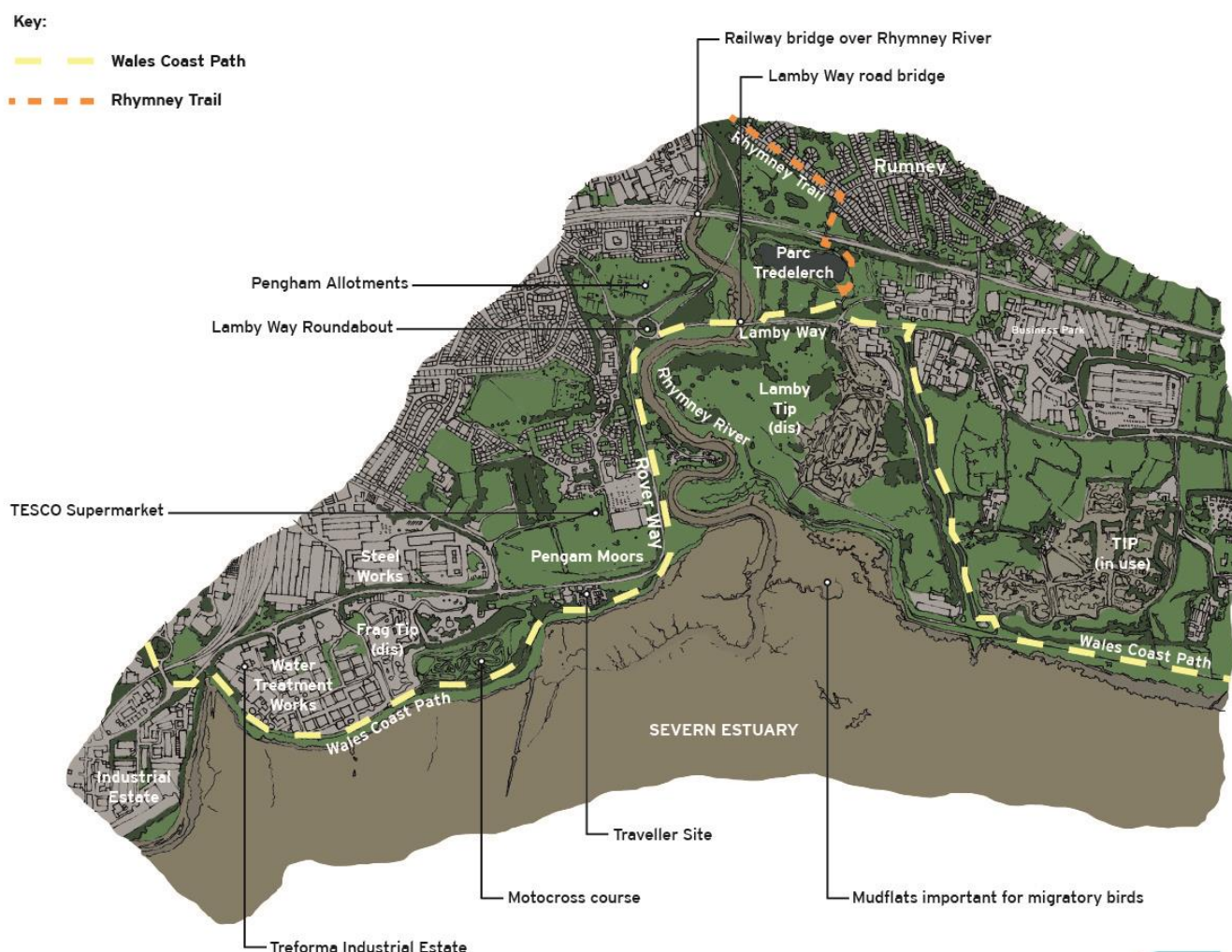


Figure 2-1: Scheme area and key features

To the west of the Rhymney River land use is a mix of open land, residential, commercial, and industrial located landward of Rover Way road (see Table 2-2). Rover Way runs parallel to the foreshore and along the western bank of the river and is an important transport route linking Cardiff city centre with the eastern suburbs of the city and the A48. The Celsa steelworks plant is located to the west of Rover Way whilst an adjacent area to the east of Rover Way is used for the storage of waste generated by the plant. The Cardiff Motocross

Centre now operates on an area of land located between the waste site and the existing flood defences on the site of the former Frag Tip.

To the east of the river, extending along the eastern bank of the river, is Lamby Way landfill site, bordered to the north by Lamby Way road. The site has been remediated and landscaped, and much of this area is now being developed by Cardiff Council as a solar farm.

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, with extensive areas of saltmarsh habitat located on bankside areas immediately downstream, which provide high-tide roosting for a large number of wintering birds.

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 Severn Estuary is protected by EU and UK legislation and is designated as a Special Conservation Area (SAC), Special Protection Area (SPA), and Ramsar site, as well as a Site of Special Scientific Interest (SSSI), for a range of habitats and species, including a breadth of wintering bird species.

The Severn Estuary nature conservation designations extend a short distance along the Rhymney River upstream of its confluence, and the river is also designated as a Site of Importance for Nature Conservation (SINC) by Cardiff Council.

Table 2-1: Photographs of the proposed development area and adjacent areas

Viewpoint	Viewpoint photograph	Description
1		View of the Rhymney River looking westwards (upstream) towards the residential properties at Glan Rhymni between the railway bridge and the A4232 road bridge.
2		View of the Rhymney River looking eastwards (upstream), with the A4232 road bridge in the background.

Viewpoint	Viewpoint photograph	Description
3		View of the Rhymney River looking northwards (upstream) towards the A4232 road bridge.
4		View of the Rhymney River looking northwards (upstream) with the Lamby Way road bridge in the background.
5		View of the Rhymney River looking south westwards (downstream) with the Rover Way/Lamby Way/A4232 roundabout in the background.
6		View of the Rhymney River looking northwards (upstream) from the with the Rover Way/Lamby Way/A4232 roundabout in the background.

Viewpoint	Viewpoint photograph	Description
7		View of the Rhymney River looking south (downstream) towards the Rhymney River Motor Boat, Sail and Angling Club.
8		View of the Rhymney River Motor Boat, Sail and Angling Club located on the west bank of the Rhymney River with the Severn Estuary in the background.
9		View looking northwards of the Severn Estuary foreshore west of the Rhymney River with the Rover Way Traveller's site in the background.
10		View looking northwards of the Severn Estuary foreshore east of the Rhymney River with Lamby Way Landfill site in the background.

2.2 Overview of baseline environmental conditions

This section provides a summary of the key baseline environmental conditions at the development site and surrounding area. A more detailed description of baseline conditions of relevance to each EIA topic is provided in chapters 6 to 14.

2.2.1 Land use and local community

The coastline in the study area is heavily modified by urban development and industry along much of its extent. This includes the presence of extensive areas of Made Ground that are now used for a variety of industrial and recreation purposes, as well as significant transport and utilities infrastructure. To the west of the Rhymney River, the main industrial activities taking place include metal salvage and recycling yards and vehicle repairers in Tremorfa Industrial Estate, and steelworks and waste disposal associated with the Celsa Steelworks north and south of Rover Way.

Lamby Way and Rover Way cross the study area and form key road infrastructure for commuters and commercial traffic accessing the Cardiff Docks, city centre and south east Cardiff. Lamby Way road bridge crosses the river to the north of Lamby Way Landfill, to join Lamby Way roundabout, located immediately behind the defences on the west bank of the river. From the roundabout Rover Way runs behind the flood embankments parallel to the river before turning to run parallel along the coast towards the steel works.

The land east of the Tremorfa Industrial Estate consists of a mix of green space, residential properties, and local amenities such as schools, leisure facilities and a large supermarket. There are also two allotment sites located close to the western bank of the Rhymney River towards the northern end of the project area. In addition, there is a Traveller's site located directly off Rover Way between the road and the coastline. Adjacent to the Traveller's site is an electricity substation, thought to supply the DCWW Waste Water Treatment Works (WWTW), which is located to the west of the study area.

The land east of the river is primarily comprised of made ground and includes the decommissioned Frag Tip which contains unknown landfill materials. The dirt bike track to the west of the Travellers site has been constructed upon the Frag Tip material.

To the east of the river is Lamby Way Landfill Site, which was, until recently, the principal waste disposal facility in Cardiff. Part of the site continues to operate as a municipal recycling facility, with the remainder of the site capped and landscaped. Much of the western portion of the site is currently being redeveloped into a solar farm. Along the coastline fronting the Lamby Way Landfill is a row of mains electricity pylons running parallel to the coast.

The Rhymney River supports a wide range of recreational activities. The Rhymney River Motor Boat, Sail and Angling Club is located on the west bank of the river adjacent to Rover Way, whilst other river and coastal users include Glamorgan Angling Club, Cardiff Sea Cadets, and Cardiff Canoe Club. The area is also a popular bird-watching location and is known to support a large number of overwintering and coastal bird species.

The Wales Coast Path is a nationally important recreation and amenity resource and is used by both local residents and visitors. It follows the coastline for much of the project area west of the Rhymney River. To the east of the river, the path diverts away from the coastline along Lamby Way highway, before diverting southwards along the eastern boundary of the landfill site back to the coastline. Proposals have been developed by NRW and Cardiff Council to realign the path so that it follows the western boundary of the landfill site before connecting back into the coastline instead. The section of the path between the WWTW and the roundabout connecting Rover Way to Lamby Way is also designated as a Public Right of Way. Sections of the path along Rover Way are in a poor state of repair and are at immediate risk from coastal erosion.

2.2.2 Water environment

The study area is located adjacent to the River Rhymney and Cardiff Flats, within the wider setting of the Severn Estuary. The estuary of the Rhymney River within the study area is entirely tidally dominated. There are two road bridges across the channel towards the north of the study area on the A4232 and Lamby Way. The river has a meandering planform and is constrained by both the Lamby Way and Rover Way.

The banks of the Rhymney River are composed of fine sediments and in-channel morphological diversity is low. The river banks are eroding in places, especially on the outside

of meander bends, with slumping of material and bank slips. Small sections of rubble and rock armour are present along the river banks originally provided to protect infrastructure. The existing defence/embankment line is mainly set back from the channel edge: on the right river bank the defence is visible alongside Rover Way in places and is constructed of sheet piles with a concrete capping.

Key geomorphology processes along the Severn Estuary coastline within the study area are related to mudbank dynamics. Longshore movement of sediment is minimal along this coastline. Available information to describe the Cardiff and Wentlooge foreshores has demonstrated that the area has experienced historic erosion pressure, consistent with substantial progressive retreat of the mudbank immediately in front of the coast. There is evidence of several factors contributing to the mudbank lowering, including sediment dynamics of the wider Severn Estuary, drainage management, saltmarsh restoration efforts, and presence of substantial outfall structures along this section of coast. Erosion effects from mudbank lowering are expected to be enhanced in response to sea level rise and may be locally exacerbated by the presence of tidal channels along parts of the foreshore.

Projection of active processes over time frames of up to 100 years suggests that there is higher potential for erosion than had been previously identified using linear projection of shoreline changes.

The Water Framework Directive (WFD) (2000/60/EC) requires that environmental objectives are set for all surface and groundwaters in England and Wales, with the aim of achieving good status by a defined date. There are two WFD waterbodies in the study area. These are the Severn Lower transitional surface water waterbody and the SE Valleys Southern Devonian Old Red Sandstone & Triassic Mercia Mudstone groundwater waterbody.

The Severn Lower waterbody (Waterbody ID: GB530905415401) is classified as a Heavily Modified Water Body (HMWB) due to the presence of flood defence infrastructure. The waterbody has an overall target of achieving Good Potential by 2021. The current (Cycle 2 RBMP) ecological status was assessed as being Moderate, whilst its chemical status was assessed as being Fail. Reasons for this failure include elevated levels of mercury (and its compounds) and brominated diphenylether, impacts on saltmarsh habitat and flowering plant species, and failure to deliver identified mitigation measures.

The SE Valleys Southern Devonian Old Red Sandstone & Triassic Mercia Mudstone groundwater waterbody (Waterbody ID: GB40902G201500) encompasses a large area between Cowbridge in the west, Newport in the east, and extends northwards to Caerphilly. The waterbody has an overall target of Good status by 2015 and is currently meeting its status objectives.

2.2.3 Biodiversity

The project area is located within the Severn Estuary European Marine Site (EMS). This site is designated for a wide range of coastal habitats and species, including intertidal and subtidal mudflats, saltmarsh, fish species and overwintering bird species. In addition, the Severn Estuary is designated as a SSSI, SPA, SAC, and Ramsar site, and the Rhymney River is designated as a SINC. Several other SINC sites are located in the project area. The study area includes a range of sensitive habitat types, including Section 7 Priority Habitats, encompassing both coastal/estuarine habitats and terrestrial habitats:

- Intertidal mudflats
- Coastal saltmarsh
- Estuarine rocky habitats
- Subtidal mixed muddy sediments
- River
- Reedbeds

These habitats are known to support protected and notable species, including:

- Birds
- Reptiles
- Amphibians
- Invertebrates
- Otter
- Water Vole
- Other mammals

A number of marine mammals are known to commute and forage within the Severn Estuary, with records for Common Porpoise and Grey Seal within 2km of the scheme area. The Severn Estuary is also designated for a range of migratory fish species, a number of which are likely to spawn further upriver, including rare Shad species.

The invasive non-native plant species Japanese Knotweed is locally dominant in the dense scrub along the roadsides of Rover Way and Lamby Way, which separates the industrial areas to the west of Rhymney River from the coastline.

2.2.4 Geology and land contamination

The outer and central Severn Estuary has formed within a geological basin of folded and faulted lower Jurassic mudstones and limestones, overlying Silurian bedrock. This basin is overlain with Quaternary sediments, which have been subject to extensive reworking due to glacial and inter-glacial sea level fluctuations. Relatively small sediment contributions occur from erosion of rock features and alluvial input from the Severn, Taff, Usk and Wye rivers; however, the predominant input has estuarine origin, being silts and muds.

Much of the project area west of the Rhymney River comprises Made Ground, known locally as the 'Frag Tip', which may contain waste materials (frag) from the metal working industry. To the east of the Rhymney River is Lamby Way Landfill Site, which is the principal landfill for Cardiff. Both sites are at risk of erosion.

The following potential sources of land contamination have been identified from regulatory data and historic and current land uses on the site and surrounding area:

- Areas of unknown fill materials, including landfills and waste management.
- Waste water treatment and sewage works, and associated sewerage network.
- Various historical and current industrial and commercial sites (including associated railway networks, airport and fuel sites).

2.2.5 Landscape

The study area is a predominantly flat landscape with a few small hills that have been created by landfill sites in the area. Views are available of industrial areas to the south and residential areas to the west, with the A4232 and B4239 flyovers as visually dominant features in the north of the study area. Around, the Rhymney River and the Severn Estuary, views open out to provide expansive views across the estuary.

The project area is not located within any nationally or locally designated landscapes although it is adjacent to the Wentlooge Levels Special Landscape Area. The study area has three distinct landscape character areas consisting of industrial development in the south, residential development in the west, and semi-natural/amenity greenspace around the Rhymney River. The study area is located within the semi-natural/amenity greenspace comprising Pengam Moors and Parc Tredelerch, community allotments, a landfill reclamation site, a motocross course, mature woodland, scrubland, lakes, and the Rhymney River. The Wales Coast Path, a long distance recreational route, runs alongside the Rhymney River and the Severn Estuary. The banks of the River Rhymney and River Severn feature a mixture of embankments, mud flats, sand, stone, rock armour and old flood defence walls that are in a state of disrepair. Along sections of the estuary foreshore fly tipping is evident, erosion of the estuary banks has created vertical drops and exposed layers of rubble, waste and geotextile making it unattractive for users of the Wales Coast Path.

2.2.6 Historic environment

The marshy environment has preserved evidence of the past environment, such as tree stumps discovered of the foreshore at Rumney Great Wharf, which have been radiocarbon dated to between 6,000 and 8,000 years BP, with aurochs being discovered in the intertidal zone of the Rhymney estuary which have been dated to 2,500BC. Peat deposits have also been uncovered that date to the late Neolithic to early Bronze Age period. Within the immediate vicinity of the development area grey features within the brown clay may represent ancient vegetation and two possible palaeochannels have been identified.

Prehistoric activity in the area is attested by evidence of Bronze Age settlement discovered in the Rhymney estuary, which includes timber structures, a roundhouse and hearth, a spearhead and finds of pottery and cattle bone. A single sherd of Iron Age pottery was found at Rumney Great Wharf and indicates activity in the later prehistoric period.

A number of drainage ditches were discovered within the intertidal area to the east of the development, at Rumney Great Wharf and the artefacts discovered within them have been dated to the late 2nd to early 4th century (Roman period). The Roman coastline is understood to have been as much as 1km to the south of the current coastline.

The development site was in the manor of Rumney during the medieval period, which formed part of the 'Lordship of Wentloog'. Whilst, the manor was located at Rumney to the north-west of the development, medieval activity has been identified along the coast. A medieval sea defence may have been located along the eastern side of the Rhymney Estuary, although its course is uncertain. A new wall was constructed slightly further inland and survives as the relict sea wall, the remains of which are protected as a Scheduled Monument (Rumney Great Wharf) located to the east of the development site.

Documentary sources and mapping dated to the late 18th century provide information regarding sea defences in the vicinity of the development area, with an early 19th century map showing them in more detail and following the line of the modern defences. The mid-19th century mapping shows the significant amount of loss of saltmarsh/coastal erosion that has occurred since this time.

During the early 20th century there was a continued retreat of the coastline south-west of the river, with additional sea defences being constructed by the 1941 mapping on the western side of the Rhymney River (following the approximate line of Rover Way). During WWII Pengham Moor was requisitioned by the Air and Ministry and became RAF Cardiff.

During the mid-20th century the area to the west of the development was being infilled with housing and associated facilities such as the allotment gardens being created. Aerial images from the 1960's show changes in the alignment of the sea defences to the western side of the estuary, the creation of Rover Way and construction of a new bank on the eastern side of the river immediately behind the existing defences.

In terms of designated heritage assets, the area includes:

- 2 Scheduled Ancient Monuments within 2km of the proposed development.
- 32 Listed Buildings within 2km of the scheme, including 2 Grade I and 2 Grade II*.
- 3 Conservation Areas within 2km of the scheme.
- 1 Registered Parks and Gardens within 2km of the scheme.
- 18 sites of interest identified in the Historic Environmental Records (HER) within 100m of the scheme.

2.3 Environmental constraints

Environmental constraints identified within up to 5km where relevant, on the basis of a review of readily available environmental information for the purpose of EIA Screening and Scoping are summarised in Table 2-1. The key environmental constraints are also illustrated in the Environmental Constraints Plan provided in Appendix A. Where relevant, further consideration is given to these environmental constraints within the baseline section of each of the EIA topic chapters (see chapters 6 to 15).

Table 2-2: Environmental features identified within 5km (where relevant)

EIA Topic	Environmental feature	Description	Distance from development boundary
Land use and local community	Local residents	Approximately 4,800 residents	500m
		Approximately 48,000 residents	2km
	Local businesses	Tesco Extra to the south of the site.	Adjacent
		Numerous businesses inside the Avenue Retail Park.	Within 100m NW
	Traffic	The A4232 and Lamby Way are within the site extent as they cross the Rhymney. Rover Way is adjacent to the SW of the site.	Within and Adjacent
	Recreation and amenity	Rhymney River Motor Boat, Sail & Angling Club	Adjacent
		Riverside Leisure Club	Adjacent
		Parc Tredelerch	Adjacent NW
		Wales Coast Path	Within and Adjacent
Water environment	Water Framework Directive (WFD) water body	Severn Lower Waterbody – Overall status – Moderate; Ecological status – Moderate; Chemical status – Fail	Within
	WFD higher sensitivity habitat	Saltmarsh	Within
	WFD lower sensitivity habitat	Gravel and Cobbles	Within
		Intertidal Soft Sediment (sand, mud and mixed)	Within
		Rocky Shore	Within
	Flood Risk	Flood Zone 2 and 3	Within
Biodiversity and nature conservation	Special Protection Areas (SPA)	Severn Estuary SPA – qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance. Including the following species: Bewick's Swan <i>Cygnus columbianus bewickii</i> , Curlew <i>Numenius arquata</i> and European White-fronted Goose <i>Anser albifrons albifrons</i> .	Within
	Special Area of Conservation (SAC)	Severn Estuary SAC – qualifies under Article 4.1 by supporting habitats and species of European Importance. Qualifying species include Sea Lamprey <i>Petromyzon marinus</i> , River Lamprey <i>Lampetra fluviatilis</i> and Twaite Shad <i>Alosa fallax</i> .	Within
	Ramsar sites	Severn Estuary Ramsar – Qualifies under a number of Ramsar Interest Features and Ramsar Criterion. Including presence of Bewick's Swan, European White-fronted Goose, Dunlin and Redshank.	Within
	Sites of Special Scientific Interest (SSSI)	Gwent Levels – Rumney and Peterstone SSSI – One of the most extensive areas of reclaimed wetland pasture in Britain. Contains important plant and animal species such as Hairlike Pondweed <i>Potamogeton trihokoides</i> and Hairy Dragonfly <i>Brachytron pratense</i> .	Within
		Severn Estuary SSSI – Immense tidal range and classic funnel shape make the Severn Estuary SSSI unique in Britain and very rare worldwide. Very large and important network	Within

EIA Topic	Environmental feature	Description	Distance from development boundary
		of mudflats, sand banks, rocky platforms and saltmarsh.	
		Rumney Quarry SSSI – A geological SSSI, providing the best exposure of the Silurian Rumney Grit, considered to belong the oldest part of the Homeric Stage of the Wenlock Series.	420m N
		Rhymney River Section SSSI – A geological SSSI, containing the most comprehensive sequence of strata in the Cardiff Silurian inlier.	660m N
		Penylan Quarry SSSI – A geological SSSI, important both in terms of the local Wenlock stratigraphy and also in a broader, palaeontological context.	1.4km NW
	Local Nature Reserves	Howardian Local Nature Reserve – contains woodland, wildflower meadow, ponds and reedbeds	620m NW
	Wildlife Sites (SINC)	Lamby North SINC – An area of inland saltmarsh located on the eastern bank of the Rhymney River immediately adjacent to the scheme area.	Within
		Lamby Saltmarsh SINC – An area of saltmarsh located on the eastern banks Rhymney River and fringing the Severn Estuary.	Within
		Lamby Way SINC – An area of damp semi-improved neutral grassland which supports Grass Snake <i>Natrix natrix</i> and Cetti's Warbler <i>Cettia cetti</i> .	Within 500m
		Rhymney Grassland East SINC – An area of neutral semi-improved grassland with some calcareous semi-improved grassland located on the western bank of the Rhymney River immediately to the north of the scheme area.	Within 500m
		The Rhymney River SINC – The Rhymney River is designated for its importance for migratory fish, Otters, wildfowl and bankside vegetation it also acts as a wildlife corridor for bats, Dormice and Grass Snakes. Eel and trout have also been recorded in the River.	Within
		Pengam Moors SINC – Artificial habitat with strong maritime influences and network of drainage channels with Sea Clover and Brackish Water Crowfoot.	Within 500m
		Rhymney River Valley Complex SINC – Saltmarsh, reedbed, rough grassland, marsh, ditch with Marsh Orchid, Bee Orchid, Meadow Cranesbill and typical local saltmarsh species.	Within 500m
	Section 7 Priority Habitats	Intertidal mudflats	Within site
		Coastal saltmarsh	Within site
		Estuarine rocky habitats	Within site
		Subtidal mixed muddy sediments	Within site
		River	Within site
		Reedbeds	Within site
	Protected	Birds – Intertidal mudflats and saltmarsh	Potentially

EIA Topic	Environmental feature	Description	Distance from development boundary
	Species	provide foraging and roosting habitat for a range of wintering wildfowl and wading bird species.	within site
		Amphibians – No records for Great Crested Newt, however suitable habitats were recorded.	Potentially within 2km
		Reptiles – There are records for Grass Snake and Slow Worm within 2km of the scheme area.	Potentially within 2km
		Otter – have been recorded within 2km of the scheme area and are known to be present within the Rhymney River catchment.	Potentially within 2km
		Water Vole – closest records located within drainage ditches 200m to the east of the scheme extent.	Potentially within 2km
		Invertebrates – mudflats provide suitable habitat for a range of macroinvertebrate species. Saltmarsh within the project area can also provide habitat for a number of invertebrate species.	Potentially within and adjacent
Landscape	Marine Character Area (MCA)	MCA 29 Severn Estuary (Wales)	Adjacent
Historic Environment	Conservation Area	Roath Mill Gardens	1.1km W
		Roath Park	1.8km W
		Oakfield Street	1.5km W
		Wordsworth Avenue	1.9km SW
	Listed Building	Rumney Pottery – closest listed building to the site extent, a pottery building.	582m NW
		31 Listed Buildings	500m-2.0km
	Scheduled Monuments	Relict Seawall on Rumney Great Wharf – Seawall 500m in length standing between 1m to 2m high. Documentary evidence shows the sea defence was in place as early as 1591, and much of the surviving clay bank is thought to be original.	675m E
		Pen y lan Roman Site- settlement dated to AD74-410. Comprises a series of grass-covered hollows and banks. Roman pottery has been recovered from the site.	1.6km to NW
	Historic Environment Records (HER)	18 sites of interest were identified by a search of the regional Historic Environment Record.	Within the study area
	Registered Park and Garden	Waterloo Gardens and Roath Mill Gardens, Roth Park	1.5km W
	Registered Historic Landscape	Wentlooge Level, one of the Gwent Levels Registered Historic Landscape (HLK (Gt2)	At eastern limit of site.

3 Proposed development

3.1 Need for the proposed development

Existing flood defences in the scheme area, located along the Severn Estuary and the Rhymney River, have failed or are at significant risk of failing. Much of the coastline across the project area is eroding and with predicted sea level rise due to climate change, the flood and erosion risk will increase into the future. The proposed scheme will manage flood risk to 2,576 residential and 204 non-residential properties over 100 years, as well as preventing erosion of landfill material, key road/rail infrastructure, and the Rover Way Travellers Site.

This scheme is comprised of two main areas:

Flood cell to the west of the Rhymney River

The coastal defences along this section of the Severn Estuary are in very poor condition and erosion is taking place at a rapid rate. Landfill material is eroding into the Severn Estuary from the disused Frag Tip, while the Rover Way Travellers Site is at risk of being lost to erosion and flooding. The coastal defences here are already at risk of breach due to erosion, leading to flooding of the land behind.

Along the west bank of the river there are low sections of defence which will overtop as sea levels rise, increasing flood risk to people and property to the west of the river. The Lamby Way roundabout and Rover Way, key infrastructure supporting the economy of Cardiff, are situated immediately behind the embankment on the outside of the river meander and are at risk of being undermined and lost to erosion within 20 years.

Here people and property are at risk from coastal erosion and flooding from the sea. In addition, fluvial erosion and tidal flooding can occur from the River Rhymney. The frequency and likelihood of both significantly increases in the future as a result of climate change.

Flood cell to the east of the Rhymney River

The defences along the east bank of the river and the coastal defences to the east of the river mouth are also at risk of erosion. It is estimated that if no works are undertaken along the coast, erosion will continue to increase and will impact upon the disused Lamby Way Landfill within 20 years, releasing landfill material into the Severn Estuary and having significant environmental impacts. Land elevations are higher on this side of the river leading to more limited flood risk but there is a risk of up to 50m of erosion along the coast within 20 years, and 270m by 2117.

The two flood cells have been combined into one scheme due to their geographic proximity and the similarities in the works required. Significant efficiencies can be realised in undertaking these works as one scheme, both during design and construction. The flood risk is predicted to increase in the future with the effects of climate change, leading to over 2,842 residential and 291 non-residential properties being at risk in the year 2119 if the flood risk is not managed (see Table 3-1 and Figure 3-1).

Table 3-1: Number of properties affected at different flood return periods without flood management

Year	Property	Return period							
		2	10	20	50	75	100	200	1000
2019	Residential	1	1	1	1	304	355	434	1,007
	Non-residential	0	0	0	0	2	2	4	11
2039	Residential	1	1	1	347	413	452	606	1,335
	Non-residential	0	0	0	2	2	4	8	65
2069	Residential	0	376	453	617	730	791	1,088	2,239
	Non-residential	0	2	4	8	11	11	27	195
2119	Residential	865	1,423	1,879	2,254	2,389	2,479	2,842	5,279
	Non-residential	11	34	131	246	220	251	291	458

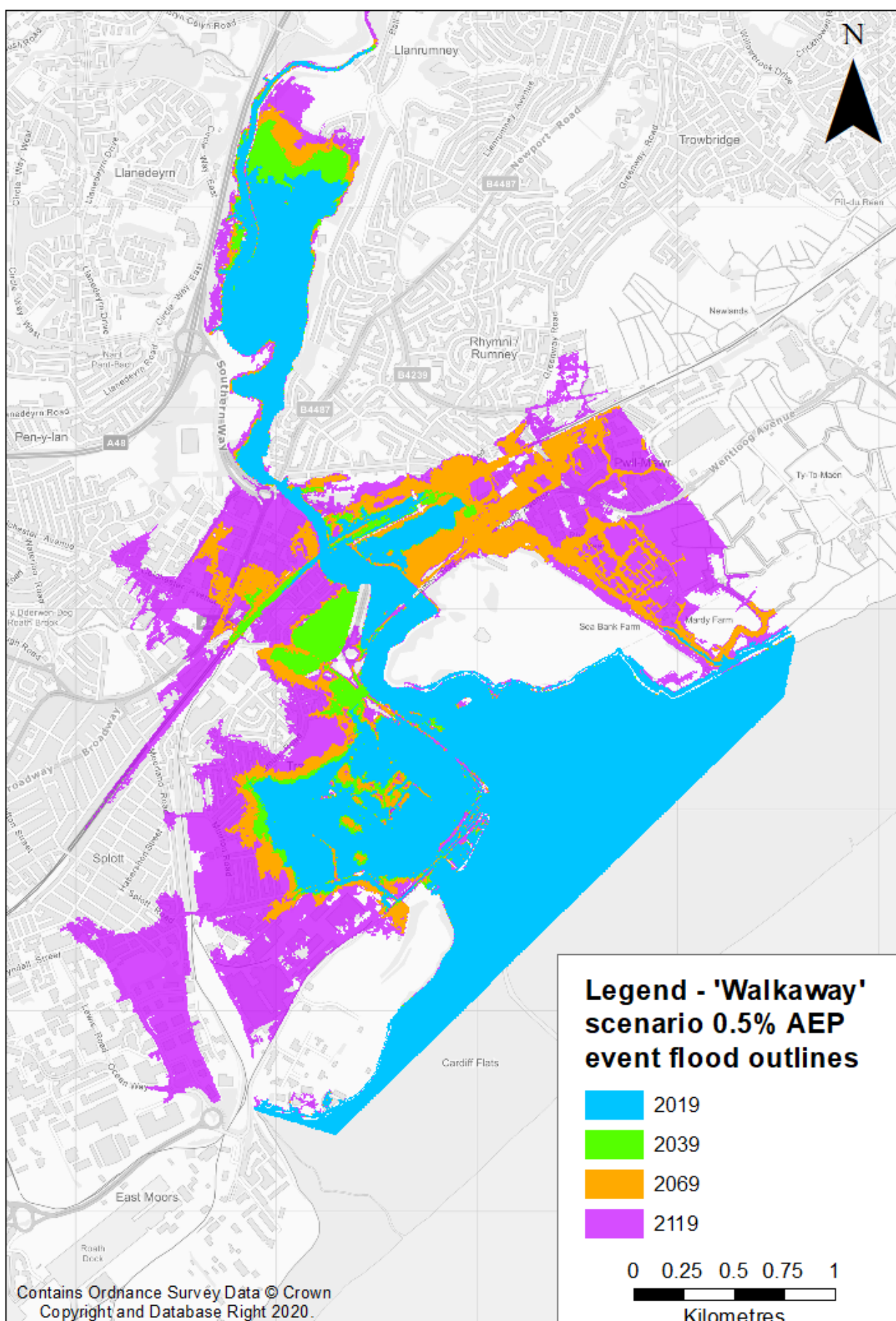


Figure 3-1: Predicted flood extents up to 0.5% AEP event (2119 Q 200 event)

The Severn Estuary Shoreline Management Plan (SMP) policy for these sections of the coastline is to 'Hold the Line' (HTL). This means that the flood defences should be maintained and upgraded or replaced in their current position. Therefore, substantial new flood defences are required to maintain and improve the level of protection currently provided.

3.2 Project objectives

The Cardiff Coastal Defence scheme has been developed and designed to achieve the following objectives:

- Reduce and manage the coastal flood risk to people and assets for the next 100 years, taking into account predicted future climate change;
- Manage 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 Landfill and the Rover Way Frag Tip, in the immediate future and over the next 100 years. At present it is not a requirement of the scheme to include the future prevention of leachate from these sites;
- Achieve wider benefits alongside coastal erosion and flood risk management, including enhanced recreational and walking areas, and increased potential for regeneration and development, aligned with the Welsh Government's seven Well-Being Goals and with Welsh Government and Cardiff Council's vision for development and economic growth of the area;
- Identify and explore potential partnership funding opportunities for any proposed capital works identified, and secure interest for investment prior to construction;
- Implement a coastal flood risk management option that is affordable over the next 100 years; and
- Protect existing features of nature conservation value and seek opportunities to improve biodiversity through the enhancements of existing habitats.

In addition, the following Critical Success Factors (CSFs) have been developed to assess the suitability of project options. Several of these CSFs have been developed by Welsh Government and these must be met by the preferred option. To represent the aspirations of the local authority, stakeholders and project partners, additional project specific critical success factors have been produced. These are shown in *italics*.

Table 3-2: Critical Success Factors (CSFs)

No	Critical Success Factor	Further Definition (<i>project specific CSFs in italics</i>)
1	Strategic fit and business needs	• Adapting to climate change • Delivery of National Strategy and SMP objectives • Local Authority support • Alignment with local Well-being plans • <i>Meets investment objectives</i>
2	Value for money	• Protect and enhance the Welsh economy by avoiding flood damage to residential and commercial properties and economic assets and infrastructure. • <i>Protect and enhance the Welsh economy by avoiding erosion damage to residential and commercial properties and economic assets and infrastructure, including key roads: Rover Way and Lamby Way</i> • Positive Net Present Value
3	Potential achievability	• Local Authority capacity to produce and manage projects
4	Supply side capacity	• Supply side capability to deliver affordable solution within time-frame
5	Potential affordability	• Achievable within current/anticipated Welsh Government and Local Authority funding settlements/borrowing powers • <i>Identify and secure the interest of external project funding partners.</i>

No	Critical Success Factor	Further Definition (<i>project specific CSFs in italics</i>)
6	Additional project specific CSFs	• <i>Protect existing features of nature conservation value and seek opportunities to improve biodiversity through the enhancements of existing habitats.</i> • <i>Identify opportunities to improve the amenity value of the site; providing benefits to local residents and attracting outside visitors.</i>

3.3 Identification of a preferred option for the development

3.3.1 Long-list options development

Cardiff Council has considered and assessed a range of options for the proposed development. This optioneering process initially involved identification of a 'long-list' of options that were subject to technical, economic, and environmental appraisal to assess whether they would achieve the project objectives and supporting critical success factors⁷. This included extensive engagement with key project stakeholders, including Cardiff Council, NRW, DCWW, and Glamorgan-Gwent Archaeological Trust (GGAT). Figure 3-2 provides a summary of the long-list options. Due to the size of the study area, the defences were divided into sections based upon the type and condition of the defence and the predominant geomorphological processes.

3.3.2 Short-list options

Several short-list options were selected by Cardiff Council. These were collated from the long-list options after unsuitable options were removed. The short-list options identified are summarised in Table 3-3. These options underwent further detailed technical, environmental, and economic assessment to determine the likely constraints, opportunities, risks, benefits, and costs associated with each option. This assessment process was undertaken in accordance with Flood and Coastal Risk Management Appraisal Guidance (FCERM-AG)⁸. This included a wide ranging non-financial benefits appraisal undertaken using Multi-Criteria Analysis (MCA) to identify a non-financial preferred option. The short-listed options were rated against a range of categories (see Table 3-4) designed to assess the relative merits of the proposed options against the project objectives and critical success factors. The outcomes of this work are fully documented in the Outline Business Case (OBC) report⁷ for the project.

⁷ Cardiff Council, 2016. Cardiff Flood and Coastal Erosion Risk Management Outline Business Case, March 2016.

⁸ Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG), Environment Agency, 2010 (<http://webarchive.nationalarchives.gov.uk/20131108051347/http://a0768b4a8a31e106d8b050dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho0310bsdb-e-e.pdf>)

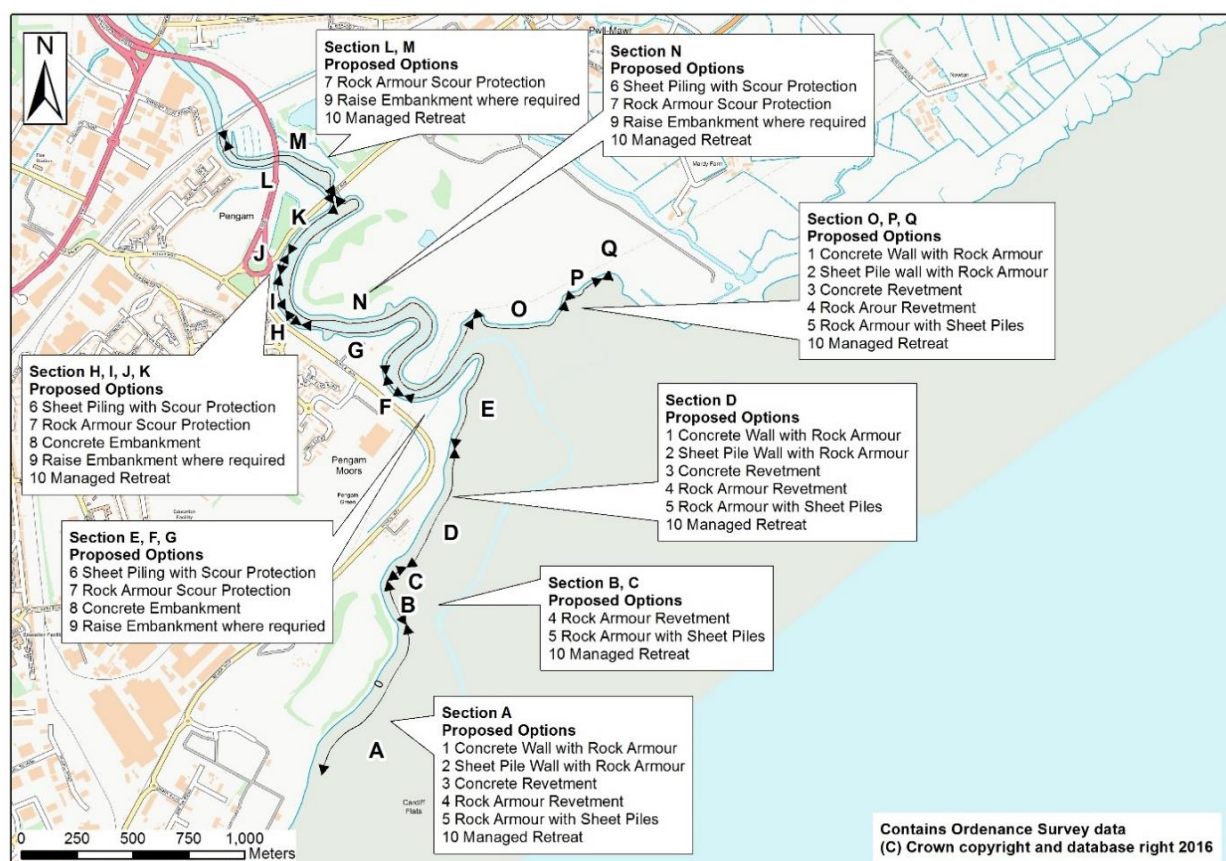


Figure 3-2: Long list of options for each Asset Section

Table 3-3: Short-listed options

Option	Name	Description
1	Do Nothing	No works undertaken. Allow natural coastal and fluvial processes to continue.
2	Do Minimum	Maintenance works along existing earth embankments. Add small rock toe to the eroding coastal defences to slow erosion.
3	Improve 1	Rock revetment along the coast to manage erosion and wave overtopping. Rock scour protection along Lamby Way roundabout. Maintain earth embankments elsewhere and raise low points in earth embankments where required to reduce flood risk. Scour protection added to Lamby Way Bridge.
4	Improve 2	Sheet piling along the coast to manage erosion and wave overtopping. Rock scour protection along Lamby Way roundabout. Maintain earth embankments elsewhere and raise low points in earth embankments where required to reduce flood risk. Rock scour protection added to Lamby Way Bridge.
5	Improve 3	Concrete wall along the coast to manage erosion and wave overtopping. Rock scour protection along Lamby Way roundabout. Maintain earth embankments elsewhere and raise low points in earth embankments where required to reduce flood risk. Rock scour protection added to Lamby Way Bridge.
6	Improve 4	Rock revetment along the coast to manage erosion and wave overtopping. Sheet piling along Lamby Way roundabout. Maintain earth embankments elsewhere and raise low points in earth embankments where required to reduce flood risk. Rock scour protection added to Lamby Way Bridge.
7	Improve 5	Sheet piling along the coast to manage erosion and wave overtopping. Sheet piling along Lamby Way roundabout. Maintain earth embankments elsewhere and raise low points in earth embankments where required to reduce flood risk. Rock scour protection added to Lamby Way Bridge.
8	Improve 6	Concrete wall along the coast to manage erosion and wave overtopping. Sheet piling along Lamby Way roundabout. Maintain earth embankment elsewhere and raise low points in earth embankments where required to reduce flood risk. Rock scour protection added to Lamby Way Bridge.

Table 3-4: Multi Criteria Analysis categories and weighting

Category	Considerations	Weighting
Technical	Still water level flood protection	2
	Overtopping protection	2
	Design life	1
	Erosion protection	2
	Ease of construction	1
	Capital cost	2
	Maintenance cost	2
	Public Health and Safety	2
Environmental and Social	Impact on the coast path use	2
	Impact on biodiversity	2
	Impact on landscape character	1
	Impact on heritage	1
	Ability to be modified in the future	1
	Carbon footprint	2
	Impact on coastal processes	1
	Contaminated land protection	2
Financial	Partnership funding	2
Strategic	Strategic policy (SMPs)	2
	Consents and licences	1

Stakeholder engagement was undertaken to inform the assessment process and the selection of a preferred option. Key responses received are summarised in Table 3-5.

Table 3-5: Key stakeholder responses

Organisation	Interest	Response	Actions taken
RSPB	Wildlife conservation	The recommendations of the Living Levels Partnership should be considered so CCC can help meet its objectives.	These recommendations have been considered within the landscape appraisal to inform the preferred option.
NRW	Flood risk management/ wildlife conservation/ ground contamination/ water quality/public access	Further analysis of ground contamination should be undertaken for the Frag Tip (off Rover Way) to inform risk of contamination mobilisation and design requirements. Habitat Regulations Assessment required to assess effects on designations and requirement for habitat compensation.	Ground contamination investigation to be undertaken by CCC as a separate project. Results to inform flood defence scheme at detailed design stage. Habitat Regulations Screening Assessment undertaken at OBC stage. Further assessment required at detailed design stage. Consultation with NRW regarding compensation requirements is ongoing.
Cadw	Archaeology and cultural heritage	Particular attention should be given to the impacts of the project on the Rumney Great Wharf Relict Seawall (GM474).	This issue has been addressed in the archaeological desk-based assessment (DBA), concluding only a low risk of an impact to the setting of the scheduled monument.
DCWW	Owner of adjacent defences to the west/ utilities assets	Undertaking separate assessment of DCWW defences. Would be interested in sharing information and potentially combining schemes to gain efficiencies.	Discussion with DCWW have continued and meetings are underway to discuss potential to combine scheme design and construction.

3.3.3 Preferred option

Based on the results of the MCA and other technical, financial, and environmental assessment work, an overall preferred option for each section of the study area was determined. Due to the scale of the proposed development (approximately 6km section of coastline/river frontage), different options were preferred for different areas. This combination of options was derived from Option 6 (Improve 4) and are illustrated in Figure 3-3. The preferred options are:

- **Section 1: Severn Estuary coastline east and west of the confluence with the Rhymney River** – the proposal along this section, extending either side of the Rhymney River, is to construct a sloping rock armour revetment along the coastline to manage coastal erosion of the Frag Tip, Lamby Way Landfill, and adjacent areas (including the Wales Coast Path), and tidal flood risk to infrastructure (Rover Way, electricity transmission, Wales Coast Path) and residential and commercial properties from wave overtopping.
- **Section 2: 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** – the proposal in this section is to raise the existing earth embankment to the required flood defence level. The existing embankment top level varies along the section, meaning the height of the raising works varies accordingly to achieve a uniform crest level. Due to the close proximity of the existing embankment to the Rhymney River channel, and risk of future erosion of the embankment, a line of sheet piles may be installed on the landward toe along a 110m length of the embankment close to the outer edge of the main river meander in this section. This may also be accompanied by some scour protection works, similar to that proposed for Section 3 below. A double flood gate will also be installed at the entrance to the Rhymney River Motor Boat, Sail & Angling Club off Rover Way to provide flood protection.
- **Section 3: West bank of the Rhymney River, from the southern approach to the Rover Way/A4232/Lamby Way roundabout, northwards to the Lamby Way road bridge, and the east bank of the river from the Lamby Way road bridge southwards to the large meander opposite the Rhymney River boat club** – the proposal for this section involves installation of a range of flood defence and scour protection measures, making use of sheet piling, hard-engineered scour protection and soft-engineered scour protection structures. Where a flood defence and hard-engineered scour protection is required, a double line of sheet piles, comprising a deep pile at bank top and a shorter scour protection pile near the base of the river channel, with rock scour protection solution in-between is proposed. This solution corresponds with areas of the channel identified as being at high risk of erosion with adjacent critical infrastructure (i.e., Rover Way/A4232/Lamby Way roundabout and Lamby Way Landfill). The deep sheet pile wall at bank top will extend approximately 1.8m above ground level to increase the level of flood protection and will be finished with a concrete capping beam. In adjacent sections of channel, where the erosion risk is less or there is no critical infrastructure immediately adjacent, the proposal is to install erosion protection measures within the eroding sections of river channel, comprising timber stakes pushed into the channel mud, with brushwood laid on the channel surface to reduce scour and promote accretion of sediment. This solution will protect a new deep sheet piled flood defence at the top of the bank.
- **Section 4: West bank of the Rhymney River from the Lamby Way road bridge, northwards to Page Drive** – the proposals comprise construction of new earth embankments on the line of the existing embankment flood defences, between the Lamby Way road bridge and the A4232 road bridge, and between the A4232 road bridge and the southern boundary of the Page Drive residential estate. Both sections of embankment are setback from the river channel.

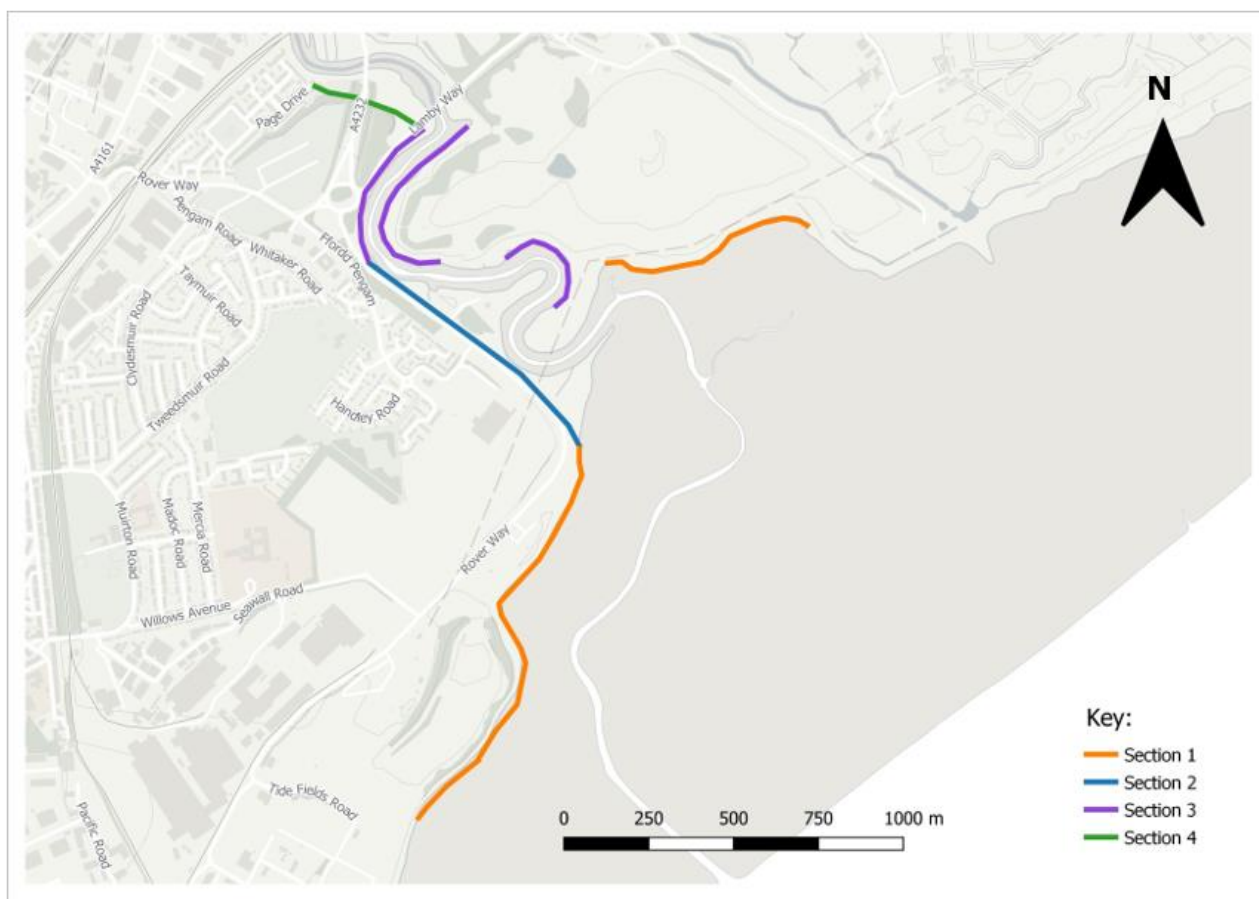


Figure 3-3: Preferred options for each scheme section

3.4 Proposed development

A detailed description of the design proposals for each section is provided below.

Section 1: Severn Estuary coastline east and west of the confluence with the Rhymney River

See drawings CCD-JBAU-00-12-SK-Z-0003-A1-C01 and CCD-JBAU-00-21-SK-Z-0004-A1-C01.

Section 1 extends along the entire coastal reach of the Severn Estuary within the scheme area and both sides of the Rhymney River confluence (see Figure 3.3). It includes the area west of the Rhymney River known as the Frag Tip, which comprises contaminated Made Ground that is being steadily eroded into the Severn Estuary, and the coastal frontage of the Lamby Way Landfill, which is at risk of erosion in the near future. Along both sections of estuary frontage are the remnants of historic flood defence structures, including sections of severely damaged gabion baskets adjacent to the Frag Tip and the remains of a rock armour revetment along much of the frontage next to the Lamby Way Landfill. The Wales Coast Path extends along this coastal section and is immediately adjacent to the foreshore for much of the extent. Land use in this area includes a derelict area used as a dirt bike track but with planning approval for a biomass energy plant, a main electricity sub-station, and a Traveller's static residential site. The DCWW Cardiff East Waste Water Treatment Works and Tremorfa Industrial Estate are located immediately west of this section.

The design proposals comprise two sections of rock armour revetment, totalling approximately 2.1km in length, extending from high ground (approximately 10.10mAOD) onto the estuary foreshore, with a crest approximately 3.5–4.3m in width and a buried toe approximately 2.8m in width, and a maximum slope of 1:2.5. The footprint of the revetment is approximately 20m in width.

The volume of overtopping discharge varies along the coast and is dependent on the flood risk and level of ground landward of the defence. The design wave height along the coast is 1.36m with a period of 5 seconds, which requires a rock grading of 1 to 3 tonnes with scour protection at the toe embedded to approximately 1.0 metres. A geotextile membrane will also be applied under the rock armour to stop sediment wash out.

Along the western half of the Frag Tip, where the hinterland elevation is relatively low, an earth embankment will be constructed immediately landward of the revetment. The revetment will have a height of approximately 1.0m and a maximum slope of 1:3. The embankment crest will be approximately 2.0m wide and will support the Wales Coast Path footpath. Along the eastern portion of the Frag Tip to the mouth of the Rhymney River, where the elevation of the hinterland is greater, no earth embankment is required and the Wales Coast Path will follow its existing alignment. East of the Rhymney River, the crest of the rock revetment will include an access footway to enable maintenance inspections of the revetment. This footway may be designated as part of the Wales Coast Path in the future.

The revetment design will include biodiversity enhancement measures following EcoStructure Project guidance⁹.

Section 2: 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

See drawing CCD-JBAU-00-22-SK-Z-0005-A1-C01.

This section comprises an existing earth embankment flood defence structure, located between Rover Way and the Rhymney River channel, and extending northwards from the Severn Estuary towards the Rover Way/A4232/Lamby Way roundabout. This section includes a length of existing steel sheet piles and erosion protection measures in the riverbank on the riverside of the earth embankment, adjacent to the large meander. The embankment and sheet piles provide flood and erosion protection for Rover Way, which is immediately landward, as well as utilities (electricity and water) services, and serves as the primary flood defence for nearby residential areas in Pengam Green and Tremorfa. The Wales Coast Path is located on the crest of the existing embankment. The river channel in this area contains extensive areas of inter-tidal mudflat and saltmarsh habitat, which provide very important feeding and high-tide roosting habitat for SPA/Ramsar bird species. The large areas of saltmarsh adjacent to the large river meander in this area are particularly important as high-tide roosts for significant numbers of birds.

The proposal for this section involves a do minimum and maintenance approach, with minor raising to a 220m section of the embankment to raise this lower section to the required level (10.15m AOD) for a 0.5% AEP event. This will improve the standard of protection on the Rover Way section of the river to a 0.5% AEP in the year 2117.

The embankment will typically have a minimum crest width of 3.0m and a 1:3 slope on both its landward and riverward sides. The embankment crest will be designed to accommodate the Wales Coast Path.

At the entrance to the Rhymney River Motor Boat, Sail & Angling Club off Rover Way, a double flood gate will be installed to facilitate continued vehicular access to the club whilst providing flood protection to the 0.5% AEP event.

The existing sheet pile located adjacent to the large meander in this area will be kept in-situ within the embankment structure.

Due to significant erosion on the outer bank of the large meander and steeply sloping bankside area, the embankment design in this area requires a steeper profile, with a 1:2 slope on the riverward side of the embankment. Alternatively, due to the potential for future channel erosion affecting the stability of the embankment and existing sheet piles, a new row of sheet

⁹ Climate Change Adaptation through Ecologically-Sensitive Coastal infrastructure (EcoStructure Project): <http://www.ecostructureproject.eu/>

piles may be installed towards the landward haunch of the existing embankment to provide future erosion protection for the adjacent hinterland in the event of failure of the embankment. This may be accompanied by erosion protection measures in the channel.

Section 3: West bank of the Rhymney River, from the southern approach to the Rover Way/A4232/Lamby Way roundabout, northwards to the Lamby Way road bridge, and the east bank of the river from the Lamby Way road bridge southwards to the large meander opposite the Rhymney River boat club

See drawings CCD-JBAU-00-21-SK-Z-0004-A1-C01, CCD-JBAU-00-31-SK-Z-0006-A1-C01, and CCD-JBAU-00-32-SK-Z-0007-A1-C01.

Section 3 extends along the large meander section of Rhymney River close to the Rover Way/A4232/Lamby Way roundabout. At the northern end of this section is the Lamby Way road bridge, which includes large abutments that narrow the natural width of the river. On the western bank of the river, erosion is threatening the roundabout and adjacent sections of the Rover Way and Lamby Way, which are critical transport routes connecting Cardiff city centre and eastern areas of the city. On the eastern bank, Lamby Way Landfill is located very close to the bank top and is at risk of erosion, with a significant bank slip occurring directly opposite the roundabout. This slip was repaired by Cardiff Council in 2018 but was subject to further failure in February 2020. The capped landfill is located approximately 15m landward of the slip area. Further evidence of erosion/slippage is found on the outer bank of the large meander opposite the Rhymney River Motor Boat, Sail & Angling Club. Again, the capped landfill is located approximately 10–15m from the eroding river channel. An access track providing maintenance access for landfill vehicles is located along the eastern bank of the river throughout this section and is at considerable risk of erosion. The river channel in this section contains extensive areas of mudflat, exposed on the falling tide, which provides important feeding and high-tide roosting habitat for SPA/Ramsar bird species.

In order to reduce the potential for further erosion of the channel next to the Rover Way/A4232/Lamby Way roundabout and the in the two slip areas on the eastern bank next to the Lamby Way Landfill, the preferred option is to install a double-line of sheet piles in the areas most at risk from erosion. A deep pile will be installed at bank top, which will function as the primary flood defence. It will extend approximately 1.8m above ground and will include a concrete capping beam (to 9.70mAOD). A second, shorter pile, will be installed near the base of the channel, which will be buried. The primary erosion mechanism in this section of the channel is undercutting at the base of the bank, causing slumping of the overlying bank/mudflats. The shorter toe pile will be installed to reduce the potential for scour at the base of the channel and will provide erosion protection for the adjacent upper section of channel/bank. Maintaining the channel profile is necessary to ensure the stability of the primary defence sheet pile.

A rock-based scour protection will be installed between the two sheet piles, extending from bank top to the toe pile. In the lower part of the channel, the scour protection will be located at the channel surface to provide the necessary scour protection. In the upper part of the channel, the scour protection will be buried (minimum 1m depth) to enable reinstatement of functioning mudflat to support continued foraging and roosting by bird species. The lower section of renomattress directly supports the mudflat habitat in the upper portion of the channel by reducing the potential for undercutting at the channel base and slumping of the overlying mud.

In areas experiencing a lower erosion risk, the proposal includes installation of a sheet pile and concrete capping beam at bank top to provide the primary flood protection; however, a shorter toe pile and renomattress are not required to provide erosion protection. Instead, erosion protection will be provided through installation of timber stakes, sunk vertically into the river channel mud, with a thick layer of brushwood placed on the channel surface in intervening areas to reduce the potential for further erosion of the channel and to promote further deposition of sediment to support stabilisation of the river bank.

Section 4: West bank of the Rhymney River from the Lamby Way road bridge, northwards to Page Drive

See drawings CCD-JBAU-00-42-SK-Z-0008-A1-C01 and CCD-JBAU-00-52-SK-Z-0009-A1-C01.

Section 4 extends along the west bank of the Rhymney River between Lamby Way road bridge and the southern boundary of Page Drive. The defence currently consists of two sections of earth embankment set back from the river bank, and in places, the embankment is lower than the 2117 200-year still water level. Approximately 155m of embankment requires raising to bring the embankment to the desired standard of protection.

In keeping with a do minimum approach, the preferred option will also address the following general maintenance issues associated with grass embankments:

- Vegetation management with removal of trees and shrubs – access provision needed for all grass to be maintained to a short length.
- Patch repair works due to unforeseen events such as pedestrian damage.
- Bi-annual condition assessments to monitor the condition of the defence.

3.5 Initial environmental assessment

An initial environmental assessment¹⁰ of the preferred option was undertaken to inform the preparation of the OBC. The assessment acknowledged that at the time of writing, only outline information on the preferred option was available and therefore there were some uncertainties regarding design and delivery. In particular, the design of the proposed scheme adjacent to the Rover Way/A4232/Lamby Way roundabout and the in the two slip areas on the eastern bank next to the Lamby Way Landfill, has changed substantially during the detailed design process and was not fully reflected in the initial environmental assessment. As a result of these uncertainties and changes, some information of importance to the final proposed development is likely to have been left out of the assessment. However, the assessment provides important baseline information on key environmental features that could be affected by the proposed development and an initial appraisal of likely significant effects.

The main findings and recommendations of this assessment were as follows:

- The proposed scheme will reduce flood and/or erosion risk to a significant number of residential and commercial properties and a range of critical infrastructure, benefitting local communities, businesses, and wider transport links.
- There is a risk that works could damage or disturb features of the Severn Estuary EMS, Severn Estuary SSSI, Rumney and Peterstone SSSI and locally important SINCS.
- Potential that the project would result in the direct loss of, or damage or disturbance to, intertidal habitat – particularly mudflat habitat – and the separation of saltmarsh from intertidal areas. These areas may require mitigation or compensation.
- Additional defences in the area could potentially block existing pollution pathways, particularly as a result of coastal erosion of the Frag Tip. In addition, increased flood protection reduces the risk of erosion of Lamby Way Landfill and the potential for significant environmental contamination. Conversely, there is potential for the project to facilitate contact between contaminated land and estuary waters. There are already areas of contact, and the water quality in the Rhymney River is poor.
- Previously unknown contaminated land could also be excavated during construction works. This could result in workers being exposed to dangerous substances or the pollution of groundwater or surface water.

¹⁰ JBA Consulting, 2017. Cardiff Coastal Risk Management Programme Outline Business Case, Preliminary Environmental Information Report, March 2017.

- There are heritage features local to the site that could be affected by the scheme. An archaeological watching brief should be carried out during all ground intrusive works. There is also the potential that unknown heritage features are present on site.
- Users of the Wales Coast Path and some recreational receptors in the area could experience reduced access during construction, and there is potential that views from the coast path could become obscured. Conversely, the proposed scheme will provide increased protection for the coast path from flooding and coastal erosion.
- Permanent impacts on local landscape character and visual amenity due to the construction of new defences along the estuary and within and close to the Rhymney River channel. Sheet pile walls should be buried within embankments so as to reduce the impact on local landscape character.
- Construction-related impacts, such as increased noise and dust levels, and changes in views, could impact the local population. The population that live in Tremorfa, off Rover Way, are potentially at the most risk of construction stage impacts. Approximately 6,000 people live within 1km of the western boundary of the proposed construction site.
- There could be impacts on the recreational use of the Rhymney River during construction. The river is popular for amateur sailing and angling. Rhymney River Motor Boat, Sail & Angling Club operate on the river, and are based off Rover Way.
- Construction of new flood defence infrastructure could have localised impacts on hydromorphological conditions in the watercourse; however, this is unlikely to be significant given the scale of the Lower Severn Transitional Waterbody. The land surrounding the proposed site is made ground and likely to be contaminated in areas. There are also local habitats that could be impacted by the scheme. Therefore, on the basis of the detailed design proposals, a WFD Impact Assessment should be undertaken to ensure no damage to water quality or habitats as a result of construction.

3.5.1 Compensatory habitat requirements

Given the potential for likely significant effects on European designated sites in the Severn Estuary, a Habitats Regulations Assessment (HRA) is required under the Habitat Regulations. In accordance with the Habitat Regulations, compensatory habitat may be required to mitigate the potential for a significant impact on the Severn Estuary EMS due to the implementation of a HTL policy and the future impacts of coastal squeeze as sea levels rise.

An initial HRA¹¹ was undertaken at Outline Business Case (OBC) stage to identify likely significant effects on European sites and potential habitat compensation requirements for the preferred option. There are ongoing discussions on the methodology and requirements for compensatory habitat with Welsh Government and NRW and therefore this assessment is likely to be subject to change.

A further, more detailed assessment will be undertaken as part of the detailed design process and will be documented in an updated HRA. It is anticipated that compensatory habitat requirements will be refined and agreed through further discussion with Welsh Government and NRW.

Delivery of compensatory habitat requirements will be through the Welsh Government National Habitat Creation Programme (NHCP) managed by NRW.

3.6 Construction of the proposed development

Detailed information on the construction method or construction programme is not available at this time. A contractor-produced Construction Method Statement will be developed in due course and this will be submitted as part of the consent applications for the proposed

¹¹ JBA Consulting, 2017. Cardiff Flood and Coastal Erosion Risk Management Outline Business Case Rover Way and Lamby Way Tip, Record of a Habitats Regulations Assessment of a project, March 2017.

development. This will also inform preparation of the Environmental Statement, with the assessment of relevant construction phase effects based upon the proposed construction method.

However, construction of the development is anticipated to include the following:

- Construction is programmed to take approximately 18 months to complete. Construction is planned to commence before spring 2022 and would be completed by autumn 2023.
- Most construction materials i.e., sheet piles, earth, etc, will be brought to the construction site via the existing highway network (primarily via Rover Way from Cardiff Docks). Rock may potentially be brought to the site by road or by barge via the Severn Estuary foreshore.
- Access for staff/plant/machinery/materials to the construction areas to the west of the 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 construction area to the east of the Rhymney River will be via Rover Way and then Lamby Way, and via the existing vehicular entrance to Lamby Way Landfill. Construction vehicles will then access the river sections and Severn Estuary coastline via an existing vehicular access track across the landfill. Access to the construction areas north of the Lamby Way road bridge will be via an existing vehicular access off Rover Way through the Stargarallot Community Garden (Pengham allotments) (to gain access to areas west of the river) and via a new access created off Lamby Way to the south west of Parc Tredelerch (to gain access to the area east of the river).
- Fencing will be installed around the perimeter of the construction area to prevent public access and ensure effective safety of visitors.
- The appointed contractor will be required to register with the Considerate Constructors Scheme (<https://www.ccscheme.org.uk/>).
- 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 be submitted with the ES and will outline methods to avoid, minimise and mitigate construction effects on the environment. It will therefore form part of the consent applications for the proposed development and will be subject to formal approval. This document will be updated as the project progresses to enable the plan to be effective and account for any changes that occur during construction works. As a minimum, the CEMP will consider:
 - Environmental permitting requirements and environmental planning conditions.
 - Protected species and habitat monitoring.
 - Archaeological supervision.
 - Providing toolbox talks on environmental issues.
 - Any working hour restrictions.
 - Dust suppression measures.
 - Traffic management.
 - Site waste management.
 - Materials management.
 - Vehicle maintenance and management.
 - Pollution prevention and control (including storage, refuelling and incident response).

- Response procedures, e.g., services strike, contaminated land, etc.
- Hazardous materials handling and storage.
- Noise management.
- Site security and delineation of working areas including signage.
- Biosecurity measures and management of invasive non-native species (INNS).
- Visual impacts.
- An Ecological 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.

3.6.1 Construction site boundary

The construction site boundary for the proposed development is shown on Figure 1-1 and Drawing CCD-JBA-00-00-DR-EN-1001-S1-P02-Site_Extent. 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 construction site boundary extends to approximately 40ha.

3.7 Maintenance requirements

Maintenance of the new flood defence structures is anticipated to include the following activities:

- Monthly visual inspection for any defects and/or signs of seepage.
- Frequent mowing of the grassed earth embankments keep grass cover short.
- Vegetation management to prevent the establishment of large woody shrubs and trees on the new embankment structures or immediately adjacent to the flood walls.
- Periodic clearance of large debris from the rock revetment and river scour protection as necessary.

4 Planning policy context

4.1 Welsh National Marine Plan

The Welsh Government published the Welsh National Marine Plan¹² in November 2019. This plan is directly informed by High Level Marine Objectives set out in the Marine Policy Statement (2011)¹³. These objectives align with the Welsh Government's Well-being Goals and principles for sustainable development and the direction provided in the EU Directive on Marine Spatial Planning 89/2014.

The plan objectives, relating to supporting policy objectives (i.e., in the Marine Policy Statement), of particular relevance to the scheme include:

- Plan Objective 7: Support enjoyment and stewardship of our coasts and seas and their resources by encouraging equitable and safe access to a resilient marine environment, whilst protecting and promoting valuable landscapes, seascapes and historic assets.
- Plan Objective 8: Improve understanding and enable action supporting climate change adaptation and mitigation.
- Plan Objective 9: Support the achievement and maintenance of Good Environmental Status and Good Ecological Status.
- Plan Objective 10: Protect, conserve, restore and enhance marine biodiversity to halt and reverse its decline including supporting the development and functioning of a well-managed and ecologically coherent network of Marine Protected Areas (MPAs) and resilient populations of representative, rare and vulnerable species.
- Plan Objective 11: Maintain and enhance the resilience of marine ecosystems and the benefits they provide in order to meet the needs of present and future generations.

4.2 Shoreline Management Plan

The Severn Estuary Shoreline Management Plan 2 (SMP2)¹⁴ covers the Severn Estuary Coastline from Anchor Head to Lavernock Point. The policy for this SMP is 'Hold the Line' over the next three defined epochs (0-20 years, 20-50 year, 50-100 years). The SMP states this policy is required as further erosion into Lamby Way Industrial Site could be harmful to water quality, and the flood defences are also currently protecting important transport links.

4.3 Cardiff Local Flood Risk Management Strategy

Cardiff Council has a duty placed on them by the Flood and Water Management Act (FWMA) to act as the Lead Local Flood Authority (LLFA) and prepare a Local Flood Risk Management Strategy (LFRMS)¹⁵. The strategy outlines Cardiff Council's responsibilities as a LLFA, and the roles and responsibilities of other organisations who are responsible for managing flood risk in Cardiff.

The LFRMS has identified four main strategy objectives:

¹² Welsh Government, 2019. The Welsh National Marine Plan. [Online] Available at: <https://gov.wales/marine-planning#section-29566>

¹³ National Assembly for Wales, 2011. Marine Policy Statement. [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf

¹⁴ Severn Estuary SMP2. [Online] Available at: <https://www.slideshare.net/SevernEstuary1/smp2-part-b-policy-statements-cardiff-onlyfinal>

¹⁵ Cardiff Council, 2014. Local Flood Risk Management Strategy, Adopted Strategy – Technical Document. [Online] Available at: <https://www.cardiff.gov.uk/ENG/Your-Council/Strategies-plans-and-policies/Local-flood-risk-management-strategy/Pages/default.aspx>

- reducing the impacts on individuals, communities, businesses and the environment from flooding and coastal erosion;
- raising awareness of and engaging people in the response to flood and coastal risk;
- providing an effective and sustained response to flood and coastal erosion events; and
- Prioritising investment in the most at-risk communities.

These objectives seek to achieve a number of outcomes, including:

- ensure a clear understanding of the local risks of flooding and erosion, so that investment in risk management can be prioritised more effectively;
- set out clear and consistent plans for risk management so that communities and businesses can make informed decision about the management of the residual risk;
- encourage innovative management of flood and coastal erosion risks, taking account of the needs of communities and the environment;
- form links between the local flood risk management strategy and local spatial planning;
- ensure that emergency plans and responses to flood incidents are effective and that communities are able to respond properly to flood warnings;
- help communities to recover more quickly and effectively after incidents.

The LFRMS also defines a number of priorities actions that need to be managed by Cardiff Council.

4.4 Planning Policy Wales

Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It translates the Welsh Government's commitment to sustainable development into the planning system, so that it can plan an appropriate role in moving towards sustainability¹⁶. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation.

The Well-being of Future Generations (Wales) Act (WBGFA) 2015 establishes a 'sustainable development principle' which means that a defined public body must act in a manner which seeks to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs. In order to achieve this principle Welsh Government expects all those involved in the planning system to adhere to:

- putting people, and their quality of life now and in the future, at the centre of decision-making;
- engagement and involvement, ensuring that everyone has the chance to obtain information, see how decisions are made and take part in decision-making;
- taking a long-term perspective to safeguard the interests of future generations, whilst at the same time meeting needs of people today;
- respect for environmental limits, so that resources are not irrecoverably depleted or the environment irreversibly damaged. This means, for example, mitigating climate change, protecting and enhancing biodiversity, minimising harmful emissions, and promoting sustainable use of natural resources;
- tackling climate change by reducing the greenhouse gas (GHG) emissions that cause climate change and ensuring that places are resilient to the consequences of climate change;

¹⁶ Welsh Government, 2018. Planning Policy Wales, Edition 10. [Online] Available at: <https://gov.wales/sites/default/files/publications/2019-02/planning-policy-wales-edition-10.pdf>

- applying the precautionary principle. Cost-effective measures to prevent possibly serious environmental damage should not be postponed just because of scientific uncertainty about how serious the risk is;
- using scientific knowledge to aid decision-making, and trying to work out in advance what knowledge will be needed so that appropriate research can be undertaken;
- while preventing pollution as far as possible, ensuring that the polluter pays for damage resulting from pollution;
- applying the proximity principle, especially in managing waste and pollution. This means solving problems locally rather than passing them on to other places or to future generations;
- taking account of the full range of costs and benefits over the lifetime of a development, including those which cannot be easily valued in money terms when making plans and decisions and taking account of timing, risks and uncertainties. This also includes recognition of the climate a development is likely to experience over its intended lifetime; and
- working in collaboration with others to ensure that information and knowledge is shared to deliver outcomes with wider benefits.

Section 6.5 of PPW deals with coastal areas. The main planning principles for coastal places, reflect the principles of Integrated Coastal Zone Management. These principles are 'to support urban and rural development, whilst at the same time being aware of, and appropriately responsive to, the challenges resulting from the dynamic interaction of natural and development pressures in coastal areas.'

Planning Policy Wales states that planning authorities should develop, or apply, specific policies through their development plans which reflect the characteristics of their coastlines. They should acknowledge the interrelationships between the physical, biological and land use characteristics of their coastal areas and the impacts of climate change. This will involve considering the potential impacts associated with incremental increases in coastal risk over time as well as any beneficial incremental changes in land use.

Coastal defences can potentially influence sediment supply by transferring the risks of erosion to elsewhere. Planning Policy Wales states that it is '*not appropriate for development in one area to adversely add to the impacts of physical change to the coast in another location.*'

Section 6.6 of PPW deals with Water and Flood risk, with paragraph 6.6.22 dealing specifically with Development and Flood Risk. The plan states that Government resources for flood and coastal defences are directed at protecting existing developments and are not available to provide defences in anticipation of future development. New or improved flood defences in coastal and/or riverside locations should be carefully planned, ensuring all potential environmental effects, both on and off-shore, and relevant SMP policies are taken into account. Flood defence works can provide opportunities to achieve wider social, economic and environmental benefits, which should be maximised where possible.

4.5 Technical Advice Notes

Planning Policy Wales is supplemented by a series of Technical Advice Notes (TANs). TANs should be taken into account by local planning authorities in Wales in the preparation of development plans. TAN 14 (Coastal Planning)¹⁷ and TAN 15 (Development and Flood Risk)¹⁸ are of relevance to this project. TAN 14 provides advice on:

- Recreation development

¹⁷ Welsh Government, 1998. Technical Advice Note 14: Coastal Planning. [Online] Available at: <https://gov.wales/technical-advice-note-tan-14-coastal-planning>

¹⁸ Welsh Government, 2004. Technical Advice Note 15: Development and Flood Risk. [Online] Available at: <https://gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf>

- Heritage coasts and non-statutory coastal groupings
- Shoreline Management Plans

TAN 15 provides advice on:

- Development advice maps to determine flood risk
- Assessing the flooding consequences of proposed development
- Development plans and development control to mitigate flood risk.

4.6 Cardiff Local Development Plan

The Cardiff Local Development Plan¹⁹ represents a 'plan-led' approach to meeting future needs. The adopted LDP provides the statutory framework for the development and use of land within Cardiff over the Plan period (2006 to 2026). The LDP states that the *Plan 'provides a balanced response to meeting social and economic needs, but in a manner, which best protects our valued open spaces, river corridors and countryside backdrop.'* The LDP 'vision', set out in the 'What Matters' Strategy, is: *'By 2020...Cardiff will be a world class European capital city with an exceptional quality of life and at the heart of a thriving city-region'.*

The LDP sets out four objectives to deliver the LDP vision:

- to respond to evidenced economic needs and provide the necessary infrastructure to deliver development;
- to respond to evidenced social needs;
- to deliver economic and social needs in a co-ordinated way that respects and enhances Cardiff's environment; and
- to create sustainable neighbourhoods that form part of a sustainable city.

The LDP also aims to protect and enhance river corridors. It provides a planning framework through which the Council is able to protect, promote and enhance river corridors. New development within, or adjacent to the river corridors may be required to contribute to projects which help to achieve the objectives set out in the River Corridor Action Plans.

4.7 River Corridor Action Plan

The purpose of the River Corridor Action Plan is to establish an agreed framework that will deliver a wide range of actions that respond to the key identified priorities. The Rhymney River and Nant Fawr Corridor Action Plan²⁰ is intended to bring about improvements in the valley. The aim of the Action Plan is to bring relevant organisations together to identify issues, agree a framework and deliver actions that:

- positively address identified priorities;
- improve the quality of the environment;
- bring about the sustainable and long-term use of land;
- maximise opportunities for improved access and recreation; and
- raise public awareness of the value of the valley to the community.

¹⁹ Cardiff Council, 2016. Cardiff Local Development Plan 2006-2026, Adopted Plan. [Online] Available at: <https://www.cardiff.gov.uk/ENG/resident/Planning/Local-Development-Plan/Documents/Final%20Adopted%20Local%20Development%20Plan%20English.pdf>

²⁰ Rhymney River and Nant Fawr Corridor Action Plan, 2010. [Online] Available at: <https://www.cardiff.gov.uk/ENG/resident/Planning/Local-Development-Plan/Examination/Core-Documents/Library/Cardiff-Council-Docs/Documents/CC21%20River%20Rhymney%20and%20%20Nant%20Fawr%20Corridor%20Action%20Plan%202009.pdf>

5 Proposed EIA methodology

5.1 The EIA process

EIA is defined as 'a systematic process to identify, predict and evaluate the environmental effects of proposed actions and projects'²¹. Regulation 4 of the Town & Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 sets out that the environmental impact assessment is a process consisting of:

'(1) (a) the preparation of an environmental statement by the person seeking or initiating planning permission...

(2) The environmental impact assessment must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of proposed development on the following—

(a) population and human health;

(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC(1) and Directive 2009/147/EC(2);

(c) land, soil, water, air and climate;

(d) material assets, cultural heritage and the landscape; and

(e) the interaction between the factors listed in sub-paragraphs (a) to (d).'

Online Government guidance^{Error! Bookmark not defined.} sets out that the aim of Environmental Impact Assessment is 'to protect the environment by ensuring that a local planning authority, when deciding whether to grant planning permission for a project which is likely to have significant effects on the environment, does so in the full knowledge of the likely significant effects, and takes this into account in the decision-making process' and 'to ensure that the public are given early and effective opportunities to participate in the decision making procedures'.

The EIA process is closely aligned with the design process (Figure 5-1)²¹. This effectively begins with EIA Screening, whereby the developer makes the decision whether EIA is required for the project in question. Suitable environmental alternatives (primary mitigation) should be considered at this early stage, but if it is decided that the potential likely significant effects on the environment cannot be avoided through mitigation measures, an EIA Screening Opinion should be sought from the appropriate authority by the developer. As well as outline design some environmental information is required to undertake EIA Screening, and so baseline surveys may be required to inform the EIA Screening Opinion request.

It is often appropriate where EIA Screening is likely to return an outcome where statutory EIA is required, that EIA Scoping is undertaken at the same time. This combined approach makes use of the environmental baseline information collated for the EIA Screening Opinion request, to consider the scope of further detailed environmental impact assessment work required. Through the submission of an EIA Scoping Report, the developer requests that the relevant authority provide an EIA Screening Opinion in order to seek confirmation from the Statutory Environmental Consultees on the level of scope of EIA required.

²¹ IEMA (2016) Environmental Impact Assessment Guide to Shaping Quality Development. [Online] Available at: https://www.iema.net/assets/uploads/iema_guidance_documents_eia_guide_to_shaping_quality_development_v7.pdf

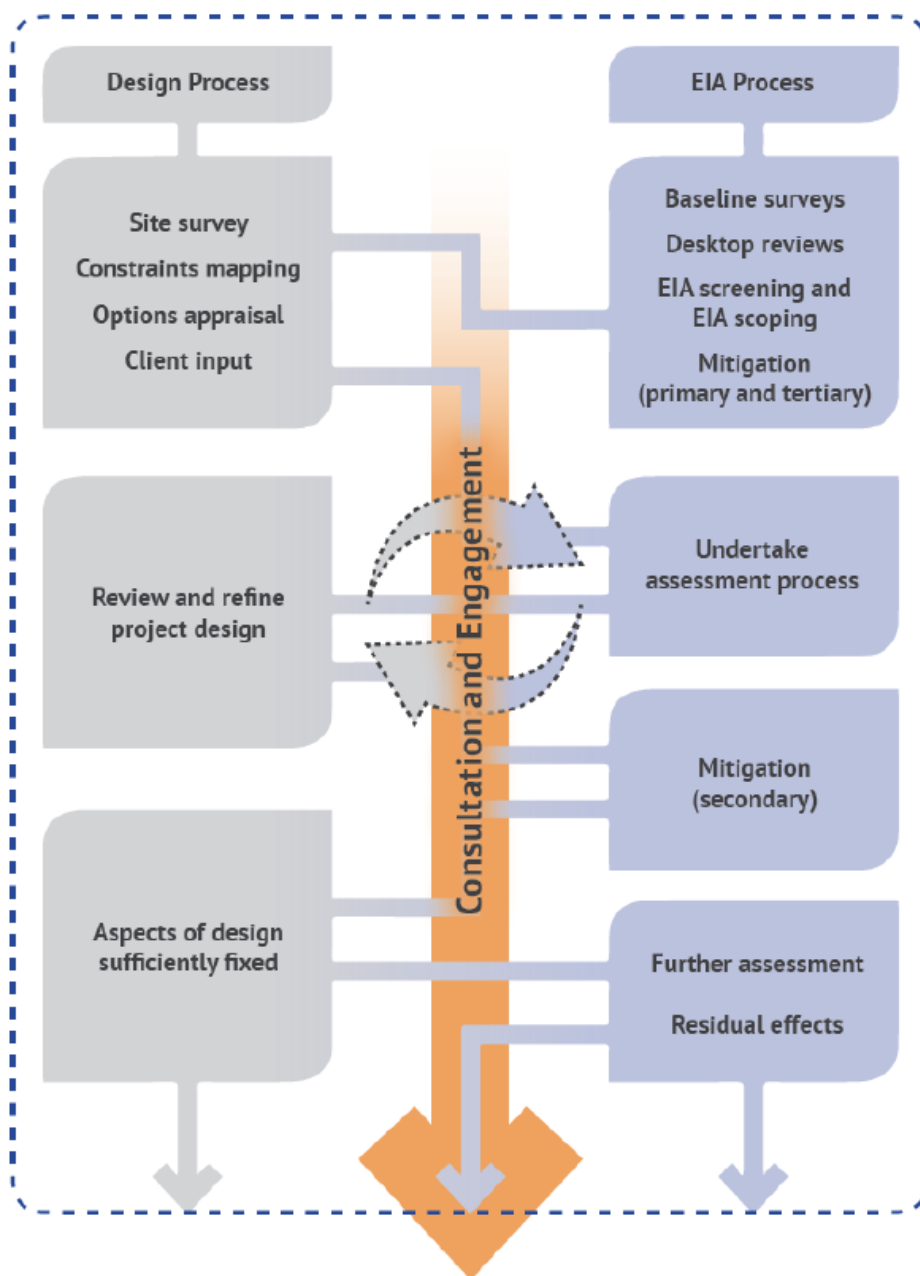


Figure 5-1: The interaction of design and EIA processes²¹

On the basis of the EIA Scoping Opinion response, further detailed baseline information is collected to inform the detailed impact assessments. The assessments involve firstly characterising the potential impacts and then the assessment of likely significant effects. At this stage Primary, Secondary and Tertiary Mitigation can be recommended to reduce or eliminate significant effects. This is an iterative process, whereby impact assessment process and design of the development process interact with one another to produce a mutually acceptable solution. This can also involve stakeholder engagement of the emerging design, to further minimise environmental effects. The results of the EIA process are documented in the Environmental Statement (ES), which should be well structured, proportionate and concise document. The ES is supplemented with a Non-Technical Summary in printed and digital format, which intended to make the findings of EIA publicly accessible.

Secondary and Tertiary Mitigation recommendations and commitments reported in the ES topic chapters often require separate environmental management plans in order to achieve the desired outcome. These are usually prepared during discharge of planning conditions or

during pre-construction stage of the approved development but can be prepared in draft at the planning stage to demonstrate that commitments in the ES will be followed up.

With reference to The Institute of Environmental Management and Assessment (IEMA) (2016), a summary of the steps involved in the EIA process is set out as follows:

- 1 Identify aspects of environment likely to be significantly affected (preliminary baseline);
- 2 Propose primary mitigation (impact avoidance measures);
- 3 Define impact assessment methodology;
- 4 Collect environmental baseline;
- 5 Assess likely significance of the effects;
- 6 Propose secondary mitigation (iterate design to reduce or eliminate effects);
- 7 Report residual effects (in the relevant ES chapter); and
- 8 Set out follow up measures (tertiary measures and environmental management plan).

5.2 EIA screening and scoping

5.2.1 EIA Screening Opinion request

This EIA Screening Opinion request is informed by the desk-based review of environmental constraints as summarised in Table 2-2 and illustrated in the Environmental Constraints Plan provided in Appendix A.

The proposed development falls within Schedule 2 of the Town & Country Planning Environmental Impact Assessment Regulations (Wales) 2017 Section 10(m) '*Coastal work to combat erosion and maritime works capable of altering the coast through the construction, for example, of dykes, moles, jetties and other sea defence works, excluding the maintenance and reconstruction of such works – all development*'. Under Regulation 5(8) of the EIA Regulations, the proposals must therefore be screened for EIA development by the Local Planning Authority (Cardiff Council) with regard to the selection criteria provided in Schedule 3 of the EIA Regulations.

Given that the development would affect an area below Mean High Water Spring (MHWS), the proposals also fall within Regulation 8(1) of the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended). The proposal must also therefore be screened for EIA against Annex 3 of the EIA Directive as part of a Marine Licence Application by Natural Resources Wales (NRW) Marine Licencing Team.

The outline proposals for 6.0km of coastal and fluvial defence improvements would require a construction site area of approximately 40ha, part of which is within an Environmentally Sensitive Area designated as the Severn Estuary SPA, SAC, and Ramsar site. The designations include intertidal mudflats and saltmarsh of importance for a range of internationally protected wetland bird species. Given the length of coastline and river that would be affected by the proposals, there is potential for both direct and indirect impacts on wetland bird species. Direct impacts would depend on the timing of construction of the works with regards to the seasonal presence of wetland bird species. Indirectly, the works have potential to alter the extent of inter-tidal habitats and patterns of coastal processes operating, potentially impacting on the roosting and foraging behaviour of wetland bird species.

Given the potential for likely significant effects on European designated sites in the Severn Estuary, a HRA Appropriate Assessment is required under the Habitat Regulations. Where there is a requirement for both EIA and HRA, then in accordance with Regulation 26(1)/15A of the aforementioned EIA Regulations, "coordination of assessments" would be required. Under the premise of the precautionary principle and given the recent European Court of Justice ruling on *People Over Wind and Sweetman v Coillte Teoranta*, it is important to note that any mitigation measures identified as part of EIA cannot however be used inform the requirement for HRA Appropriate Assessment.

The outline proposals would comprise a new activity within the Severn Lower coastal waterbody, and therefore falls within the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. A Coastal WFD Screening Assessment²² has identified that detailed WFD Compliance Assessment is required as part of the Marine Licence Application. The detailed assessment would need to demonstrate the scheme would not result in a degradation in status of any waterbodies or inhibit any waterbody from achieving its WFD objectives.

5.2.2 EIA Scoping Opinion request

The objective of EIA Scoping, as set out Regulation 14 of the EIA Regulations, is to consider the scope and level of detail of the information to be provided in the ES. On the basis of reasonably accessible environmental baseline information, the EIA Scoping Report therefore proposes a methodology for the assessment of likely significant effects and proposes an appropriate structure for the ES report. Although it is not a statutory requirement to undertake EIA Scoping, it allows agreement on approach to be sought from the statutory environmental consultees at an early stage in the EIA process. Early engagement through EIA Scoping also encourages an iterative approach to design development, whereby any environmental concerns raised during consultation can be used to inform the emerging design proposals and mitigate any significant environmental effects.

Schedule 3 of the EIA Regulations sets out the Regulation 5(8) selection criteria for EIA screening, the requirement for EIA is set out on the basis of:

1. *the characteristics of the development;*
2. *the environmental sensitivity of geographical areas likely to be affected by development; and*
3. *the types and characteristics of the potential impact to identify the likely significant effects of the development on the environment.*

Schedule 4 of the EIA Regulations, sets out the requirements for information to be included in the ES includes 'a description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape'.

Consideration of the EIA scope is set out in this report under the following broad environmental topics:

- Climate change (Chapter 6)
- Coastal processes and geomorphology (Chapter 7)
- Biodiversity and nature conservation (Chapter 8)
- Landscape and visual (Chapter 9)
- Cultural heritage (Chapter 10)
- Population and human health (Chapter 11)
- Traffic and transport (Chapter 12)
- Construction-related effects (Chapter 13)
- Other environmental effects (Chapter 14)
- Cumulative effects (Chapter 15)

²² JBA Consulting, 2017. Cardiff Coastal Risk Management Programme Outline Business Case, Water Framework Directive Screening and Scoping Assessment, March 2017.

These chapters are generally set out according to the following structure:

- **Baseline:** provides a description of the key baseline features of relevance to the project and aspects of the environment likely to be significantly affected by the project.
- **Environmental impacts and likely significant effects:** considers the likelihood of the aspects of the environment to be significantly affected, to the extent of the information available, and potential mitigation measures that could be applied. It also sets out whether the topic area is to be scoped out of or into the EIA.
- **Proposed methodology:** if the topic is to be scoped into the EIA, this section describes how the likely significant effects would be assessed in detail as part of the EIA.

Environmental aspects that are 'scoped in', would require further detailed technical studies undertaken to inform the ES. Where environmental aspects are 'scoped out' these would not be considered further, unless there is a material change in the development proposals. The outcomes of the scoping process are summarised in the Chapter 16 of this report. However environmental issues can be scoped in or out at any stage of EIA, which would be definitively reported in the ES.

5.3 EIA method of assessment

Regulation 17(3) of the EIA Regulations requires that:

'An environmental statement is a statement which includes at least—

- (a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;*
- (b) a description of the likely significant effects of the proposed development on the environment;*
- (c) a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;*
- (d) a description of the reasonable alternatives studied by the applicant or appellant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the significant effects of the development on the environment;*
- (e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and*
- (f) any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.'*

The requirements of information for inclusion in the ES is set out in Schedule 4 of the EIA Regulations. Where information about the proposals is not sufficiently known to inform these requirements, the premise of the Rochdale Envelope is employed (referring to a judgement made on the planning law case *R. v Rochdale MBC ex parte Milne in 2000*). This follows that the more detailed the proposal, the easier it will be to ensure compliance with the Regulations, but where such detail is unavailable, 'appropriate parameters' would need to be defined for the purpose of EIA.

Section 55 of the Town and Country Planning Act of 1990 defines development as *'the carrying out of building, engineering, mining or other operations in, on, over or under the land, or the making of any material change in the use of any buildings or other land'*. Case law provided by *Parkes vs Secretary of State for the Environment (1978)* follows that the first half, 'operations', comprises activities which result in some physical alteration to the land which has some degree of permanence in relation to the land itself. The second half 'use' comprises activities which are done in, alongside or on the land, but do not interfere with the actual

physical characteristics of the land. Operation and use are therefore material planning considerations and will need to be set out in sufficient detail in the ES for the purpose of informing Planning Consent.

In defining the methodology for EIA, reference is made to the current practice guidance:

- Online Government Guidelines.
- Guidelines for Environmental Impact Assessment (IEMA, 2004) & 2006 Updates²³.
- IEMA (2011) State of Environmental Impact Assessment Practice in the UK. Special Report²⁴.
- IEMA (2016) Environmental Impact Assessment Guide to Shaping Quality Development²¹.
- IEMA (2016) Environmental Impact Assessment Guide to Delivering Quality Development²⁵.

Other environmental topic-specific guidance are detailed in the methodology section of each EIA topic chapter.

5.3.1 Proportionate EIA

EIA is widely recognised as delivering valuable and accessible information that positively influences development design and consenting to the benefit of developers, communities and the environment. However as noted in the IEMA Proportionate EIA Strategy it is also becoming increasingly recognised that EIA needs to be more effective and more proportionate to deliver these benefits.

The assessment of the scope of likely significant effects needs to be considered carefully to ensure that disproportionate or irrelevant environmental information are not scoped into EIA.

5.3.2 Sufficient expertise

Regulation 17(4) requires that the ES must '*(a) be prepared by persons who in the opinion of the relevant planning authority or the Welsh Ministers, as appropriate, have sufficient expertise to ensure the completeness and quality of the statement; (b) contain a statement by or on behalf of the applicant or appellant describing the expertise of the person who prepared the environmental statement*'.

Where an EIA deliverable contributes towards statutory EIA, it must be technically reviewed and approved by the relevant 'competent expert', who is defined here as a chartered member equivalent of a relevant professional institution and therefore up to date with relevant continuing professional development. A statement on those involved in the technical review of EIA will be provided in the ES.

5.3.3 Defining the temporal and spatial scope of EIA

Regulation 17(3) states that the ES includes at least (a) '*a description of the proposed development comprising information on the site, design, size and other relevant features of the development...*'

The temporal scope of the EIA is considered in terms of the following principal stages of development:

- existing conditions (baseline);

²³ Institute of Environmental Management and Assessment (IEMA) (2004). Guidelines Environmental Impact Assessment. 2006 Updates.

²⁴ Institute of Environmental Management and Assessment (IEMA) (2011). *State of Environmental Impact Assessment in the UK*. IEMA Special Report.

²⁵ Institute of Environmental Management and Assessment (IEMA) (2016). Environmental Impact Assessment Guide to Delivering Quality Development. [Online] Available at: <https://www.iema.net/assets/newbuild/documents/Delivering%20Quality%20Development.pdf>

- construction dates (currently assumed to be two years);
- operation (including maintenance) of the development over the next 100 years; and
- future decommissioning of the development (beyond the 100 year scheme design life).

Operation of the scheme would be defined on the basis of engineered design life of the scheme, and the length of time it would provide resilience to the effects of climate change.

Given the Severn Estuary SMP2 policy of HTL over the next three defined epochs (0-20 years, 20-50 year, 50-100 years), it is considered likely that the scheme would need to be upgraded for continued protection of the coastline from erosion. Decommissioning of the current scheme under this scenario would overlap spatially with works for construction of a future scheme. Given the uncertainty of the future legislative or policy requirements that could apply when updating or decommissioning the project in 100 years' time, future decommissioning of the project would need to be deferred to any future consenting requirements associated at that time.

The spatial scope of the EIA is considered on the basis of:

- the physical extent of the proposed works, as defined by the limits of land to be acquired or used (temporarily or permanently);
- the nature of the existing baseline environment, including the location of sensitive receptors;
- the geographical extent of impacts beyond the site, e.g. effects on traffic, or watercourses that might extend some distance from the development site; and
- the geographical boundaries of the political and administrative institution and authorities, which provide the planning and policy context for the project.

5.3.4 Defining impacts and effects

With reference to the selection criteria for screening Schedule 2 development as set out in Schedule 3 of the EIA Regulations, the requirement for EIA is based on a preliminary assessment of the following:

- the characteristics of the development;
- the location of the development; and
- the types and characteristics of the potential impact.

Paragraph 1 of the above considers the nature of the development being proposed. Paragraph 2 considers the environmental sensitivity of geographical areas likely to be affected by the development. Paragraph 3 considers the likely significant effects of the development on the environment [as specified in regulation 4(2)] in relation paragraphs 1 and 2 taking into account the following:

- a. the magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);
- b. the nature of the impact;
- c. the transboundary nature of the impact;
- d. the intensity and complexity of the impact;
- e. the probability of the impact;
- f. the expected onset, duration, frequency and reversibility of the impact;
- g. the cumulation of the impact with the impact of other existing and/or approved development; and
- h. the possibility of effectively reducing the impact.

The requirement for EIA is therefore based on the characteristics of the development proposals that could impact on the environment as set out in paragraph 1, the value, sensitivity or importance the environment as defined in paragraph 2, and likely significant

effect quantified by the characteristics of the potential impact as set out in paragraph 3. Distinction is drawn between characteristics of the 'potential impacts' and the significance of any resultant 'likely effects'. This is because not all potential impacts identified using paragraph 1 and 2 will necessarily have a likely significant effect on the environment when assessed against the criteria set out in paragraph 3.

For the purpose of EIA impacts and effects may be further distinguished from one another using the following definitions:

- *Impacts* are the predicted changes to valuable, sensitive or important aspects of the baseline environment which are attributable to the development proposals;
- *Effects* are the consequences of the changes to the baseline environment resulting from the types and characteristics of the potential impact attributable to the development proposals.

A matrix approach is often used in EIA to assist with the quantification of likely significant effect [on the factors specified in regulation 4(2)], as illustrated in Table 5-1. The matrix approach assists in the judgement of the scale of significance, by enabling a direct comparison to be made between the scale of magnitude, intensity, irreversibility etc of potential impacts, and the scale of the value, sensitivity or importance of the impacted environmental resource or receptor. The matrix-based approach helps to provide consistent significance scoring terminology by pre-defining the relationship between significance scoring terms. For consistency throughout the ES, these significance scoring terms will be used where possible, with any topic specific scoring terminology set out in individual ES chapter methodologies where this deviates from the general approach. Where significance scores derived using the matrix approach fall between terms (i.e. slight or moderate; moderate or large), then a professional judgement is made by the assessor upon which score should reasonably apply.

Table 5-1: Matrix for quantifying significance of effect scoring terms

		Magnitude, intensity, irreversibility, etc of impact			
		No Change	Minor	Moderate	Major
Value, sensitivity or importance of environmental resource or receptor	Low	Not Significant or Neutral	Slight	Slight or Moderate	Moderate
	Medium		Slight or Moderate	Moderate	Moderate or Large
	High		Moderate	Moderate or Large	Large

Examples impact magnitude criteria are given as follows:

- **Major** – complete loss or the intensive alteration to an aspect of the baseline, which may be irrecoverable, slow to recover or if negative cannot be easily mitigated.
- **Moderate** – some loss or change to the baseline situation that occurs over a period of time and has limited potential to recover or if negative to be mitigated.
- **Minor** – a small change in the baseline situation that may not be immediately obvious, but which would have a perceptible impact on the receptor, and may be fully recoverable or if negative easily mitigated.
- **No Change or Negligible** – no perceptible change in the baseline situation. Receptors would not require mitigation for negative impacts, but may be positively enhanced.

Examples receptor importance and sensitivity criteria are given as follows:

- **High** – a receptor of national or international importance, or which is of particular or unique value, and which has no little or no resilience to change which could result in loss of the characteristics that make the receptor valuable.

- **Medium** – a receptor of regional importance, or which is of value to wider value, and which has some limited resilience to change without the complete loss of the characteristics that make the receptor valuable.
- **Low** – a receptor of local importance, which is common but of some value, and which has resilience to changes in the characteristics that make the receptor valuable.

Schedule 4 of the EIA Regulations, sets out the requirements for information to be included in the ES includes' a description of the factors specified in regulation 4(2) likely to be significantly affected by the development... The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development...'

These types of effect are defined herein for the purpose of this EIA using the following terms:

- *Direct effects* – arise from the impact of activities that form an integral part of the project;
- *Indirect or secondary effects* – arise from the impact of activities that do not form part of the project, but are a consequence of it;
- *Cumulative effects* – result from multiple impacts or effects on a particular environmental resource or receptor, which would otherwise not occur or would be less severe;
- *Short-term, medium-term or long-term effects* – refer to the temporal scale of an effect;
- *Permanent effects* – result from an irreversible change to the baseline environment or which persist for the foreseeable future;
- *Temporary effects* – persist for only a limited period or which may disappear due to natural recovery of the environment or assimilation into it;
- *Positive effects* – have a beneficial influence on environmental receptors and resources; and
- *Negative effects* – have an adverse influence on receptors or resources.

Consideration of transboundary effects are also a requirement of Schedule 4, which in the UK are considered with regard to the geographical boundaries of the political and administrative institution and authorities, which provide the planning and policy context for the project (refer to Section 5.3.3).

5.3.5 Mitigation, enhancement, and reporting of residual effects

Schedule 4 of the EIA Regulations sets out the requirement for inclusion in the ES: 'A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases'.

Mitigation measures should be both reasonable and practicable, taking account of the following criteria:

- current best practice guidance;
- precedents set by similar projects;
- the effectiveness of different technical solutions;
- their feasibility in construction and operational terms; and
- their incremental costs.

When identifying the best possible design measures available to achieve the required mitigation within a scheme, the principles of the hierarchy of mitigation should be employed as follows (in order of preference):

- *Avoidance* – making changes to the project's design to avoid or prevent adverse effects on an environmental feature;
- *Reduction* – where avoidance is not possible, adverse effects can be reduced through sensitive environmental treatments/design;
- *Remediation* – where adverse effects are unavoidable; management measures can be introduced to limit their influence;
- *Compensation* – where avoidance or reduction measures are not available, it may be appropriate to provide compensatory measures to seek to offset the adverse effect with a comparable positive one.

Consideration to mitigation should be undertaken from the earliest possible design stage, after the baseline data has been collected, and throughout the EIA process. EIA mitigation can also therefore be characterised depending on the stage of the assessment when it is considered²⁴.

- *Primary* – Changes made in the pre-application phase of the development, that modify the location or design of the development. This mitigation has the greatest ability to avoid impacts. They are the most effective when applied as early as possible, as it is often difficult to act on primary mitigation measures as the design begins to stabilise.
- *Secondary* – Actions that require activity to achieve a desired mitigation. These can be imposed in the ES in order to achieve planning consent.
- *Tertiary* – Actions that would have been undertaken regardless of the EIA process, due to other legislative requirements or standard practices. This mitigation is the least flexible – either the legislation exists to create the mitigation or does not (i.e. Protected Species Licencing).

Where positive effects can be voluntarily introduced without the requirement to mitigate an effect, this is termed 'enhancement'.

Any environmental effects that remain significant after mitigation are termed 'residual effects'. Residual effects are a convenient way of reporting the overall significance of environmental effects of a proposed development scheme and would therefore be reported in the ES conclusion and non-technical summary.

6 Climate change

6.1 Introduction

This chapter sets out the proposed approach to assessing the nature and magnitude of effects relating to climate change. It is proposed that a climate change ES chapter will assess:

- The effects of the proposed development on climate change mitigation and greenhouse gas (GHG) emissions (Section 6.2)
- The effects of climate change on the proposed development and nearby receptors, including the need for climate change adaptation to improve and address resilience (Section 6.3):
 - a. Here we will consider two elements: (1) the impact of climate change upon the proposed development; and (2) the impact of the proposed development on the local receptor's resilience to climate change.

6.1.1 Policy and guidance context

The assessment will be prepared in accordance with the following IEMA guidance:

- *Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance* (2017).
- *Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation* (2020).

A summary of the relevant national and local legislation, policy and guidance will be included in the assessment, including:

- UK Climate Change Act 2008 (2050 Target Amendment)
- UK Climate Change Risk Assessment (2017) Summary for Wales
- Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
- The Well-being of Future Generations (Wales) Act 2015
- The Environment Act (Wales) 2016
- Prosperity for All: A Climate Conscious Wales (Wales Climate Change Adaptation Plan) (2019)
- Planning Policy Wales (2018)
- Technical Advice Note 15: Development & flood risk
- Technical Advice Note 14: Coastal planning
- Shoreline Management Plan
- National Strategy for Flood and Coastal Erosion Risk Management in Wales (current consultation draft)
- Cardiff Local Development Plan 2006–2026 (Adopted January 2016).

6.2 Climate change mitigation and greenhouse gas emissions

6.2.1 Baseline conditions

For climate change mitigation, the baseline for the proposed development is defined as the current GHG emissions arising from activities and infrastructure within the project site boundary, in line with the IEMA (2017) guidance.

The project site contains a number of different land uses including capped landfill sites, residential homes, highways, commercial units, leisure facilities, medical centre, car parks, allotments, woodland, a solar farm, and industrial estates.

It is difficult to determine the current baseline GHG emissions in the area because the existing flood defence infrastructure comprises the heavily eroded remnants of rock armour defences, short sections of sheet piles and sections of earth embankments which have very low operational GHG emissions and there are no existing assets that emit GHGs across the rest of the area where new flood defence assets are proposed.

In the context of this proposed development (flood risk mitigation), an important baseline to consider is alternative future baseline emissions as a result of the proposed development not being constructed.

Future baseline conditions

The GHG emissions associated with flood and coastal erosion damages as a result of not constructing flood defences are potentially significant in the short term. These could include emissions from:

- Building repairs
- Replacement of contents of properties
- Construction of replacement infrastructure and buildings

A report from the Environment Agency in 2010 estimated that the annual carbon emissions arising from FCERM activities (delivering of traditional flood defences) were 0.53 Mt CO₂e per year, whereas flood and coastal erosion damages were estimated to be 1.90 Mt CO₂e per year. These figures were calculated using a proxy approach, linking estimates of economic damage costs to carbon emissions, using a multiplier similar to that calculated for TE2100 (Halcrow, 2008). The report concluded that net emissions would be greater without FCERM activities due to the impacts of greater flood damage.

6.2.2 Potential impacts and likely significant effects

The majority of GHG emissions are expected to arise from the construction phase of the proposed development. Given that the defences would be designed to a 100-year design life and require no energy to function, operational GHG emissions of the proposed development are likely to be negligible in comparison to construction GHG emissions.

Construction emissions

The construction of the proposed development would result in GHG emissions due to the following factors:

- Demolition and waste removal of assets already in place;
- Vehicle movements arising from the delivery of materials to site and travel of personnel to and from the site;
- Use of construction equipment and plant; and
- Embodied carbon of the materials used to construct the proposed development.

Operational emissions

The operation of the proposed development would result in GHG emissions due to the following factors;

- Maintenance (e.g. patch repairs); and
- Inspection.

Given that the rate of progress in reducing GHG emissions in Wales has been deemed slow and a long way short of targets set by the Committee on Climate Change, any new GHG emissions can be considered significant, and any inability to eliminate new emissions can also be considered significant.

Construction GHG emissions associated with plant and machinery movement, embodied carbon in construction materials, and transport of material are likely to be significant in the

legislative and planning policy context, and are therefore **scoped in** for further detailed assessment in the EIA.

Operational GHG emissions of the proposed development have been considered. Although there would be emissions associated with maintenance (i.e. repairs), these would be difficult to predict and quantify, and would be likely to be negligible in comparison to construction GHG emissions. On this basis, operational GHG emissions of the proposed development are not likely to be significant and are **scoped out** of further assessment.

There could be significant future GHG emissions associated with adapting the proposals beyond the design life. However, given the high uncertainty of climate change scenarios over this timescale, and indeed, the uncertainty of the future legislative or policy requirements that could apply when updating or decommissioning the project, it is not considered reasonably possible to assess this aspect of future climate change. This aspect of climate change assessment would be deferred to any future consenting requirements associated with modification or decommissioning of the coastal defence scheme and is therefore **scoped out** of further assessment.

6.2.3 Assessment methodology

It is proposed that GHG assessment will utilise the Environment Agency (EA) e:Mission Carbon Planning Tool. This carbon calculation program predicts the GHG emission impacts of construction, operation, and maintenance activities in terms of CO₂ equivalence (CO₂e). It does this by calculating the embodied CO₂e of materials, plus the CO₂e associated with their transportation. It also considers personnel travel, site energy use, and waste management. The tool was developed by the EA for use on its projects that are predominantly fluvial and coastal schemes.

Where information is not available to complete the climate change calculations, assumptions would be made that detail a worst-case scenario (following the guidelines of the precautionary principle).

6.2.4 Uncertainties and assumptions

There are uncertainties with the estimation of GHG emissions associated with the flood defences. To combat this, a precautionary principle approach will be taken, assuming the worst-case scenario.

For the assessment of operational transport emissions associated with maintenance and inspection, assumptions shall be made on the likely distance of travel for operational staff of the proposed development. As such, there will be uncertainty in the estimations provided.

6.3 Climate change resilience and adaptation

6.3.1 Baseline conditions

Resilience of the project site to climate change is currently low due to the risk of coastal and fluvial flooding. There has been a detectable rise in mean sea levels over the last fifteen years and a rising trend of 2.4mm/yr⁻¹ on the Severn Estuary²⁶. Coastal erosion is quickly establishing a breach of the coastal defences to the east of the Rover Way Traveller's site, resulting in flood risk to significant areas of land behind, including Rover Way, which runs parallel to the defence, Tremorfa Industrial Estate, large areas of residential properties, local amenities, and a large supermarket.

²⁶ <http://www.coastaladaptation.eu/index.php/en/9-experiences-3/severn-estuary/138-climate-change-and-coastal-management>

Future baseline conditions

The conditions described below relate to broad predictions for Wales overall, derived from UKCP18 data and presented in the Technical Annex²⁷ of the climate change adaptation plan for Wales: '*Prosperity for All: Climate Conscious Wales*'. Information has also been drawn from other chapters. The Climate Change Resilience and Adaptation Chapter in the ES will use probabilistic projections for Cardiff from UKCP18.

Flood Risk

Flood risk is predicted to increase in the future with the effect of climate change, leading to an increased number of residential and non-residential properties at risk. Infrastructure will also be at risk, including electricity, gas pipes, telecommunications, water pipes, and sewer works. Along the west bank of the river, there are number of sections of embankment with lower crest heights than the surrounding defence. These lower sections will start to overtop as sea levels rise, leading to potential breaches in the unmaintained defences and flooding of the land behind.

Coastal erosion

Coastal erosion is also predicted to increase, risking the loss of land where the Rover Way Traveller's site is located and the adjacent electrical substation in approximately 5-10 years. This also risks the release of significant volumes of unknown waste material from the Frag Tip into the Severn Estuary.

Sea Level

According to the UKCP18 climate projections, Cardiff and London show the largest value of future sea level rise of all the UK capital cities²⁸ (see Table 6-1).

Table 6-1: UKCP18 projections for future sea level change for Cardiff

City	Sea level change at 2100 (m) relative to 1981-2000 average		
	RCP2.6	RCP4.5	RCP8.5
Cardiff	0.27-0.69	0.35-0.81	0.51-1.13

Rainfall

Winter precipitation in Wales is projected to increase by 5% by 2050 and 9% by 2080, whereas summer precipitation in Wales is projected to decrease by 16% by 2050 and 23% by 2080.

Temperatures

Summer average temperatures in Wales are projected to increase by 1.24°C by 2050 and 3.03°C by 2080.

Storm surge

Within the Bristol Channel and Severn Estuary, the size of surge expected to occur on average once every 50 years is projected to increase by about 0.8 mm per year (not including relative mean sea level change) over the 21st century. This may be considered insignificant when compared to projected sea level rise²⁹.

²⁷ <https://gov.wales/sites/default/files/publications/2020-03/prosperity-for-all-a-climate-conscious-wales-technical-annex.pdf>

²⁸ <https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Marine-report.pdf>

²⁹ <http://www.severnestuariespartnership.org.uk/sep/estuary/weather-climate-change/weather-climate-change/>

6.3.2 Potential impacts and likely significant effects

Resilience of local receptors

The aim of the proposed development is to improve the resilience of the local human and infrastructure receptors to flood and coastal erosion risk arising from sea level rise and fluvial flooding. It is therefore anticipated there will be positive impacts in the context of climate change resilience and adaptation of local human and infrastructure receptors; however, the level of resilience will be limited to the level of protection the assets are designed to provide.

The impact of sea level rise, together with the delivery of this coastal defence project, could potentially lead to increased risk of coastal squeeze. This could subsequently have an impact on the resilience of ecological receptors in the estuary to climate change (further consideration of this environmental impact is provided in Chapter 8: Biodiversity and Nature Conservation).

Resilience of proposed development

Given that the project is being designed, delivered and driven by the context of a changing climate, the proposed development will have a pre-determined level of resilience to climate change risks, namely sea level rise, flood risk, and storm surges. The assessment will also assess the potential impacts and effects of other climate change risks upon the proposed development (e.g. heat waves).

6.3.3 Assessment methodology

Baseline	
Existing conditions (historic climate and current site use)	A review of historic weather trends, significant weather events and site conditions to understand the current climatic conditions and hazards impacting the site.
Future baseline-UKCP18 projections	Climate projections have been used as part of the methodology for this EIA assessment. Climate trends and projections are published by the Met Office through the UK Climate Projections website. The UK Climate Projections 2018 (UKCP18) became available in November 2018 and provides the most up to date assessment of how the climate of the UK may change over this century.
Climate drivers and hazards	Based on the historic climate events, climate projections and stakeholder consultation the pertinent climate drivers for the site and the associated hazards are identified for current and future (2060–2079) epochs.
Sensitive receptors	In order to assess climate change impacts of future climate hazards it is necessary to split the assessment to account for different land uses and receptors. Climate change risk and adaptation ability for identified climate hazard will be undertaken for each identified project component.
Potential effects	
Embedded mitigation	Mitigation inherent to the site location, layout and design are outlined and taken into consideration when determining exposure to and consequence of climate hazards to sensitive receptors.
Local receptors	Consideration of the impact of the development on the ability of local receptors outside of the project boundary to demonstrate resilience to future climate hazards.
Exposure assessment	This stage assesses the degree to which the site is currently affected by climate hazards and the degree to which it is likely to be affected in the future for the agreed epochs (UKCP18 projections). A scoring approach will be developed to score the probability of climate hazards occurring on a 0–3 (no to high) basis. The Exposure Assessment is undertaken for both construction and operational development lifecycle stages.
Consequence assessment	This stage involves assessing how the identified climate hazards could affect the site assets and operations. The sensitivity analysis seeks to identify

Baseline	
	sensitivity of project aspects and activities to UKCP18 climate projections, independent of the specific masterplan design and location. The scoring approach relates to the degree of damage to assets or the potential for operations to be affected or cease to function and what the implications of these could be more widely (e.g. the area was isolated due to a flood event). This scoring approach relates to the social, economic and environmental impacts that could result from climate risks. The Consequence Assessment is undertaken for both construction and operational development lifecycle stages.
Significance of effect assessment	This stage combines the results from the two previous stages (exposure assessment score x consequence assessment score). This stage results in significance of effect scores for each receptor for current and future (2060–2079) epochs. The Significance of Effect Assessment is undertaken for both construction and operational development lifecycle stages
Mitigation and monitoring	
	This stage proposes mitigation measures to increase receptor resilience and reduce the significance of effect of climate hazards on the receptors. Mitigation is proposed for both construction and operational development lifecycle stages.
Residual effects	
	This stage re-assesses the significance of effect following implementation of the proposed mitigation measure. Significance of effect scoring is re-assessed to determine change accounting for mitigation. Residual effects are considered for receptors at both construction and operational development lifecycle stages.

7 Coastal processes and geomorphology

7.1 Introduction

Schedule 4 of the EIA Regulations, sets out the requirements for information to be included in the ES and includes (inter alia) '*a description of the factors specified in regulation 4(2) likely to be significantly affected by the development: ...soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality)...*'.

This chapter concerns changes to aspects of the coastal and fluvial environment of the Severn Estuary and Rhymney River, principally relating to patterns of erosion, sediment transportation and deposition (hydromorphological impacts), and the quality of water resources (hydrological impacts).

Given the location of the proposed development within the Severn Lower transitional waterbody, the requirements of the Water Framework Directive (WFD) (EC Directive 2000/60/EC) apply to the proposals. The WFD Directive is implemented in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. This commits the UK to achieve 'good' status in all water bodies by 2015. The quality goals are split between 'Chemical' status and 'Ecological' status. There are a further two deadlines if 'good' status cannot be achieved by 2015, which are 2021 and 2027. A preliminary WFD assessment has been prepared separately and has been used to inform hydrological elements of this assessment.

7.2 Baseline conditions

7.2.1 Fluvial geomorphology

A Geomorphology Study³⁰, comprising both an assessment of fluvial geomorphology and coastal geomorphology, was undertaken as part of the Outline Business Case (OBC) and has been used to inform this EIA Screening and Scoping Report. A recent (fluvial) Geomorphology Review and Appraisal³¹ undertaken for this design stage of the project, is consistent with the findings of the 2017 Geomorphology Study.

The Rhymney River is a tidally dominated estuary within the study area. The banks are composed of fine sediments and in-channel morphological diversity is low. The river has a meandering planform but is confined by both Lamby Way Landfill and Rover Way highway. The landfill site dominates the left (eastern) bank of the river and the right (western) bank is developed with both residential and commercial properties.

Bank erosion is occurring along the river, notably at both the Lamby Way road bridge on the left bank and on the right bank in the vicinity of the Rover Way/Lamby Way A4232 roundabout. Both instances of erosion are occurring on the outer bends, where fluvial processes tend to direct higher velocities. Where the riverbanks are eroding, slumping of material/bank slips are the main failure mechanisms. Water is constricted as it flows through the Lamby Way road bridge, which is likely to be causing scour upstream of the structure on the right bank. Historic modification of the channel, which involved cutting off a significant meander bend for the construction of Lamby Way, resulted in the loss of approximately 1.2km of channel length. Excess energy in the channel, as a result of the shortened reach, is thought to be contributing to the erosion of the outer bends downstream. The realignment of the river course took place between 1975 and 1982, and although the banks are unstable and the system is evidently still adjusting to the new planform post realignment, the channel does not seem to have migrated significantly during this time. The rate of erosion and channel adjustment is

³⁰ JBA Consulting, 2017. Cardiff Flood and Erosion Risk Management - Rover Way to Lamby Way Tip, Geomorphology, April 2017.

³¹ JBA Consulting, 2019. CCD-JBAU-XX-00-TN-EN-0001-S1-P01-Geomorphology_Review

therefore considered slow; nevertheless, the natural channel adjustment is expected to continue into the future.

Analysis of hydraulic modelling results and comparison with the Hjulstrom curve indicates velocities that are capable of eroding and entraining sands and silts. Due to climate change predictions, there is a risk that current erosion will increase over the next century.

7.2.2 Coastal hydromorphology

The site is located adjacent to the Rhymney River and Cardiff Flats, within the wider setting of the Severn Estuary. This position provides a range of geomorphic scales, within which landform dynamics may actively contribute to observed or projected coastal change (Table 7-1). Interaction of the associated landforms with management of the Rover Way and Lamby Way foreshores is expected to occur (e.g. mudbank retreat caused by change at the Severn Estuary scale will affect coastal management). In general, there is a relationship between temporal and spatial scales, which supports the identification of the key processes (e.g. larger-scale morphodynamics are strongly linked to longer-term environmental change). However, this concept may provide a limited basis for process attribution in situations where the coast is highly perturbed, which may include storm response, construction of major works, or sea level rise.

Table 7-1: Classification of geomorphic units by scale

Feature	Scale	Geomorphic Classification
Severn Estuary		
Severn Estuary	~100 km	Large-scale tidal estuary
Severn Central	~20 km	Tidal estuary basin
Taff - Usk Floodplain	~15 km	Alluvial floodplain
Cardiff Foreshore (PU2)	~2 km	Made ground
Wentlooge Foreshore (PU3)	~2 km	Reclaimed wetland
Rhymney River		
Sub-tidal	~2.2 km x 50m	Inter-tidal channel
Meanders	~2.5km x 40m	Tidal channel meander
Channel	15m width	Riverine channel
Cardiff Flats / Wentlooge Levels	~1 km	Inter-tidal flats
Tidal Channels	~1-10 m	Tidal channels
Outfall / drain channels	~1-4 m	Drainage channels
Beaches	~40 m	Sand-gravel Beaches
River banks	~20 m	Mud-sand Banks
Foreshore structures	~10 m	Walling
Structure sub-scales	~1-5 m	Walling components

Separate studies describing the dynamics at the scale of the Severn Estuary (Royal Haskoning DHV 2015³², HR Wallingford 2016³³), and from the Taff-Usk floodplain scale down to SMP process unit scale are available (Kirby 1989³⁴, Atkins 2010³⁵). These are locally supplemented

³² Royal Haskoning DHV. (2015) *Morphological Characterisation of the Severn Estuary and Solway Firth*. Prepared for Natural England. Report PB2693/r/303996/PBor.

³³ HR Wallingford (2016) *Morphology Synthesis*.

³⁴ Kirby R, (1989) Development of a methodology to predict changes to tidal flat shapes arising from tidal power schemes. Report to Severn Tidal Power Group, Ref STPG Task No. S.I(iii)i1. Ravensrodd Consultants Ltd, 92pp.

³⁵ Atkins (2010) *Severn Estuary Shoreline Management Plan Review*, Main Report, produced for Severn Estuary Coastal Group; Atkins (2010b) *Severn Estuary Shoreline Management Plan Review*, Appendix C, Baseline Processes, produced for Severn Estuary Coastal Group.

by stratigraphic analyses (Allen 1987³⁶), historic survey profiles, and LiDAR surveys (Atkins 2013; HR Wallingford 2016a). In brief, these studies indicate:

- Significant sediment transport occurs within the Severn Estuary, strongly related to tidal currents (Dyer 1984³⁷).
- Separation of residual suspended and bed load transport, resulting in a tendency for the accumulation of fine sediments up-estuary and potential for outward movement of coarse material, constrained by bedrock exposure towards the central estuary (HR Wallingford 2016³³).
- Accommodation space relative to tidal exchange (cross-sectional area relative to a notional equilibrium based on tidal flows) varies within the estuary (Royal Haskoning DHV 2015³²). The inner estuary is overfilled, suggesting potential for material export, whereas the central estuary, including the Cardiff area, is underfilled, providing capacity to accrete, or otherwise supporting stability of discrete sedimentary features such as the inter-tidal mudflats between Cardiff and Newport (Gwent Levels).
- Substantial change of the mudflats and adjacent coast has occurred historically. This has included the effects of anthropogenic activities since Roman times, with substantial drainage, walling, reclamation and saltmarsh restoration efforts. Phases of mudbank erosion and accretion over time scales varying from 50 to 2000 years are apparent within the stratigraphy (Allen 1987³⁶).
- The modern record of change, which largely corresponds to the 20th Century, has shown mudbank and coastal erosion along the Wentlooge and Rumney coast, coincident with accretion along the Peterstone coast further to the northeast. This is considered likely to be driven by along-coast sediment transfer, as other factors such as walling, sewage outfalls and saltmarsh restoration efforts will have had influences with similar spatial distribution. High rates of vertical mudbank lowering (0.03–0.04m per year) have been reported through analysis of discrete profile measurements, including observations from 1987, 2000 and 2006, along with construction profiles at Rumney Valley Sewer outfall and the Y&P sewer outfall (HR Wallingford 2016³³).
- Change along the Cardiff coast is highly obscured by substantial reclamation and walling, and no measurements of long-term (>50 years) mudbank movement have been reported within the SMP (Atkins 2010³⁵) or Severn morphology assessment (HR Wallingford 2016³³). Limited measurement of the mudbank from 1987, 2000 and 2006 has been reported (HR Wallingford 2009³⁸) showing erosion from 1987 and strong recovery by 2006. This scale of change is difficult to distinguish from potential inter-annual variability, which has not been measured. The influence of major works, including Cardiff East outfall, has potentially contributed to the general pattern of mudbank accretion between 2000 and 2006. Modifications to the older Cardiff East outfall facility suggest that this section of mudbank has lowered since construction of the facility in the 1860s.

Interpretation of reported information (Atkins 2010³⁵; HR Wallingford 2016³³) and geomorphic parallels (Rossington et al 2009³⁹) have been used to summarise mechanisms for dynamic

³⁶ Allen JRL. (1987) Late Flandrian shoreline oscillations in the Severn Estuary: the Rumney Formation at its typesite (Cardiff area). *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 315(1171), 157-184.

³⁷ Dyer KR. (1984) Sedimentation processes in the Bristol Channel/Severn estuary. *Marine Pollution Bulletin*, 15(2), 53-57.

³⁸ HR Wallingford. (2009) Severn Tidal Power SEA – Hydraulics & Geomorphology. Annex Geo 3: Improve baseline understanding of intertidal morphology and dynamics. Technical note DDR4417-01. Written by HR Wallingford for the Department of Energy and Climate Change.

³⁹ Rossington, K., Whitehouse, R. J. S., & Spearman, J. (2009). Morphological modelling of intertidal profiles in estuaries with strong tidal currents. *Rivers, Coastal and Estuarine Morphodynamics*, 941-946.

behaviour from the mudbank to beach scales (Table 7-2). There are linkages between these processes, and the relative importance of different mechanisms changes over time.

There is limited information reported about mudbank dynamics over short time-scales, although it is apparent that comparatively rapid movement of the mudbank surface occurs, with the tidal channels providing a pathway for small-scale adjustment. This is demonstrated by historical mudbank imagery, showing sequences of incision and infilling, mostly in the same channels due to relative mobility of recently deposited sediments. In the long-term, mudbank dynamics are likely to be dominated by large-scale changes to sediment supply (estuary scale), which includes alongshore transfer patterns. Modern patterns of erosion along the Cardiff shore are expected to accelerate.

Table 7-2: Dynamic processes associated with the main geomorphic features

Short Time Scales (<10 years)				Long Time Scales (>10 years)			
Feature	Dynamics	Drivers	Scale	Feature	Dynamics	Driver	Scale
Mudbank Front	Horizontal	Shear, Waves	Unknown	Mudbank Front	Horizontal	Supply, Sea Level Rise	Large
Mudbank Surface	Vertical	Sea level, Waves	Unknown	Mudbank Surface	Vertical	Supply, Sea Level Rise	Large
Tidal Channels	Cross-sections	Sea level	Moderate	Tidal Channels	Cross-sections	Sea Level Rise	Moderate
Beach	Cross-shore	Waves, Water Levels	Small	Beach	Cross-shore	Supply, Sea Level Rise	Moderate
Beach	Alongshore	Waves, Water Levels	Very Small	Beach	Alongshore	Waves	Small

The 'beach' (foreshore) area does not experience strong dynamics due to the relative infrequency of inundation and significant nearshore wave transformation (friction and refraction) across the mudbank as the waves approach. Material burial within the mudbank provides a mechanism for progressive erosion. Relative stability of the 'beach' is expected to reduce over time due to both the narrowing of the mudbank and higher sea level, which will include greater mobility in both alongshore and cross-shore directions. It is considered that net transport is likely to increase towards the northeast (due to increased swell energy), although the transport potential in both directions is likely to increase, and is likely to be variable between seasons and years.

The Rhymney River tidal catchment (up to the weir north of the A4232/A48 roundabout) is relatively small and there are no substantial increases of tidal inundation under moderate sea level rise scenarios. Consequently, projected sea level rise is estimated to cause a small change in tidal prism and a moderate change to the channel cross-section. This creates an increased tendency for sedimentation due to the limited fluvial sediment input. This in turn may create a small potential for near-field erosion, with material moving from the banks towards the base of the channel. Material feed from the channel entrance (i.e. mudbank and adjacent coast) is expected to be low, although this can produce additional erosion pressure in the immediate vicinity.

7.2.3 Coastal hydrology and water quality

The WFD aims to protect the quality of both surface water and groundwater bodies. There is one WFD waterbody that could be affected by the proposed development. The Severn Lower waterbody (Waterbody ID: GB530905415401) is a transitional waterbody adjacent to the proposed development. Table 7-3 presents a summary of the current WFD status for each of the constituent quality elements.

Table 7-3: Summary of the Lower Severn waterbody status

Waterbody criteria	RBMP Cycle 1 (2009)	RBMP Cycle 2 (2015)	Status objectives
Overall waterbody status	Moderate	Moderate	Good by 2021
Ecological status	Moderate	Moderate	Good by 2021
Chemical status	Good	Fail	Good by 2021
Biological quality elements	Moderate	Moderate	Good by 2021
Phytoplankton classification	-	High	High by 2015
Hydromorphological supporting elements	-	-	Not assessed by 2015
Other substances	-	-	-
Physico-chemical quality elements	Moderate	Good	Good by 2015
Specific pollutants	High	High	High by 2015
Supporting elements (surface water)	Moderate	Moderate	Good by 2021

The Environment Agency has published the Severn River Basin Management Plan (RBMP), which sets out the measures through which compliance with WFD objectives will be achieved in the plan area. The Severn Lower waterbody encompasses an area from the original Severn crossing road bridge, approximately 35km east of the project area, to Lavernock Point, between Cardiff and Penarth, approximately 8.5km to the west. Located downstream of the Severn Lower waterbody is the Bristol Channel Inner North coastal waterbody (Waterbody ID: GB641008660000).

The Severn RBMP identifies the Severn Lower waterbody as a 'heavily modified waterbody' (HMWB) due to the presence of flood defence infrastructure. Issues associated with required mitigation measures are due to the continued pressures on waterbody status due to physical modifications associated with flood protection infrastructure.

The waterbody has an overall target of achieving Good Potential by 2021. The current (Cycle 2 RBMP) ecological status is assessed as being 'Moderate', whilst its chemical status is assessed as being 'Fail'. Reasons for this failure include elevated levels of mercury (and its compounds) and brominated diphenylether, impacts on saltmarsh habitat and flowering plant species, and failure to deliver identified mitigation measures. Ecological status has remained the same since the Cycle 1 RBMP (2009) assessment, but chemical status has reduced from 'Good' in 2009.

The Multi-Agency Geographic Information for the Countryside (MAGIC) website⁴⁰ records several 'higher sensitivity habitats' present in the project area. These comprise a ribbon of saltmarsh habitat located along the Rhymney River and along the Severn Estuary to the east and west of the Rhymney River, and a small area of mussel beds located approximately 1km to the south west of the project area. The MAGIC website also identifies the presence of 'lower sensitivity habitats' comprising intertidal soft sediments (mudflats and mixed sand and mud), gravels and cobbles, and rocky shore habitat within Severn Estuary and Rhymney River adjacent to the project area.

A WFD Screening and Scoping Assessment⁴¹ was undertaken by JBA Consulting in March 2017. It suggested the following impacts were likely and included recommendations to minimise them:

⁴⁰ <https://magic.defra.gov.uk/MagicMap.aspx>

⁴¹ JBA Consulting, 2017. Cardiff Coastal Risk Management Programme Outline Business Case, Water Framework Directive Screening and Scoping Assessment, March 2017.

- Sensitive habitats (saltmarsh, mudflats and rocky shores) may be impacted during construction and then operation via coastal squeeze. Compensatory habitat is likely to be necessary;
- Biodiversity enhancements should be incorporated into the defence designs; and
- Assessment is required to determine the potential for chemical release into the watercourse from contaminated land.

The scoping assessment considered the potential for impacts on the SE Valleys Southern Devonian Old Red Sandstone & Triassic Mercia Mudstone groundwater waterbody. However, it was determined that the proposed scheme would not be likely to affect this aquifer. Therefore, this aspect is **scoped out** for further assessment in the EIA.

The nearest Bathing Water Quality area is at Barry Island located approximately 15km to the southwest of the proposals, and therefore impacts on Bathing Water Quality are **scoped out** of the EIA.

7.3 Potential impacts and likely significant effects

7.3.1 Fluvial hydromorphology

The potential impacts of the development along the river have been considered in the points below. Any likely significant effects that would need to be assessed in detail as part of the EIA have been acknowledged.

The development would see engineering of the riverbanks throughout the study area. The works will involve a combination of sheet pile flood walls, repairs and raising of existing embankments and erosion protection. During construction, the works would involve excavation of the banks and riparian zone to install the engineered solutions, which could release quantities of fine sediment to the fluvial system. The sediment is likely to be entrained by fluvial processes temporarily and then deposited within the channel. This could impact sensitive receptors nearby unless managed effectively during the temporary works.

The proposed works may also involve reinforcing the bank slopes vulnerable to erosion. The solutions to this will either involve hard engineering techniques or softer techniques. Bank reinforcement would limit natural erosional processes and hinder lateral migration of the channel. However, the erosion rate is considered to be low, due to the lack of significant channel change over recent years, and the channel is already constrained by the road network, which restricts channel movement. The impacts of the bank protection on lateral migration are therefore considered to be minor. Softer engineering techniques would provide a more natural approach than hard engineering, which would be more sympathetic to hydromorphic processes.

The proposed bank erosion protection would change the structure and composition of the bank slope material, which could have a notable impact on the habitat potential of the banks and therefore affect in-channel ecology. Softer engineering techniques would provide a more natural approach than hard engineering, which could be more sympathetic to natural habitats and ecology.

The proposed flood walls or embankments would impact the connectivity between the channel and its floodplain. The purpose of this is to reduce flood risk. The impact on hydromorphological processes would be a disconnection during flood flows that would concentrate higher flows in channel, potentially increasing erosive energies in-channel, which could increase local erosion rates.

7.3.2 Coastal hydromorphology

The Cardiff-Wentlooge coast has been highly modified since Roman times, including extensive drainage and reclamation activities. The construction of hard walls along the Cardiff shore

was largely associated with development of Cardiff Docks over the late 19th and early 20th centuries. To the east of the study area, along the Wentlooge coast, embankments were initially constructed to reduce flooding of low-lying reclaimed farmland. These have subsequently been increasingly fortified to cope with coastal stress following both regional and localised erosion.

Behaviour in response to flood defence and land reclamation cannot effectively be distinguished from large-scale coastal dynamics, and therefore it is typically characterised by modelling, based on conceptual frameworks (Kirby 2000⁴²; Rossington et al 2009³⁹; Townend et al 2011⁴³). Processes influencing response include:

- Reduced tidal prism, resulting in a change to the movement and deposition of suspended mud sediment.
- Increased wave reflection from walling, resulting in scour in front of the wall.
- Formation of a new interface between the mud surface and the foreshore treatment, which may involve the development of a 'mixed zone'.

These processes may all contribute to a rapid initial adjustment, followed by more gradual progressive erosion. Vegetation in front of the walling, particularly saltmarsh, may extend the period over which the progressive erosion occurs.

In addition to reclamation and walling, a range of drainage structures have been installed, including both stormwater drains and more substantial sewers. Extremely large, localised erosion rates (up to 4m vertical change on the mudbank) have been measured at the Ystradfydwg and Pontypridd (Y&P) outfall near Lamby Way, and Rumney Valley outfall further to the east (Kirby 1989, HR Wallingford 2009). Records of lowering in the vicinity of the Cardiff East outfall have not been identified, although secondary structures supporting the old outfall suggest adaption to mitigate progressive erosion.

Works that may influence the Cardiff foreshore behaviour have continued to be installed in modern times, including the Cardiff Bay Barrage (completed in 1999) and an upgrade of Cardiff East outfall (completed in 2002). These facilities have been constructed with generally greater awareness of coastal dynamics than previous works. Net accretion of approximately 1m vertical change across the upper mudflat has been measured on Cardiff Flats to the southwest of the Cardiff East outfall between 2000 and 2006, which is equivalent to the net erosion observed between 1987 and 2000 measurements (HR Wallingford 2010³⁸, 2016³³).

A number of sources of likely impacts on coastal processes have been identified from activities associated with the works, including:

- stockpiling and storage of rock on the foreshore.
- excavation for rock revetment construction.
- tracked vehicle movements on the foreshore.
- construction of foreshore access ramp(s).
- physical presence of the rock revetment.

These disturbances on the foreshore could give rise to impacts on coastal estuarine geomorphology and processes as a result of changes to patterns of sediment erosion, mobilisation/entrainment, suspension/turbidity, and redeposition. Given the environmental sensitivities of the Severn Estuary, in particular being a part of the Severn Estuary SAC, and supporting internationally important wetland bird species designated within the Severn Estuary SPA, there is potential for changes in geomorphological processes during construction and the operation of the coastal defences to give rise to likely significant effects. Whilst the

⁴² Kirby R. (2000) Practical implications of tidal flat shape. *Continental Shelf Research*, 20(10), 1061-1077.

⁴³ Townend, I., Fletcher, C., Knappen, M., & Rossington, K. (2011). A review of saltmarsh dynamics. *Water and Environment Journal*, 25(4), 477-488.

primary impact on coastal geomorphology and processes will be assessed in the Coastal Processes ES chapter, any secondary impacts on ecological species and designations will be assessed as part of the Biodiversity and Nature Conservation ES chapter (refer to the Chapter 8 herein).

7.3.3 Coastal hydrology and water quality

There are a number of activities that could occur during construction, which may pose a risk to water quality. These activities include:

- Accidental spillages, including fuels and polluting materials such as concrete.
- Exposure of bare ground, earth movement, stockpiling material, mobilising of sediment into surface water receptor through runoff from the site.
- Run-off from wheel washing.
- Pollution due to vandalism of stores or plant.
- Poor/inadequate storage of materials and chemicals/fuels and wastes, such as on permeable surfaces, adjacent to watercourses or without sufficient bunding capacity.

It is envisaged that the works will not pose a barrier to fish movement and migration. Noise impacts from the work are unlikely to impact fish as the work will likely be undertaken when the working area is above the water level and dry.

7.3.4 Biological elements of the WFD

The proposed development has potential to cause both temporary and permanent impacts on intertidal habitats, which are present through the site extent. This includes saltmarsh and intertidal soft sediment, gravel & cobbles and rocky shore WFD Habitats.

Construction of the proposed flood defences has the potential to cause damage or disturbance to the higher sensitivity saltmarsh habitat and lower sensitivity gravel & cobbles and intertidal soft sediment habitats, through excavation of land along the Severn Estuary and Rhymney River foreshore. Depending on the extent of the defences, there is the potential for permanent removal of habitat and for temporary damage to occur during construction. In addition, there is potential for future inter-tidal habitat loss due to 'coastal squeeze' as a result of sea level rise due to climate change.

However, there is the potential to provide ecological enhancement to the rock armour revetment. The rock armour may encourage establishment of WFD higher sensitivity habitats, including mussel beds and polychaete reefs. The usage of bio-blocks and creation of rock pools within the rock armour may also increase its suitability as a habitat.

7.3.5 Chemical water quality elements of the WFD

The Severn RBMP identifies that the chemical status of the Lower Severn waterbody is not meeting its status objectives. The reasons for this include the effects of chemical pollutants and also impacts associated with existing flood defence infrastructure. The proposed project is likely to provide some benefits to chemical status by reducing the potential for continued erosion of the contaminated 'Frag Tip' adjacent to Rover Way, and future erosion of Lamby Way Landfill site. However, the construction works around the Lamby Way Landfill and Frag Tip also have potential to disturb sediment that could release chemical contaminants into the environment. Further consideration of potential effects on chemical status associated with the construction of new hard defences is also therefore required.

7.4 Proposed assessment methodology

7.4.1 Fluvial geomorphology

This assessment considers the potential short-term (construction) and long-term (operational) impacts of the proposals on the local fluvial hydromorphic processes. This

assessment is based on information presented in the Geomorphology Study undertaken as part of the OBC (JBA 2017), and from information obtained during the on-going (fluvial) Geomorphology Review and Appraisal being carried out for this design stage of the project. These assessments provide a visual, hydromorphic survey of the river and understanding of historic channel change.

This assessment also makes use of hydraulic modelling results, which have been analysed in terms of the sediment transport mechanisms within the channel.

7.4.2 Coastal hydromorphology

This assessment considers the potential short-term (construction) and long-term (operational) impacts of the proposals on the local and regional coastal processes. This assessment was based on information largely obtained during the coastal desktop study and informed by coastal processes literature where available.

Given the scale of the coastal defence scheme, the potential presence of contaminated sediments and existing pollution pathways on sensitive mudflat habitats within the Rhymney Estuary forming part of the Severn Estuary SAC, and supporting internationally important wetland bird species designated within the Severn Estuary SPA, potential impacts on coastal processes as a result of construction and operation of the coastal defence proposals are **scoped in** to further detailed impact assessment. However, existing coastal processes and patterns of sediment deposition are considered unlikely to change significantly as a result of the proposed scheme, as the current coastal alignment will not change. Detailed sediment modelling is therefore unlikely to be required in these areas.

Construction activities would be assessed in accordance with the definitions of impacts provided in Table 7-4 with regards to their potential to impact on coastal processes, namely changes to sediment entrainment operating as part of the estuarine mudflat system, changes to sediment suspension or turbidity, and changes to patterns of sediment deposition.

The consequences of these impacts would then be assessed with regards to scale at which they naturally operate in accordance with the sensitivity criteria provided in Table 7-5. Table 5-1 is used in order to determine the significance of the effect of the scheme proposals. Where the consequences of the changes in coastal processes could impact (i.e. through pollution pathways) on specific environmental receptors of value (i.e. ecological receptors), these are addressed as secondary effects in the relevant chapters of the ES (i.e. Biodiversity & Nature Conservation).

Table 7-4: Criteria for defining the magnitude of impacts on coastal processes assessed

Impact score	Criteria
Major	Major change in the strength of magnitude of the process operating.
Moderate	Moderate change in the strength of magnitude of the process operating.
Minor	Minor change in the strength of magnitude of the process operating.
Negligible or no change	No perceptible change in the strength of magnitude of the process operating.

Table 7-5: Criteria for defining the sensitivity coastal processes operating:

Sensitivity score	Criteria
High	Coastal processes operating at the scale of the tidal cell.
Medium	Coastal processes operating at the scale of tidal sub-cell.
Low	Coastal processes operating at the scale of the site or limited to the immediate nearshore zone.

7.4.3 Coastal hydrology and water quality

All new activities in the water environment need to take into account the requirements of the WFD. For a project or activity to be compliant with the WFD, it should demonstrate that:

- There is no risk of it causing a deterioration in the status of any element; in addition, for groundwater, it will limit or prevent the input of pollutants;
- There is no risk of it preventing WFD protected areas from achieving their objectives
- It will not jeopardise any waterbody from achieving good status/potential; and
- It will contribute to the protection, enhancement and restoration of waterbodies.

WFD assessment aims to determine whether a proposed development would have the potential to cause or contribute to the deterioration in status of a WFD waterbody or inhibit a waterbody from achieving its status objective. It also assesses the potential for the development to contribute to the objectives of the WFD. A detailed WFD assessment following EA guidance⁴⁴ would be undertaken and would be used to inform the Coastal Process and Hydromorphology impact assessment. Coastal hydrology relating to all three elements of WFD (hydromorphological elements, biological elements, and chemical water quality elements) is therefore **scoped in** for further detailed assessment.

⁴⁴ Environment Agency, 2017. Water Framework Directive assessment: estuarine and coastal waters [Online]
Available at: <https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters>

8 Biodiversity and nature conservation

8.1 Introduction

Schedule 4 of the EIA Regulations, sets out the requirements for information to be included in the ES (inter alia) '*a description of the factors specified in regulation 4(2) likely to be significantly affected by the development: ...flora and fauna...*'.

The location of the proposed development in the Severn Estuary means that there is a range of flora and fauna that could potentially be impacted. Ecological systems are present, elements of which form part of both designated and undesignated ecological species and habitats. This chapter will therefore assess the impact of the development proposals on the biodiversity and nature conservation value of the ecological systems operating in the Severn Estuary and Rhymney River.

Wildlife sites formally designated under the Conservation of Habitats and Species Regulations 2017 (as amended) (the 'Habitats Regulations') are present within the Severn Estuary, meaning that as well as EIA, a Habitats Regulations Assessment (HRA) is also required. Regulation 26(1) of the aforementioned EIA Regulations requires that: '*where in relation to EIA development there is, in addition to the requirement for an environmental impact assessment to be carried out, also a requirement to carry out a Habitats Regulations Assessment, the relevant planning authority (or the Welsh Ministers, as the case may be) must where appropriate ensure that the Habitats Regulations Assessment and the environmental impact assessment are co-ordinated*'.

This chapter therefore considers two aspects of biodiversity and nature conservation: (1) the impact of the development proposals on the conservation objectives of wildlife sites designated under the Habitat Regulations; and (2) the wider impact of the proposals on ecological systems that form part of other designated and undesignated species and habitats.

The designated and undesignated species and habitats that fall outside of the Habitats Regulations are assessed within this chapter following the wider EIA methodology, and with due regard to the Rochdale Envelope Approach, where relevant. Impacts on wildlife sites, designated under the Habitats Regulations, are also assessed herein with regard to the Precautionary Principle. However, it must be noted that any pre-mitigation Likely Significant Effects on the conservation objectives of these sites are to be coordinated with the HRA Screening Assessment. This overall approach is considered to be consistent with relevant case law relating to both EIA (i.e. *R. v Rochdale MBC ex parte Milne [2000]*) and HRA Screening (i.e. *People Over Wind & Sweetman v. Coillte Teoranta [2018]*).

8.2 Baseline conditions

8.2.1 Desk-based assessment

A desk-based assessment was undertaken as part of a Preliminary Ecological Appraisal⁴⁵ in 2017 (updated in 2019) as part of the Outline Business Case (OBC) and has been used as the basis of this chapter. As part of this, information was sought for all relevant statutory and non-statutory sites within a 5km radius of the development site's boundaries. Data was also collected on records of species with legal protection, or of nature conservation importance within the research area. Information was requested from Cardiff County Council, including records of non-statutory designated nature conservation sites (i.e. Sites of Importance to Nature Conservation (SINCs)), protected species, and species of conservation concern.

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

⁴⁵ JBA Consulting, 2017. Cardiff Coastal Risk Management Programme Outline Business Case, Preliminary Ecological Appraisal, March 2017.

Royal Society for the Protection of Birds (RSPB), and the Joint Nature Conservation Committee (JNCC) (on behalf of the statutory nature conservation bodies), in association with the Wildfowl and Wetlands Trust. A request was made for data from the compartments that cover the areas of the proposed scheme, namely Rhymney Estuary and Great Wharf.

Additional data was also collected from the following sources:

- MAGIC website⁴⁶;
- The Lle Geo-Portal⁴⁷

8.2.2 Extended Phase I Habitat Survey

An Extended Phase I Habitat Survey was carried out by an experienced Ecologist on the 23rd November 2016 and was conducted following the JNCC survey method (JNCC, 2010⁴⁸). The methodology of the Phase I Habitat Survey involves classifying and mapping parcels of land using specified habitat types. An Extended Phase I Habitat Survey involves determining the suitability of these habitats for supporting rare or legally protected species. The survey was extended to include consideration of notable/protected habitats and species, such as Badger, Otter, Dormouse, reptiles, Great Crested Newt, and invertebrates (CIEEM, 2013). A secondary survey was undertaken on the 21st March 2019, to update the original results obtained in 2016. The Phase I Habitat Map for the development area is included in Appendix B.

Furthermore, a detailed botanical survey was carried out on the 14th October 2019 by JBA Ecologists. This involved a walkover of all accessible areas of saltmarsh on the site. Stands of vegetation were identified by eye on site and mapped onto aerial imagery. Species were recorded along with their abundance. The vegetation stands could be relatively easily assigned to describe vegetation, so no quadrats were necessary. Vegetation was initially assigned to a community or sub-community of the National Vegetation Classification (NVC) (Rodwell 1992, 2000). These communities were then assigned to a corresponding Annex I habitat using the interpretation manual (European Commission 2013).

8.2.3 Limitations

The assessments, conclusions and recommendations in this report are based on the results of the survey, the limitations listed below and the available data. The conclusions and recommendations presented within this report are based on the most recent designs and current ecological features present. If any change in management occurs, or if there is a significant delay before proceeding with the works, this could result in the identified ecological features changing naturally over time. Furthermore, any subsequent changes to the proposed works may alter the recommendations and proposed mitigation and enhancement measures.

It was not possible to access the boat yard at the time of the survey and this area was surveyed through binoculars from the eastern bank.

8.2.4 Designated sites

The Severn Estuary European Marine Site (EMS) is designated as a SPA, SAC, and Ramsar site (see Appendix A). The Severn Estuary qualifies as a SPA under Article 4.1 of the Birds Directive (79/409/EEC) by supporting populations of European importance of certain species, internationally important populations of regularly occurring migratory bird species, and internationally important assemblage of waterfowl.

The Severn Estuary qualifies as a SAC under Article 4.1 of the Habitats Directive (79/409/EEC) by supporting habitats and species of European Importance listed on Annex I and Annex II of the Directive. The Severn Estuary primarily qualifies for the following features:

⁴⁶ <https://magic.defra.gov.uk/>

⁴⁷ <http://lle.gov.wales/home>

⁴⁸ JNCC, (2010). Handbook for Phase 1 habitat survey - a technique for environmental audit, ISBN 0 86139 636 7.

- 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)

In addition, there are further habitats present, but not a primary reason for qualification:

- 1110 – Sandbanks which are covered by seawater all the time (SAC interest feature 2)
- 1170 – Reefs (SAC interest feature 5)

The Severn Estuary also qualifies for species of primary interest:

- 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)

In addition to its SPA and SAC designation, the Severn Estuary is also designated as a Ramsar site under the Ramsar Convention 1971. The site is designated for a number of Ramsar interest features, which meet certain Ramsar Criterion:

- Ramsar Interest feature 1: Estuaries – Habitat communities and species assemblages. Ramsar Criterion 1 and 3.
- Ramsar Interest Feature 2: Assemblage of migratory fish species. Criterion 4 and 8
- 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 – Ramsar Criterion 5 and 6.

There are a further six statutory designated sites located within 5km of the proposed development:

- Gwent Levels SSSI – a series of aquatic SSSIs located between Cardiff and Chepstow.
- Rumney and Peterstone SSSI – part of the Gwent Levels SSSI; supports several important plant species.
- St Brides SSSI – part of the Gwent Levels SSSI; the site has notable plant and invertebrate species.
- Rumney Quarry SSSI – a geological SSSI.
- Rhymney River Section SSSI – a geological SSSI.
- Penylan Quarry SSSI – a geological SSSI.

In addition to the statutory designated sites, there are five non-statutory designated sites located within 500m of the proposed development. These are referred to as Sites of Importance for Nature Conservation (SINC). These are:

- Lamby North SINC

- Lamby Saltmarsh SINC
- Lamby Way SINC
- Rhymney Grassland Easy SINC
- The Rhymney River SINC

8.2.5 Habitats

Running water

The proposed development is located within the Severn Estuary. The estuary is fully tidal and consists of highly mobile sediments and extensive subtidal sandbanks and mudflats in the area of the works. The study area also includes the Rhymney River from its confluence with the Severn Estuary to approximately 800m upstream. The river in this section is also fully tidal and subject to the same tidal range as the Severn Estuary. It is relatively slow flowing, and has a number of large meanders.

Intertidal mudflats

The Severn Estuary foreshore consists of extensive intertidal mudflats throughout the extent of the scheme, extending up to 2km into the Severn Estuary channel, which are exposed at low tide. Intertidal mudflats are also present along the Rhymney River, with large areas exposed along both banks of the channel, and in particular, at the meanders in the river, at low tide.

Mudflats are considered highly productive areas, providing feeding and resting areas for internationally important populations of migrant and wintering waterfowl, and are also important nursery areas for fish.

Intertidal boulders/cobbles

A small amount of rocky habitat is present within the foreshore area, primarily to the west of the Rhymney River. The communities present are consistent with those found on sheltered upper eulittoral bedrock with Spiral Wrack *Fucus spiralis* most common.

To the east of the Rhymney River, fucoid species have settled on the toe of the existing remnant blockstone flood defences, with Spiral Wrack again abundant.

Coarse sand above the high tide mark

Immediately to the east of the Rhymney River, small pockets of barren littoral sand are present. Sand casts, most likely from Ragworm, were locally common within these areas during the habitat surveys in 2016 and 2019.

Shingle/gravel above high-tide mark

Shingle and gravel form a narrow band along much of the coastline foreshore, primarily to the west of the Rhymney River. For the most part, this was formed from eroded Frag Tip material and other disposed materials. This area was largely devoid of plant life and the highly mobile nature of the coarse material means that this area is unlikely to support large numbers of macroinvertebrates.

Boulders/rocks above high-tide mark

The existing, remnant flood defences located along the Estuary consist of a mixture of formal blockstone revetment and reused building materials. In some areas, a community of yellow and grey lichens have colonised within the splash zone. To the west of the Rhymney River, this habitat consists of exposed tip waste and the remnants of historic flood defences; the majority of this material is devoid of plant or animal life with only a very sparse number of lichens recorded.

Saltmarsh

Atlantic salt meadow was recorded on the banks of the Rhymney River and fringing the existing flood defence along the Severn Estuary to the east of the river. The largest sections of saltmarsh are bordering the Rhymney River, with the largest of these located on the lowest two meanders of the river. These sections were grazed and consisted predominantly of species indicative of mid to upper saltmarsh communities. Several drainage channels provided opportunities for saltmarsh herb species, with Sea Beet *Beta vulgaris subsp. maritima* most common. Within the saltmarsh, saline reedbeds were also present on the eastern side of the Rhymney River.

The vegetation on site represents typical saltmarsh habitat occurring in western British saltmarshes. A total of 8.2ha of the vegetation qualify as EU Annex I habitat 'H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)', a designated feature of the Severn Estuary SAC, in which at least part of the study area is located. These NVC communities are also notifiable features of the Severn Estuary SSSI, and Habitats of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (formerly UK BAP priority habitats).

To the east of the Rhymney River, saltmarsh fringes the existing remnant Severn Estuary flood defence. The community present is again indicative of mid to upper saltmarsh communities, with cord-grasses *Spartina* sp. present closer to the seaward side and on sections of soil that have fallen onto the foreshore. Scattered fragments of saltmarsh vegetation are also present beyond the flood defence where the ground is high enough not to be completely inundated by the tide.

Dense scrub

Dense scrub is present along the roadsides of Rover Way and Lamby Way, with locally dominant areas of Japanese Knotweed *Reynoutria japonica*. A ground covering of Ivy *Hedera helix* is present where the scrub thins out.

Dense scrub separates the industrial areas to the west of the Rhymney River from the coastline. To the west of the Rhymney River, dense scrub in the form of Hawthorn *Crataegus monogyna*, Willow *Salix* sp., Bramble *Rubus* sp., scattered Gorse *Ulex* sp. and large areas of Buddleia *Buddleja davidii* is present on the steep sloping ground behind the foreshore area. This area forms a mosaic of habitats, with tall ruderal and grassland habitats also present.

Semi-natural broadleaved woodland

Broadleaved trees line both Rover Way and Lamby Way which are predominantly Poplar *Populus* sp. and Sycamore *Acer pseudoplatanus*. To the east of the Rhymney River, areas of broadleaved woodland have been planted at the base of the Lamby Way Landfill; these areas were surveyed from approximately 500m away on the opposite side of the river, with Silver Birch *Betula pendula* and Oak *Quercus robur* identified as being dominant.

Coastal grassland

Coastal grassland is present in transitional areas behind areas of saltmarsh. Grassland indicative of the coastal environment is also present within the areas of scrub and tall ruderal habitats along Lamby Way and Rover Way.

Tall ruderal

Lining the roadsides of Lamby Way and Rover Way, tall ruderal species have colonised less disturbed areas and pavements and include common species such as Willowherbs *Epilobium* sp., Creeping Thistle *Cirsium arvense*, Common Nettle *Urtica dioica*, and False Oat-grass *Arrhenatherum elatius*. This forms a mosaic of habitats with areas of dense scrub and grassland.

8.2.6 Species

Invertebrates

The intertidal and subtidal mudflats described provide suitable habitat for a range of macroinvertebrate species. The range of sediment sizes present mean that it is likely that a diversity of macroinvertebrate communities has been able to develop, which in turn provide an important food source for bird and fish species associated with the Severn Estuary.

Honeycomb Worm *Sabellaria alveolata* reefs have been recorded approximately 2km into the channel (EMODnet)⁴⁹. This polychaete worm constructs tubes from sand or shell fragments in tightly packed masses, which form a honeycomb appearance and provide habitats for a variety of other invertebrates. The reefs recorded in this area are subtidal and none were recorded in the intertidal zone during the survey.

Saltmarsh within the project area can also provide habitat for several invertebrate species, with typical assemblages consisting of a range of marine and freshwater benthic species as well as terrestrial species. Saltmarsh in the South Wales area has been identified as an important habitat for several rare bee species including the Shrill Carder Bee *Bombus sylvarum* and Large Carder Bee *Bombus muscorum*. Saltmarsh provides a corridor to suitable habitats in the wider area.

Fish

The Severn Estuary EMS is designated for a range of migratory fish species; a number of these are for migratory species that are likely to spawn further up river, including rare Shad species. Over 100 species of fish have been recorded within the estuary. Migratory fish such as Trout *Salmo trutta* and Eel *Anguilla anguilla* have also been recorded within the Rhymney River catchment, and it is likely that these species migrate through the works area to the Severn Estuary.

Birds

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 EMS. BTO WeBS data revealed a total of 34 wading, wildfowl and gull species have been recorded utilising the habitats within the relevant compartment. This data shows that the mudflats in the scheme area support significant populations of wintering birds associated with 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 *Tringa totanus* and 24.46% of Pintail *Anas acuta* populations in the Severn Estuary. Important numbers of Shoveler *Anas clypeata* are also found and comprise 11.8% of the total Shoveler population using the Severn Estuary SPA.

A large number of records were provided for terrestrial bird species, including Cetti's Warbler *Cettia cetti* and Kingfisher *Alcedo atthis*, with Cetti's Warbler having been recorded in the reedbeds adjacent to the scheme area. The saltmarsh and surrounding scrub habitat provides nesting and foraging opportunities for a range of bird species, whilst the saltmarsh provides potential for ground nesting species such as Lapwing *Vanellus vanellus*.

Amphibians

No records for Great Crested Newt *Triturus cristatus* were provided within 2km of the proposed scheme. However, suitable terrestrial habitat for Great Crested Newt was recorded in the form of a scrub-grassland mosaic located along Rover Way and Lamby Way. Two ponds

⁴⁹ EMODnet - European Marine Observation Data Network (EMODnet) Seabed Habitats project (<http://www.emodnet-seabedhabitats.eu/>)

were identified at the eastern extent of the scheme area; these were considered to hold potential for Great Crested Newt, with suitable terrestrial habitat located to the north of this area. Parc Tredelerch also provides suitable terrestrial habitats.

Records within 2km of the scheme area were provided for Common Frog *Rana temporaria*, Common Toad *Bufo bufo*, and Palmate Newt *Lissotriton helveticus*. The closest record for each of these was located approximately 200m to the northwest of the scheme area. The grassland scrub mosaics, as well as some areas of the saltmarsh, all provide habitat for these species.

Natterjack Toads *Epidalea calamita* breed in saline pools, where the saline conditions have flushed most predators away. Whilst pools within the saltmarsh area do provide some potential for this species, the surrounding habitat offers low potential for other stages of their lifecycle and it is considered that the presence of Natterjack Toads is unlikely. No records for Natterjack Toad within 2km of the proposed scheme were provided.

Reptiles

There are records for Grass Snake *Natrix natrix* and Slow Worm *Anguis fragilis* within 2km of the scheme area, with records for Slow Worm located between the Rhymney River and the Lamby Way Landfill. Areas of scrub-grassland mosaic bounding the river has the potential support a number of species of reptiles. The habitats within Parc Tredelerch also have the potential to support a range of reptile species. Species such as Grass Snake are also known to utilise saltmarsh habitats.

Badger

There are no records of Badger *Meles meles* within 2km of the proposed works. No signs of Badger were recorded during the site surveys; however, habitat suitable for Badger to excavate setts was recorded within the dense scrub located along Lamby Way and Rover Way as well as the habitats within Parc Tredelerch. These areas also provide foraging potential for Badger. There is also the potential for setts to be excavated within the steep scrub areas located to the west of the Rhymney.

Otter

Otter *Lutra lutra* have been recorded within 2km of the scheme area and are known to be present within the Rhymney River catchment. Therefore, it is likely that Otter will commute through the works area. Due to the exposed nature of the mudflats, it is unlikely that Otter will utilise the banks of the river for resting or holt sites. However, the dense scrub that lines the river, as well as areas of reedbed within the saltmarsh, have the potential to provide resting and holt sites for Otter. Habitats located within Parc Tredelerch have the potential to provide holt sites in some of the areas of denser vegetation and reedbeds.

Water Vole

A large number of records within 2km of the scheme extent were provided for Water Vole *Arvicola amphibius*, with the closest records located within drainage ditches 200m to the east of the scheme extent. A drainage channel to the east of the Lamby Way Landfill was considered suitable for Water Vole although no evidence was recorded during the 2016 or 2019 survey. A drainage ditch that runs along the southern border of the Lamby Way Landfill site was considered to have low potential for Water Vole; however, high levels of green algae suggested that the ditch was subject to pollution from the landfill site. Using aerial imagery, it appears that these ditches are connected to watercourses where Water Vole have been recorded.

Bats

No buildings suitable for roosting bats were identified within the scheme area. Broadleaved woodland located adjacent to the scheme area was predominantly of a young age and is therefore unlikely to provide potential roosting features, such as cracks, knot holes, or lifted

bark. However, given the large size of the study area, no specific tree surveys were carried out. The scheme area is likely to provide foraging habitat for bats, with the potential for a large number of invertebrate species associated with the saltmarsh, dense scrub, and broadleaved woodland habitats. It is also likely that the river corridors provide commuting opportunities.

Marine mammals

A number of marine mammals are known to commute and forage within the Severn Estuary, and there are records for Common Porpoise *Phocoena phocoena* and Grey Seal *Halichoerus grypus* within 2km of the scheme area.

Invasive non-native species

Japanese Knotweed is abundant along the roadside verges of Lamby Way and Rover Way.

8.3 Potential impacts and likely significant effects

8.3.1 Construction Phase

Potential significant effects on species and habitats from activities during the construction phase will be assessed. This will comprise the following effects that are **scoped in** to the EIA:

- Damage, disturbance, or loss of coastal and aquatic habitats, including intertidal mudflat, saltmarsh, rocky shore, and river habitats – and associated invertebrate species.
- There is the potential for the scheme to negatively impact upon the features and conservation objectives of the River Severn European Marine Site and River Rhymney SSSI.
- Killing/injury or noise or visual disturbance to wintering and migratory bird species.
- Noise or vibration disturbance to fish species.
- Killing/injury of reptiles and/or noise or visual disturbance to reptile species.
- Noise or visual disturbance to Otter.
- Killing/injury of Water Vole and/or noise or visual disturbance to Water Vole if the drainage ditches identified above are impacted as part of the scheme.

There is the potential for damage to coastal and aquatic habitats along the coastal sections of the Severn Estuary through the placement of rock armour. There is the potential for a larger footprint to be impacted during the construction through vehicle movements and material storage.

There is the potential for damage to aquatic and coastal habitats within the River Rhymney to be impacted through the installation of sheet piling and scour protection.

The Severn Estuary and Rhymney River SINC are designated for a range of migratory fish species, including migratory species that are likely to spawn further upstream in the Rhymney River or in other rivers in the Severn Estuary. There is the potential to impact fish species if the work proposes any disturbance or damage to sub-tidal areas. There is also a potential risk to migratory fish should the project involve working practices that will cause excessive noise/vibration within the water column.

Grass Snake, Slow Worm and Otter species could be found within 2km of the site extent and may be impacted during the construction period. The PEA identified that it was likely that Otter would commute through the site, and therefore may be directly affected by site materials, vehicles, workforce and equipment.

There is potential for the project to facilitate contact between contaminated land and estuary waters, which could result in an impact on water quality that could then affect aquatic and marine habitats and species. There is the potential for the works to facilitate the spread of Japanese Knotweed.

Any clearance to terrestrial scrub and woodland habitats has the potential to impact nesting birds.

8.3.2 Operational phase

Potential significant effects on species and habitats from activities during the operational period of the scheme will be assessed. This will comprise the following effects that are **scoped in** to the EIA:

- Degradation/loss of priority intertidal habitats as a result of future erosion of habitats adjacent to and overlying the proposed new defences, particularly along the Rhymney River.
- There is the potential for the scheme to negatively impact upon the features and conservation objectives of the River Severn European Marine Site and River Rhymney SSSI.
- Degradation/loss of Annex I saltmarsh and mudflat habitats.
- Degradation/loss of foraging or roosting habitat for wintering/migratory bird species.
- Disturbance/degradation of aquatic habitat for invertebrate assemblages.
- Habitat loss for reptile assemblages.
- Damage to, and loss of, coastal habitats in the future as a result of coastal squeeze due to sea level rise, which could affect foraging and roosting behaviour of wintering/migratory bird species.
- Increased risk of disturbance to wintering and migratory bird species through increased use of the Wales Coast Path following the completion of the flood defence scheme.

The scheme has the potential to result in the permanent loss of intertidal habitat, including mudflat and saltmarsh habitat, and the separation of saltmarsh from intertidal areas. This loss may occur as a result of construction of the proposed development (habitat loss within the footprint of the proposed new defences) and future habitat loss as a result of changes in coastal/fluvial erosion and coastal squeeze due to sea level rise. Impacts to these habitats have the potential to affect bird features utilising the area through the permanent loss of foraging and roosting sites. In particular, the saltmarsh located on the eastern bank of the Rhymney River at its confluence with the Severn Estuary has been identified as a roosting site for important numbers of Redshank.

A coastal squeeze assessment⁵⁰ was undertaken at OBC stage to identify potential intertidal habitat losses within the Severn Estuary SAC and potential habitat compensation requirements for the preferred option. Discussions with Welsh Government and NRW are ongoing with regards to the assessment methodology and requirements for compensatory habitat, and therefore, this assessment may be subject to change. A further, more detailed assessment will be undertaken as part of the detailed design process and will be documented in a HRA. It is anticipated that compensatory habitat requirements will be refined and agreed through further discussion with Welsh Government and NRW. Delivery of compensatory habitat requirements will be through the Welsh Government National Habitat Creation Programme (NHCP) managed by NRW.

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

⁵⁰ JBA Consulting, 2017. Cardiff Coastal Defences, Habitat Compensation Assessment, Final Report, June 2017.

the Severn Estuary SPA and Ramsar. 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. Therefore, there is potential to disturb these species as the project is likely to impact upon foreshore areas. A HRA Screening Assessment⁵¹ of the outline designs at OBC stage identified a number of impact pathways and significant effects on bird species associated with the Severn Estuary SPA. Dunlin, Redshank, Shelduck, and Gadwall were identified as potentially being impacted upon.

8.3.3 Mitigation measures

The following recommendations for mitigation measures have been identified:

- Permanent habitat loss will be minimised.
- The amount of SAC habitat loss will be assessed and calculated, with compensatory habitat provided.
- The detailed design process will seek to incorporate ecological mitigation measures to benefit intertidal habitats and species.
- The detailed design process will seek to incorporate ecological mitigation measures to benefit a range of intertidal habitats and species.
- Adoption of precautionary method of working to avoid potential harm to reptiles.
- Adoption of precautionary method of working to avoid potential harm to Water Vole if impact to drainage ditches is identified.
- Minimising lighting around the site during construction to avoid potentially disturbing roosting/foraging bats.
- Implementation of pollution prevention techniques based on industry standard pollution control measures and best practice (such as the *Guidance for Pollution Prevention*⁵²).
- Production of a Construction Environmental Management Plan and Environmental Action Plan that will be implemented and supervised by an Ecological Clerk of Works.
- Appropriate working practices to ensure migratory fish species are not impacted.
- Biosecurity measures should be implemented to ensure that invasive non-native species are not spread by works vehicles and site personnel.

8.4 Proposed assessment methodology

The HRA Screening assessment undertaken on the outline design at OBC stage concluded that the project is likely to have a significant effect on the Severn Estuary EMS and that an Appropriate Assessment would be required under the Habitat Regulations. However, it was recommended that a further screening assessment is undertaken at the next stage of the project (detailed design), once further information is available on the design and construction of the outline proposals, to confirm the requirement for an Appropriate Assessment. Further HRA Screening is also required to ensure coordination with EIA in accordance with Regulation 27 of the EIA Regulations.

The Biodiversity and Nature Conservation ES chapter will build on the preliminary ecological assessments undertaken at the outline design stage to assess two aspects of biodiversity and nature conservation as follows:

⁵¹ JBA Consulting, 2017. Cardiff Flood and Coastal Erosion Risk Management Outline Business Case Rover Way and Lamby Way Tip, Record of a Habitats Regulations Assessment of a project, March 2017.

⁵² <https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/>

- (1) Any impacts of the detailed design proposals on the 'conservation objectives' of European sites designated under the Habitats Regulations (Severn Estuary EMS). This would be assessed in coordination with a HRA, with any uncertainty addressed with due regard given to the Precautionary Principle, as required under the Habitat Regulations. It must also be noted that with relevant case law relating to HRA Screening (i.e. *People Over Wind & Sweetman v. Coillte Teoranta [2018]*), only pre-mitigation Likely Significant Effects upon the conservation objectives of such sites will be assessed.
- (2) The wider impact of the detailed design proposals on ecological systems that form part of other designated and undesignated species and habitats that fall outside of the Habitats Regulations. Impacts on ecological systems will be assessed where relevant following the wider EIA methodology and with due regard to the Rochdale Envelope Approach EIA case law (i.e. *R. v Rochdale MBC ex parte Milne [2000]*). This follows that where there is any uncertainty, clearly defined parameters for assessment will be set out, and where mitigation measures are proposed, such measures will mitigate for the worst case scenario in order to account for the uncertainty.

Whilst the assessment of (1) will be undertaken in coordination with HRA, the assessment of (2) will be undertaken on the basis of guidelines provided by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016⁵³). This defines EcIA as '*a process of identifying, quantifying and evaluating the potential effects of development-related or other proposed actions on habitats, species and ecosystems*'. It also places emphasis on assessing 'significant effects' in EcIA is rather than all ecological effects: '*Relevant legislation, regulations, plans and policies should be considered at an early stage, as these will have a bearing on the scope of investigations, how potential effects are interpreted, and the criteria needed for determining significance*'.

The assessment of impacts on the Severn Estuary EMS will include a further assessment of future impacts associated with coastal squeeze as a result of sea level rise. The methodology for this assessment will be agreed with Welsh Government and NRW and will be documented in the HRA. The HRA will identify any compensatory habitat requirements to be delivered through the Welsh Government NHCP managed by NRW.

In order to quantify the likely significant effect on ecological systems, impact assessment significance scoring criteria have been defined in accordance with the wider EIA methodology as detailed in Section 5.3.4. The following criteria will be used to assess ecological impact magnitude and receptor sensitivity/importance as follows:

Examples of ecological impact magnitude criteria are given as follows:

- **Major** – complete loss or the intensive alteration to an aspect of the ecological baseline, which may be irrecoverable, slow to recover or, if negative, cannot be easily mitigated.
- **Moderate** – some loss or change to the ecological baseline situation that occurs over a period of time and has limited potential to recover or, if negative, to be mitigated.
- **Minor** – a small change in the ecological baseline situation that may not be immediately obvious, but which would have a perceptible impact on the receptor and may be fully recoverable or, if negative, easily mitigated.
- **No Change or Negligible** – no perceptible change in the ecological baseline situation. Receptors would not require mitigation for negative impacts but may be positively enhanced (i.e. habitat creation).

⁵³ <https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/>

Reference in particular will be made to the ES climate change assessment and the coastal processes assessment when assessing the impact magnitude on baseline ecological systems.

Examples of ecological receptor importance and sensitivity criteria are given as follows:

- **High** – an ecological site, habitat or species of national importance (i.e. Wildlife & Countryside Act schedule 5 & 8 species, SSSI)*, or which is of particular or unique value, and which has no little or no resilience to change that could result in loss of the characteristics that make the receptor valuable.
- **Medium** – an ecological site, habitat or species of regional importance (i.e. Environment (Wales) Act Section 7 species or habitat, LNR), , and which has some limited resilience to change without the complete loss of the characteristics that make the receptor valuable.
- **Low** – an ecological site, habitat or species of local importance (i.e. SINC), which is common but of some value, and which has resilience to changes in the characteristics that make the receptor valuable.

*note that ecological receptors of 'international' importance will be subject to HRA, which does not employ assessment criteria for significance quantification. Likely significant effects on ecological receptors of international importance will therefore be reported in the ES in terms of 'significant' or 'not significant'.

9 Landscape and visual

9.1 Introduction

Schedule 4 of the EIA Regulations, sets out the requirements for information to be included in an ES which includes (inter alia) *'a description of the factors specified in regulation 4(2) likely to be significantly affected by the development: ...Landscape'*. As part of the ES, an assessment of the effects of the proposal on the landscape character and visual amenity will be required. The assessment will include the following key stages:

- Desk-based research to determine the scope of the study;
- Desk-based research to establish the landscape and visual baseline and identify potential receptors;
- Field work to verify the baseline studies and ascertain how the landscape and visual resource would change;
- Assessment and reporting of potential effects;
- Potential mitigation for adverse effects; and
- Residual effects.

This process is supported by the use of viewpoints to illustrate and evaluate effects at key sites relevant to the proposal; however, the assessment of effects is not confined to these viewpoints.

For the purposes of this screening and scoping report, this chapter will ascertain the likely landscape and visual effects that may arise from the proposals, and the aspects that will be assessed (scoped in) and the aspects that will not be assessed (scoped out).

9.2 Baseline conditions

9.2.1 Visual description of the site

A Landscape Appraisal⁵⁴ was undertaken in March 2017 to support the development of the OBC and has been used to inform this chapter. The assessment for this screening and scoping report has involved the following key stages:

- Desk-based research to determine the scope of the study;
- Desk-based research to establish the landscape and visual baseline and identify potential receptors;
- A site visit was undertaken in November 2020, to verify data collected in the baseline studies; and
- Assessment and reporting of potential effects.

The site covers a stretch of the Rhymney River from the railway bridge to the north of the A4232 road bridge, down to the mouth of the river as it enters the Severn Estuary. The proposed works then extend north east adjacent to Lamby Way Landfill, and south west along the Severn Estuary to the DCWW WWTW.

The Rhymney River emerges from under a steel bridge that supports the Cardiff to Newport railway and flows for a short distance along a meandering river corridor with steep mud banks before passing under the A4232 road bridge. A large land drain to the east of the river also emerges from beneath the railway line, via a culvert and an old brick bridge, entering the river after a short distance along the left (east) bank. Smaller land drains also connect with the river along the left bank further downstream from an area of semi-wet grassland to the

⁵⁴ JBA Consulting, 2017. Cardiff Flood and Coastal Erosion Risk Management - Rover Way and Lamby Way Tip Outline Business Case, Landscape Appraisal, March 2017.

east. On the right (west) bank of the river, downstream from the railway bridge, there is a residential area of modern brick buildings, and a semi-wet grassland area with community allotments. Sections of the riverbanks are colonised by reeds and other riparian vegetation, dispersed amongst predominantly semi-wet grassland areas.

The river corridor begins to widen downstream of the A4232 bridge, and mudflats extend along the western side of the river on the inside of a large bend. On the left bank, an embankment colonised by emergent plant species separates the river from the area around Parc Tredelerch.

The river then flows under the B4239 'Lamby Way' highway, which forms part of the Wales Coast Path recreational trail. The riverbanks become steep along this stretch and are colonised by low-lying self-seeded vegetation around the higher areas. After a short distance, the river is intersected by a short section of channel remaining from the historic course of the river to the east. The river then continues in a more westerly direction, parallel to Lamby Way highway and the Wales Coast Path, separated by a thin stretch of bank that has been colonised by self-seeded native deciduous trees and scrub. To the east of the river there is a plateau colonised by scrub, and a deciduous woodland planted on the site of the disused Lamby Way Landfill.

Further south-west, the B4239 runs very close to the river as it meets the Rover Way/Lamby Way/A4232 ('Queen's Gate') roundabout. Along this stretch, sections of remnant rock armour is positioned along the right bank. The course of the river then continues in a more southerly direction away from the B4239. At this point, the Wales Coast Path has been temporarily diverted inland, while the old route of the Wales Coast Path continues as a footpath alongside the river, separated from the river by scrub and a few groups of self-seeded trees. A vegetated embankment sandwiched between the road and the path begins at this point and continues for approximately 800m. A low concrete retaining wall with a culvert is located between the path and the river as it begins to round a bend in an easterly direction. Rover Way highway runs parallel with the path at this point and both run in a south-easterly direction away from the course of the river.

The Rhymney River Motor Boat, Sail and Angling Club is situated on a thin strip of land created by the meandering river. Palisade fencing approximately two metres in height runs around the club's boundaries and down to the river's edge.

The course of the river then returns to run alongside the footpath for a short stretch. The pathway transitions from an informal grassy walkway to a concrete platform that has become partly overgrown by encroaching weeds and scrub.

The course of the river again meanders away from the path before connecting with the Severn Estuary to the south-east. These areas are covered in wet grassland and contain brackish waterbodies, and water flowing from these areas into the river has carved several small channels, eroding parts of the riverbanks.

At low-tide, large mudflats can be seen at the river mouth, attracting large numbers of migratory birds. The right bank of the Severn Estuary, north-east of the Rhymney River, features a mixture of mudflats, sand, stones, and remnant rock armour. On the landward side, the existing flood defence rock revetment is in a state of disrepair, and beyond this there is palisade security fencing approximately 2m in height around the boundary of Lamby Way Landfill. Further to the north-east, another section of the Wales Coast Path runs along the top of a raised embankment in parallel to the Severn Estuary.

To the south-west of the river mouth, the footpath continues to run alongside the estuary around an area of made ground, passing the Rover Way Traveller's site. Along this section there is much evidence of fly tipping and the coastline is eroding into the estuary. Further south-west, the erosion of the land becomes more extreme, creating vertical drops from the path down to the estuary. Along these parts, layers of rubble, waste and geotextile layers have become exposed, making it unattractive for users of the footpath.

The path continues to follow the estuary, slightly inland, with hardy coastal vegetation to both sides. A disused motocross course comprising of a network of tracks is located on a raised area slightly further inland on the site of a disused landfill ('Frag Tip'). As the path emerges from the vegetated section, it continues to run alongside the estuary. Along this stretch, severe erosion of the coastline continues, and the foreshore is covered with concrete and brick from gabion baskets that have corroded and collapsed. On the landward side, the footpath passes a variety of industrial areas, including a large DCWW wastewater treatment plant and an active landfill. In some parts, the path passes very close to palisade fencing on the landward side, and there are sheer drops down to the rubble along the edge of the estuary.

The land curves to the west to an inlet where there is a drain that connects into the estuary via a large culvert. At this point, the footpath leaves the estuary edge and continues along Rover Way and Ocean Way towards Atlantic Wharf to the north-west. Beyond the drain and study area, further south, there appears to be less erosion and the topography becomes less steep. Concrete and brick from the heavily eroded gabion baskets continues around the estuary edge, and there is an industrial estate located slightly inland, separated from the foreshore by a band of scrub and deciduous trees.

9.2.2 National Landscape Character Areas (NLCA)

Wales has been divided into 48 National Landscape Character Areas (NLCA), each of which have descriptive profiles that make reference to their regionally distinct natural, cultural and perceptual characteristics.

Much of the site lies on the edge of NLCA 35, Cardiff, Barry and Newport. The relevant key characteristics of the area are as follows:

- Busy, heavily urbanised areas – containing Cardiff, and other large settlements including Penarth and Barry to the south to the west and the city of Newport and new town of Cwmbran to the east.
- Cardiff – capital city, largest urban area and principle administrative centre for Wales. The Romans established a settlement at Cardiff, with remains visible in Cardiff Castle. Mid-19th century growth as the most important port in the world for coal export. Cardiff Bay has since regenerated as a secondary focus in the city. The urban form of Cardiff expands across much of the surrounding landscape.
- Urban fringe/peri-urban areas – for example land between Penarth and Barry, which contains linear settlement linked by rural roads but has an urban fringe character in parts.
- Lowland river corridors – rivers Taff and Ely drain into Cardiff Bay and the tidal Rhymney River runs through east Cardiff; the tidal River Usk forms the focus of Newport with the River Ebbw meandering to the south east.

Part of the site lies on the far western edge of NLCA 34, Gwent Levels. The relevant key characteristics of the area are as follows:

- Alluvium – former marsh and inter-tidal areas from the Severn Estuary. Triassic mudstones are beneath.
- Flood embankment to the sea – the land has been successively reclaimed from the sea and coastal marshes and is protected from the tides by a sea wall.

The site is also just to the west of The Gwent Levels, a Registered Landscape of Outstanding and of Special Interest in Wales. This has been designated due to its extraordinarily diverse environmental and archaeological potential.

9.2.3 Local Landscape Character: LANDMAP

LANDMAP (Landscape Assessment and Decision-Making Process) is a landscape assessment process developed by the Countryside Council for Wales (now Natural Resources Wales) to provide a system to cover the whole of Wales. The site is included within the following

LANDMAP character areas, set out according to the particular LANDMAP data sets in which they appear:

Visual and Sensory:

- Rhymney valley floor urban fringe, Lamby Way Landfill, River Rhymney, Lamby Way Park, Severn Estuary, Cardiff Flats, and Cardiff East.

Historic Landscape:

- Pengam Moor, Rumney Intertidal Zone, Cardiff Flats Reclaimed Land, Southwest Wentloog Level, Tremorfa, and River Rhymney Corridor.

Cultural Landscape:

- Lamby Way Landfill, Lamby Way Park, Severn Estuary, Cardiff Flats, Cardiff East, Rhymney valley floor urban fringe, and River Rhymney.

Landscape Habitat:

- Lamby Lake & surrounds, Rhymney Estuary, Lamby Tip, Rhymney Mudflats, Cardiff Docks and Atlantic Wharf, Pengam Green and Tremorfa Park, Maindy to Splott, and West of Rhymney Estuary.

The landscape character information within these data sets will be used to evaluate the particular characteristics of the site, in order to produce a bespoke assessment of the likely effects on the area which may be brought about by the proposed development.

9.2.4 Marine Character Areas

NRW were commissioned on behalf of Welsh Government to identify the character of Wales' seascapes at a broad scale. The inshore waters around Wales have been divided into 29 MCAs.

The site is part of Marine Character Area 29 Severn Estuary (Wales). There are a number of key characteristics that are relevant to the site.

- Expansive funnel-shaped Severn Estuary, sitting at the mouth of four major rivers (the Severn, Wye, Usk and Avon).
- The immense tidal range of the estuary is second only to the Bay of Fundy in Canada. The status of the tide has a significant bearing on perceived character.
- Soft Triassic and Jurassic rocks exposed along the shore, creating a wide rocky intertidal area. Elsewhere the shore is defined by extensive tidal flats
- Mud, sand and gravel sediments deposited in the Holocene period producing a varied seabed of flats and bars, with associated shallow waters and numerous shoals presenting hazards to navigation.
- Estuary important for the interpretation of coastline dynamics and land-forms, and also past changes in sea level, sediment supply, climate and river flow.
- Strong tidal streams and turbidity producing biological communities characteristic of the extreme physical conditions of liquid mud and tide-swept sand and rock.
- Tidal flats, saltmarshes and the extensive wet grasslands are of international importance for wintering waterfowl and migratory birds.
- Some of the richest and most diverse populations of non-exploited fish in the UK – Sea Lamprey and Twaite Shad populations are considered to be larger than in any other estuary.
- Flat coastline backed by the Wales Coastal Path, affording long views into the Bristol Channel. Cars travelling along the M4 via the Severn Bridge also overlook the area.
- Views to major commercial, port and industrial development at Cardiff and Avonmouth, as well as the two road bridges, contrasting with the open, empty vistas characterising the Gwent Levels

- Seascape's open character affording strong intervisibility with the Somerset coastline, including Portishead, Clevedon and Weston-Super-Mare. The higher hill summits of the Quantock Hills Area of Outstanding Natural Beauty (AONB) and Exmoor National Park form a distinctive upland backdrop.
- Estuary's classic funnel shape and south-west orientation make it susceptible to extreme weather conditions (including storm surges) sweeping in from the east Atlantic.

9.2.5 Cultural heritage designations

Impacts on the views and setting of designated cultural heritage assets including Listed Buildings, Scheduled Monuments, and Conservation Areas are covered within the chapter on Cultural Heritage within this report. This chapter is not an assessment of effects on designated or non-designated heritage assets. It also does not include an assessment of the significance of these effects. However, it is useful to consider these designations as they may inform landscape and visual sensitivity. The site is not within or adjacent to any Conservation Areas, nor are there Listed Buildings located within or adjacent.

The nearest Conservation Areas are Roath Mill Gardens, Roath Park, and Oakfield Street, and all are located between 1.0 and 2.0km to the west of the site. All of the Conservation Areas contain Listed Buildings of grade I and II. There is no direct view of the site from any of the Conservation Areas. There are also no Historic Parks and Gardens within or adjacent to the site.

9.2.6 Visual receptors – residents

Residents are usually regarded as the most sensitive of visual receptors. For this scheme the nearest receptors live to the west of the river close to the railway bridge at the north end of the site. The dwellings are a mix of 2,3 and 4 storey buildings consisting of both detached and semi-detached homes and flats. The garden boundaries between the properties and the area on the west bank of the river consist of a mix of fencing, most of which are above head height, and close-boarded.

9.2.7 Visual receptors – recreation and users of the Public Rights of Way (PRoW)

Rhymney River Motorboat, Sail & Angling Club is located on the west bank of the Rhymney River. The club is active and there are numerous boats on the small peninsula formed by the meandering of the river, and within the river channel, and all are within the site extent.

The Wales Coast Path is an 882-mile long footpath that runs from Chepstow, Monmouthshire around the coast of Wales (including Anglesey), finishing at Chester, Cheshire. The Wales Coast Path runs directly through the site, south west along the top of the Lamby Way Landfill and crosses the Rhymney River, where it is now temporarily diverted inland to the west. The PRoW now continues as a footpath, which runs parallel to Rover Way, continuing on along the River Severn estuary foreshore to the south.

9.2.8 Visual receptors – road and rail

The Cardiff to Newport Railway line runs across the northern most extent of the site, over a steel bridge that crosses the Rhymney River. Most of the site is hidden from the railway by vegetation, development and the topography of the land. However, where the railway passes over the Rhymney River, the site is visible for train passengers.

Lamby Way and Rover Way run alongside the Rhymney River but views of the river itself are mostly blocked by vegetation and embankments. Both the A4232 and Lamby Way road cross the Rhymney River towards the north of the site and have unobstructed views of the river on both sides.

9.3 Potential impacts

9.3.1 Construction phase

Impact on landscape features

The construction works are expected to have an adverse impact on the Rhymney River, the foreshore of the Severn Estuary and associated vegetation during and immediately post-construction. There are a few detracting elements, including some areas along the foreshore of the estuary which are currently strewn with litter, waste, and rubble, which is being eroded from the Frag Tip landfill site. These existing detracting elements will, in part, reduce the adverse impacts caused by the construction works.

In addition to vegetation loss, there may also be some minor tree loss to enable access for construction works for the proposed flood defences. The number of trees that would be affected is not currently known, although small numbers of trees may be impacted along Lamby Way and Rover Way. The removal of trees is expected to have an adverse impact. Further assessment of the construction techniques proposed and possible ways to reduce tree loss and damage will be undertaken in consultation with an arboricultural consultant and Cardiff Council as part of the detailed design process.

Impact on landscape character

Landscape effects would arise through the construction operations for the creation of approximately 2km of rock armour along the estuary foreshore, approximately 1.1km of sheet piling along the Rhymney River, raised embankments, loss of trees and vegetation, and changes to the extent of intertidal mudflats.

Construction of the scheme is likely to have temporary adverse impacts on the landscape character of the estuary foreshore and the river corridor throughout the construction phase of the scheme due to the presence of site machinery and plant operations, with associated disruption to the busy road network with temporary site access points.

Works may have temporary adverse effects on the adjacent residential character areas throughout the construction phase of the scheme due to noise and the increase in activity due to site machinery and plant operations.

Impacts on the adjacent industrial character areas would be negligible due to their existing nature.

Impact on visual receptors

Receptors using PRoW and residents are considered to be highly sensitive to changes to the visual environment. The scheme will be visible to some residents in the area to the south of the railway line. Pedestrians and cyclists using parts of the Wales Coast Path and other PRoW that are not closed for construction will also be affected. These receptors are expected to experience adverse effects during the construction phase of the scheme due to access restrictions, plant and machinery operations.

Recreation receptors using areas such as Parc Tredelerch may also experience minor adverse effects during the construction phase of the scheme due to plant and machinery operations, tempered by the distances involved. Those using the Rhymney River Motorboat, Sail & Angling Club and setting out on the river are likely to experience some adverse effects as they will be in close proximity to the proposed works.

Passengers on the railway with views over the river will experience some adverse visual effects, whilst those using the local road network are likely to experience some adverse visual effects, albeit in the context of the busy road network where the focus for drivers will be on the traffic and other road users.

9.3.2 Operational phase

Impact on landscape features

The proposed works along the estuary foreshore may result in the permanent loss of existing scrub vegetation and mudflats in some places.

The sheet pile walls are to be buried and existing embankments altered slightly, and these changes are likely to have a slight change to the existing character once works are complete.

There is likely to be an adverse effect due to the loss of the trees and vegetation along sections of the estuary and river, including along B4239 Lamby Way and adjacent to the Rover Way/Lamby Way/A4232 (Queen's Gate) roundabout.

Impact on landscape character

The proposed flood defence scheme is likely to have some effect on the local landscape character of the area as a whole, particularly in the areas immediately surrounding the estuary foreshore, and where embankments are proposed. The wider influence of the development on the entire study area is likely to be limited.

Impact on visual receptors

It is likely that there will be some noticeable effects for receptors as a result of the proposed scheme. However, for most, these are likely to be quite minor and they may, in places, be beneficial rather than adverse.

For the residents close to the railway bridge it is anticipated that there will be only a small adverse change at worst.

For recreation receptors and users of the PRow along the river corridor, they are most likely to notice a change to the embankment alongside Rover Way. The changes to the foreshore of the estuary may be more visible in some places, but it is likely that these will either be seen from a distance (north of the river mouth), or will be seen as a neutral change, balancing the existing rubble-strewn situation with the proposed solution.

For users of the Rhymney River Motorboat, Sail & Angling Club and the river, the changes may be minor, and some may be beneficial, particularly along the estuary shore next to Lamby Way Landfill. However, these receptors are also those who will be able to see any changes at close quarters, and therefore any change may be significant.

For all other users the effects are likely to be negligible.

9.4 Potential mitigation measures

9.4.1 Construction phase

The mitigation options are likely to be limited during this period and may rely on good construction practices to limit the disturbance to landscape and visual receptors. Advance seeding/planting may be possible in certain areas to help to minimise any adverse visual effects during this phase.

9.4.2 Operational phase

The detailed landscape scheme should include a comprehensive planting/seeding and maintenance programme that will ensure the proposed development is integrated as well as can be achieved within the landscape. These measures should help to reduce any adverse landscape and visual effects, although it is unlikely that all can be eliminated.

9.5 Proposed assessment methodology

9.5.1 Outline of the assessment process

Stages and definitions

The assessment will involve the following key stages:

- Establishing the nature of the existing or 'baseline' landscape character and visual context of the scheme.
- Determination of how the scheme will change the baseline landscape character and visual context, through consideration of specific landscape and visual 'receptors'.
- Assessment and reporting of potential effects, with particular reference to those that are likely to be 'significant'.
- Identification of mitigation to reduce adverse effects.

For the purposes of LVIA, a clear distinction is made between landscape and visual impacts as follows:

- Landscape impacts are those that may arise from the scheme on physical characteristics or components of the landscape which inform its character, such as landform, vegetation, water courses or perceptual influences.
- Visual impacts are those that relate to changes in the view that may arise from the scheme as experienced by specific 'receptors', such as local residents or users of footpaths.

'Residual' effects are those that are likely to remain once any mitigation has been incorporated and has become established (e.g. with new planting).

Effects will be assessed at the following stages:

- Construction: temporary, relatively short-term works.
- Operational effects at Year 1, i.e. when the facility opens and begins to operate, vegetation has yet to establish and assuming a worst-case 'winter' scenario of not being in leaf.
- Residual effects with mitigation at Year 15, during the summer, which represents a 'best case' scenario where vegetation is sufficiently established and in full leaf.

The process will be supported by the use of viewpoints to illustrate and evaluate effects at key locations relevant to the proposal, but the assessment of effects is not confined to these viewpoints.

The LVIA will also include a review of planning and other policy relevant to landscape and visual considerations in the area, which help to inform the scope of the study and the assessments.

Best practice guidance

The assessment of landscape and visual effects will be prepared with reference to the following:

- Guidelines for Landscape and Visual Impact Assessment, 3rd edition (GLVIA3). The Landscape Institute and the Institute of Environmental Management and Assessment, 2013.
- An Approach to Landscape Character Assessment. Christine Tudor, Natural England, October 2014.
- Landscape Institute Technical Guidance Note TGN 06/19 Visual Representation of development proposals, 2019.

Assessment terminology

In order to determine the scale of effects, two key aspects should be established. These are the nature of the landscape or visual receptor likely to be affected, often referred to as its sensitivity, and the nature of the effect likely to occur, which is often referred to as the magnitude of the likely change. These two results are combined to form a judgement of the scale of the effect. Consideration of the scale of the effect then enables a judgement to be made as to whether the effect is significant.

Professional judgement

GLVIA3 recognises that professional judgement is an important concept within LVIA. Whilst there is scope for quantitative measurements of some factors, in many situations the assessment must rely on qualitative judgements that are based on reasoned and informed justifications.

Limitations of the assessment

The assessment and the prediction of effects during the life-span of the proposals are based on the available background information and supplied drawings of the proposal and involve a degree of informed professional judgement.

Assessment of residential receptors

The assessment of visual effects on residential receptors is an outline assessment only, it is not a detailed Residential Amenity Assessment.

Timing of surveys

The effects of screening by vegetation will need to be considered depending on the timing of survey work. Where deemed relevant, consideration of seasonal vegetation will be given within the assessment.

9.5.2 Determining the scope of the study

The scope of the LVIA will be defined by desk-based research and site survey work. Key matters reviewed in determining the scope:

- The extent of the study area.
- Sources of relevant landscape and visual information.
- The nature of the possible landscape and visual effects.
- The main receptors and any specific viewpoints.
- The extent and appropriate level of detail for the baseline studies to be proportionate to the scale and type of development proposed.

Viewpoints

A viewpoint is a location from where a view of the proposal may be gained; a number of viewpoints will be chosen in order to support the assessment of landscape and visual effects and illustrate effects at key locations.

The viewpoints are carefully selected to be either:

- Representative viewpoints: those selected to represent the experience of different types of visual receptors, where a large number of viewpoints cannot all be included individually and where notable effects are unlikely to differ. For example, viewpoints may be chosen to represent views of users of a number of footpaths or bridleways. Viewpoints may also be selected to reflect visual elements that inform the landscape resource.
- Specific viewpoints: important key viewpoints within the landscape. Examples of these may include local visitor attractions, settlements, routes valued for their scenic amenity, or places with cultural landscape associations.

- Illustrative viewpoints: those chosen specifically to demonstrate a particular effect or specific issues, e.g. restricted visibility at certain locations.

Viewpoints are initially selected as those places from where a proposed development is likely to be visible and would result in notable effects on the view and the receptors. This is informed by maps, fieldwork observations and information on other relevant issues such as access, landscape character and popular vantage points.

A range of views and viewers are represented through the choice of viewpoints. Factors which will be considered in selecting the final viewpoints to be used for the assessment include:

- Landscape character type (separate and combinations of type).
- The presence of nationally designated landscapes and/or Areas of High Landscape Value within local planning policy, recreational routes, local amenity spaces.
- Visual composition, for example focused or panoramic views, simple or complex landscape pattern, vistas or glimpses.
- Distance from the proposed development (short, medium and long range views).
- Aspect and elevation.
- Viewer type.
- Activities of the receptors, for example those at home, work, travelling in various modes or carrying out recreation.
- Modes of movement, for example those moving through the landscape or stationary.

For all viewpoints, photographs will be taken with a full-frame sensor digital SLR camera with a 50mm fixed lens. The camera will be tripod mounted in a portrait orientation to minimise distortion and enable an accurate location to be determined. A series of images suitable to stitch together to form a panoramic image was taken in accordance with the SNH guidance and the following information will be recorded:

- Precise location 12 figure OS grid reference.
- Viewpoint altitude in metres Above Ordnance Datum (m AOD) interpolated from DTM/OS mapping.
- Viewing height in metres.
- Horizontal field of view (in degrees).
- Distance to development.
- Date of assessment.
- Weather conditions and visual range.

The following information will be described in the assessment:

- Description of location (receptor).
- Description of nature of existing view and likely change during development life-span.
- Description of magnitude of impact and sensitivity of visual receptors.
- Summary of the significance of the potential impact.

9.5.3 Baseline studies: landscape

For the purposes of LVIA, the landscape is considered to be a resource in its own right. The European Landscape Convention (2000)—which is noted in GLVIA3—provides the following definition of landscape:

'Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.'

The assessment of landscape effects considers the effects the proposed development or change will have on this landscape resource.

Landscape effects that may arise include a change, loss or addition of elements; features, aesthetic or perceptual aspects that contribute to the distinctiveness or character of the landscape.

Establishing the landscape baseline

To enable the assessment of the effects of a proposed development or change, the landscape baseline must be established. This enables the identification of landscape receptors and the effects of the proposed changes on these landscape receptors can then be considered. The landscape baseline studies consider the following:

- Landscape fabric – physical landscape elements present within the landscape such as landform, land cover, boundary features and trees and woodland. Physical elements that make up the landscape we see, and that may be affected during the construction, operation and decommissioning of the proposed development.
- Landscape character – the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement but also encompasses its perceptual and aesthetic qualities. It creates the particular sense of place of different areas of the landscape. Assessment of the effect of the development on landscape character is a crucial element of the landscape assessment.
- Landscape designations – sites with landscape designations are considered in addition to the overall landscape character areas, to enable site specific judgements of effects on particularly valued sites.

These studies enable a list of potential landscape receptors to be compiled.

Determining landscape sensitivity

The next stage is to determine the sensitivity of the landscape receptors to the type and scale of development proposed. In order to do this, the susceptibility and value of the receptor are considered, although within the assessment these may not always be explicitly noted. In many cases, it is considered sufficient to describe only the sensitivity, which is informed by an overall professional judgement.

Susceptibility is the *"ability of the landscape receptor (whether it be the overall character of quality/condition of a particular landscape or area, or an individual element and/or feature or a particular aesthetic or perceptual aspect) to accommodate the proposed development without undue consequences for the maintenance of the baseline and/or the achievement of planning policies and strategies."* (GLVIA3).

Where noted, susceptibility is described as follows:

- High – where undue negative consequences are expected to arise from the proposal.
- Medium – where undue negative consequences may arise from the proposal.
- Low – where undue negative consequences are unlikely to arise from the proposal.

Susceptibility may be informed by existing Landscape Character Assessments, which often note sensitivity. However, this is frequently 'intrinsic' or 'inherent' sensitivity, which may not directly relate to the type of development proposed. In such cases, a judgement must be made as to how this sensitivity might relate to the development in question.

The value of a landscape receptor is informed by designations, planning policy and documents, the contribution of special (cultural, historic or conservation) contributors or associations, scenic quality, rarity, recreational value and aesthetic, perceptual and experiential qualities. These are again reinforced by judgements, particularly where no designations are established. Conversely, care should be taken not to rely on designations as the sole indicator of value; this should be reinforced by rationale where necessary. Where noted, value is described as follows:

- High – landscapes with national or international designations on account of landscape value, such as National Parks, Areas of Outstanding Natural Beauty, Heritage Coasts or World Heritage Sites; landscapes informed by presence of significant heritage designations.
- Medium – landscapes of local value, subject to local Planning policy protection (such as Areas of High Landscape Value), or undesignated areas where it is considered that particular features are more valued and/or appreciation of the landscape is greater than other nearby areas.
- Low – landscapes that are not subject to designation and may be valued only at a community or local level.

It should be noted that 'undesignated' landscapes and the value which should be attributed to them is a complex area, potentially subject to a number of contributory factors. Landscapes that are not valued but offer visual and amenity value to local communities may not necessarily be of low sensitivity.

Landscape sensitivity combines the judgements made for susceptibility and value, as described above. Three levels of sensitivity are recorded:

- High sensitivity – a landscape of high value and a particularly distinctive character that is susceptible to relatively small changes of the type proposed;
- Medium sensitivity – a landscape of valued characteristics reasonably tolerant of change of the type proposed; and
- Low sensitivity – a landscape of relatively low value or importance which is potentially tolerant of substantial change of the type proposed.

Other landscape considerations

The considerations noted above are further informed by general observations regarding the condition and quality of the landscape. These support the overall narrative and judgement of sensitivity. Landscape quality or condition may relate to the level of management, distinctiveness, number of detracting features, pattern, unity, structure, sense of place, function, definition and aesthetic value.

Areas of landscape quality may not necessarily correlate directly with landscape character areas or designated sites as defined by statutory agencies or local planning authorities. Where it is considered that this is the case, mention is made within the description and sensitivity evaluation.

Magnitude of landscape change

Effects on landscape receptors are assessed in terms of their magnitude of change. This is a combination of the size or scale, geographic extent of the area influenced and the duration and reversibility of the impact. Within the assessment, size and scale or extent may not always be noted. In many cases, it is considered sufficient to describe only the magnitude of change, which is informed by an overall professional judgement.

Size and scale concerns the amount of existing landscape elements that will be lost, and the extent to which these represent or contribute to the character of the landscape. It also relates to the degree to which aesthetic or perceptual aspects of the landscape are altered through removal or addition of new features, such as hedge loss or introduction of tall features on skylines.

Size and scale, where noted, may be rated as follows:

- Large – major change to the existing landscape including key elements, characteristics and qualities.
- Medium – partial or noticeable change to key elements, characteristics and qualities.
- Small – some discernible but largely minor change to key elements, characteristics and qualities.

- Negligible – very minor or virtually imperceptible change to key elements, characteristics and qualities.

The geographical extent over which landscape effects are felt is distinct from the size or scale, for example, large scale effects may be limited to the immediate site area. Again, extent is subject to a degree of professional judgement, but where noted these may be rated as follows:

- Wide – influencing several landscape types or areas, beyond around 5km.
- Medium – generally within the local character area or up between 1 and 5km.
- Local – the site and immediate surrounds, up to around 0.75 to 1km.
- Site – within around 0.75km of the site.

The duration of the effect relates to the time period during which the changes to the landscape will occur. This may be rated as follows:

- Long-term – beyond 10 years.
- Medium-term – 2 to 10 years.
- Short-term – up to 2 years.

Consideration should also be given as to whether the change is temporary or permanent.

The magnitude of change is a product of the size/scale, extent and duration of the impacts. This is judged as a four-point scale:

- High – notable and long-term change in landscape characteristics over an extensive ranging to a very intensive, long term change over a more limited area.
- Medium – moderate, short term change over a large area or moderate long-term change in localised area.
- Low – slight long term or moderate short-term change in landscape components.
- No change/negligible – no discernible/virtually imperceptible change to the landscape's resources.

Within the assessment, size and scale or extent may not always be noted. In many cases, it is considered sufficient to describe only the magnitude of change, which is informed by an overall professional judgement.

9.5.4 Baseline studies: visual

Visual effects relate to how the development may affect the views available to people and their visual amenity. Visual amenity is the visual quality of a site or area as experienced by residents, workers or visitors. Visual receptors are people that experience the view. Development can change people's direct experience and perception of the view depending on existing context, the scale, form, colour and texture of the proposals, the nature of the activity associated with the development, and the distance and angle of view. Visual effects can be experienced through development intruding into existing views experienced by residents and day to day users of the area, and the views of tourists and visitors passing through or visiting the area.

Establishing the visual baseline

Identification of potential visual receptors is informed by desk and field studies in conjunction with consideration of the ZTVs for the proposed development (where applicable), to identify places where people might be expected to receive a view of the proposed development. Once receptors have been identified, it is necessary to document the following information, though the degree of detail required will vary depending on the nature of the receptor and the view experienced:

- Type, relative numbers, and activities of potential receptors.

- The nature, composition, and characteristics of the existing views, for example, the nature and extent of the skyline, aspects of vertical scale and proportion, key foci, and elements which interrupt, filter or otherwise influence the view.

Determining visual receptor sensitivity

In order to determine the scale of visual effects, it is necessary, as with the assessment of landscape effects, to determine the sensitivity of the receptor. This is achieved through the consideration of the susceptibility of the receptor and the value of the view. Within the assessment, susceptibility and value may not always be noted. In many cases, it is considered sufficient to describe only the sensitivity, which is informed by an overall professional judgement.

Visual receptor susceptibility is a function of receptor type, location and activity. In assessing visual receptor susceptibility, factors such as the following have been accounted for with a degree of professional judgement:

- Receptor activities – for example, those at home, undertaking leisure, recreational and sporting activities, or those at work.
- Movement/duration – whether receptors are likely to be stationary or moving, which influences how long they will be exposed to the change.
- Orientation – of receptors in relation to the development.
- Purpose/expectation – of receptors at that location.
- Context – the quality of the landscape.
- Importance of the view/location – popularity of location as indicated by existence of designations or local value.

The value of the view that is experienced may relate to associated landscape or planning designations, cultural references or the presence of facilities (car parking, interpretation boards, signage) that may emphasise importance.

Sensitivity is then judged as a combination of susceptibility and value and is ranked as follows:

- High – visitors to promoted or valued viewpoints especially those with panoramic views; visitors to heritage or tourism sites where views are important; viewpoints noted within planning guidance or policy; receptors to public rights of way particularly those receiving high numbers of visitors or signposted trails; receptors in residential properties.
- Medium – receptors travelling along cycle routes or local roads particularly those in rural areas where speeds are slower.
- Low – receptors that are fast-moving (due to speed on roads and motorways) or because they are engaged in an activity not concerned with the landscape or view (such as work or sport).

As with all aspects of the methodology, these definitions are not rigid; where professional judgement has been applied, this would be noted in the narrative.

Visual receptor magnitude of change

The assessment of the magnitude of change on visual receptors follows similar principles to landscape assessment in terms of size or scale, the geographic extent of the area influenced and its duration and reversibility. Within the assessment, size and scale or extent may not always be noted. In many cases, it is considered sufficient to describe only the magnitude of change, which is informed by an overall professional judgement.

Size and scale concerns the relative change in the elements, features, qualities and characteristics that make up the view.

Size and scale, where noted, these would be rated as follows:

- Large – major change to the existing view including key elements, characteristics and qualities.
- Medium – partial or noticeable change to elements, characteristics and qualities within the view.
- Small – some discernible but largely minor change to key elements, characteristics and qualities within the view.
- Negligible – very minor or virtually imperceptible change to key elements, characteristics and qualities such that the view essentially remains unchanged.

Where specifically noted, the geographical extent over which visual effects would be described as follows:

- Wide – influencing most of a view or receptor (over half).
- Medium – generally between one quarter or one half of a view or receptor.
- Small – generally less than one quarter of a view or receptor.
- Limited – generally affecting only a small part of the receptor.

The duration of the effect relates to the time period during which the changes to the landscape will occur. This would be rated as follows:

- Long-term – beyond 10 years.
- Medium-term – 2 to 10 years.
- Short-term – up to 2 years.

The magnitude of change is a product of the size/scale, extent and duration of the impacts. These would be judged as a four-point scale:

- High – where the development causes a very significant change in the existing view for a sensitive receptor.
- Medium – where the development would cause a very noticeable change in the existing view.
- Low – where the development would cause a noticeable change in the existing view.
- Negligible/no change – where the development would cause a barely perceptible change in the existing view.

9.5.5 Assessment of effects

Scale of effects

The next step is to determine the scale of effects (see Table XX). This is evaluated by combining the sensitivity (or nature) of the landscape or visual receptor and the magnitude (or nature) of change. The following matrix provides an objective rationale for determining the scale of effects, in order to provide consistency and transparency to the process; however, a degree of professional judgement is a key element of the evaluation.

The scale is usually rated as follows:

- Substantial indicates an effect that is very important in the planning decision making process.
- Moderate-substantial indicates an effect that is material in the planning decision making process.
- Moderate indicates a noticeable effect that is not, in isolation, material in the planning decision making process.
- Slight indicates an effect that is not material in the planning decision making process.
- Negligible/No Change indicates an effect that is akin to no change and is thus not relevant to the planning decision making process.

Table 9-1: The scale of effects matrix

Magnitude of change resulting from impacts identified	Sensitivity to change (nature of receptors)			
		Low	Medium	High
	No Change/ Negligible	Negligible	Negligible	Negligible
	Low	Slight	Slight/Moderate	Moderate
	Medium	Slight/Moderate	Moderate	Moderate - Substantial
	High	Moderate	Moderate/ Substantial	Substantial

The scale of effects detailed above can be classed as Beneficial, Neutral or Adverse.

Classification of landscape effects

Adverse landscape effects occur when features or key landscape characteristics such as established planting, old buildings or structures which—when considered singularly or collectively—help to define the character of an area are lost, or where new structures out of scale or character with the surroundings are introduced. The different levels of effect are described as follows:

- Substantial adverse landscape effects occur where the proposals are at considerable variance with the landform, scale and pattern of the landscape and would be a dominant feature, resulting in considerable reduction in scenic quality and large-scale change to the intrinsic landscape character of the area.
- Moderate adverse landscape effects occur where proposals are out of scale with the landscape, or inconsistent with the local pattern and landform and may be locally dominant and/or result in a noticeable reduction in scenic quality and a degree of change to the intrinsic landscape character of the area.
- Slight adverse landscape effects occur where the proposals do not quite fit with the scale, landform or local pattern of the landscape and may be locally intrusive but would result in a minor reduction in scenic quality or change to the intrinsic landscape character of the area.
- Neutral landscape effects arise when the change proposed results in no discernible improvement or deterioration to the landscape resource. The proposals sit well within the scale, landform and pattern of the landscape and / or would not result in any discernible reduction in scenic quality or change to the intrinsic landscape character of the area.

Beneficial landscape effects occur where derelict buildings, land or poorly maintained landscape features are repaired, replaced and maintained or where new features are introduced such as new tree planting which helps to define landscape structure where none currently exists. Beneficial landscape effects can be slight, moderate or substantial.

Classification of visual effects

Adverse Visual Effects occur when the proposed development will introduce new, non-characteristic, discordant or intrusive element/s into views. The different levels of effect are described as follows:

- Substantial adverse visual effects occur where the proposed development would cause a considerable deterioration in the existing view or visual amenity.
- Moderate adverse visual effects occur where the proposed development would cause a noticeable deterioration in the existing view or visual amenity.

- Slight adverse visual effects occur where the proposed development would cause a barely perceptible deterioration in the existing view or visual amenity.
- Neutral visual effects occur where the change proposed results in no discernible improvement or deterioration to views or visual amenity.

Beneficial visual effects occur when the proposed development would enhance the quality of the receptor's view e.g. by creating a new focal point in a degraded landscape that includes a range of existing detractors. Beneficial visual effects can be slight, moderate or substantial.

9.6 Proposed scope

Following on from the earlier section that dealt with potential impacts, it is proposed that the following aspects, where there may be significant effects as a result of the proposed development, will form the scope for the assessment. Other aspects where it is judged that there will be no significant effects have been listed, with justifications provided as to why they will not be assessed.

9.6.1 Construction phase

Aspects that will be assessed

It is recognised that the construction phase is temporary and any disruption will have a limited timescale. On this basis, it is concluded that the following may be significantly affected during construction:

- Landscape features: The Rhymney River banks, the foreshore of the estuary, associated vegetation immediately adjacent to the works, and existing trees.
- Landscape character: any of the landscape character areas within the study area which contain the river corridor, the estuary foreshore, and the residential areas.
- Visual receptors: Residents, pedestrians and cyclists on the Wales Coast Path and PRowers, those using Rhymney River Motorboat Sail & Angling Club and the river, and travellers on the railway.

Aspects that will not be assessed

- Landscape features: those not directly affected by the proposed works, or immediately adjacent to the proposed works.
- Landscape character: areas which include the existing industrial premises and associated surrounding works and access. The character of these areas are likely to be unaffected by the works due to their existing nature.
- Visual receptors: receptors using Parc Tredelerch for recreation, as they will be too distant from the proposed works to be affected; receptors using the road network as their main focus will be on the busy road and on other road users.

9.6.2 Operation phase

Aspects that will be assessed

It is concluded that the following may be significantly affected during the operation of the proposed works:

- Landscape features: vegetation along the line of the works and immediately adjacent.
- Landscape character: any of the landscape character areas within the study area which contain the river corridor, and the estuary foreshore.
- Visual receptors: those using Rhymney River Motorboat Sail & Angling Club and the river, as their proximity to the changes will mean any adverse effects may be significant.

Aspects that will not be assessed

- Landscape features: existing self-seeded trees, as those removed are likely to be replaced with a comprehensive matrix of newly planted trees within the detailed landscape scheme; those landscape features not directly affected by the proposed works, or immediately adjacent to the proposed works.
- Landscape character: areas which include the existing industrial premises and associated surrounding works and access. These are likely to be unaffected by the works due to their existing nature.
- Visual receptors: residents in the dwellings close to the railway bridge, as the effect of the proposed works is likely to be unseen or neutral; all other visual receptors apart from those using Rhymney River Motorboat Sail & Angling Club and the river, as the effects are likely to be slight adverse at worst, with some changes being beneficial where the existing situation is unsightly, especially along the estuary shoreline.

10 Historic environment

10.1 Baseline conditions

In 2017, the Projects Department of GGAT (GGAT Projects), was commissioned to carry out an archaeological desk-based assessment to inform the OBC stage of the proposed development. Since this assessment was undertaken, the development area has been revised and reduced in scope. To reflect the revised scheme boundary, a rapid reappraisal of the data has been undertaken in 2020 by JBA Consulting, to review and, where required, update the baseline conditions. These assessments considered both the direct effects of the proposed development on cultural heritage assets within the proposed site extent, and the indirect effects on assets located outside of the site boundaries.

The baseline conditions were determined by means of a desk-based study, together with a field survey, undertaken in 2017 and reappraisal of this data in 2020. The desk-based study collected information from the Regional HER, the National Monuments Record (NMR), Scheduled Ancient Monument and Listed Building information. Aerial Photographs, Cartographic and documentary sources were also reviewed. The 2020 reappraisal was undertaken using online sources including Archwilio⁵⁵ and Cof Cymru⁵⁶, which identified that the content of the 2017 study for the new study area was still relevant and valid.

This section presents a summary of the historical background for the area, based on the results from the desk-based studies. The assessments conformed to the *Chartered Institute for Archaeologists' Standard and guidance for historic desk-based assessments* (2014, updated in 2017 and 2020).

Assets recorded in the original HER are referred to by their Primary Record Number (PRN), while those recorded in the NMR are referred to by their National Primary Record Number (NPRN).

10.1.1 Listed buildings

Listed buildings are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990, as amended by the Historic Environment (Wales) Act 2016. All listed buildings are nationally important but are graded in order of significance as Grade I, II* or II. Grade I buildings are considered to be of equal status to Scheduled Ancient Monuments. Local planning authorities must have special regard to the desirability of preserving the setting of a listed building regardless of its grade, and it also requires planning proposals to meet the test of determining the extent to which a development affects views to and from a listed building. Planning Policy Wales (10th edition, 2018) requires a '*general presumption in favour of the preservation of a listed building and its setting, which might extend beyond its curtilage*' (6.1.10).

The closest listed building to the site is the 'Rumney Pottery' building, a house and pottery building located approximately 580m north-west of the site.

10.1.2 Conservation areas

These are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990. This Act requires local planning authorities to have special regard to the desirability of preserving the setting of a Conservation Area, and it also requires planning proposals to meet the test of determining the extent to which a development affects views to and from such an area. Planning Policy Wales (10th edition, 2018) states that there '*will be a strong presumption against the granting of planning permission for developments which damage the character or appearance of a conservation area or its setting to an unacceptable level*'

⁵⁵ <https://archwilio.org.uk/arch/>

⁵⁶ <https://cadw.gov.wales/advice-support/cof-cymru>

(6.1.15). Four Conservation Areas – Roath Mill Gardens, Roath Park, Oakfield Street and Wordsworth Avenue – are located between 1.1km and 1.9km to the west/south-west of the site. All of the Conservation Areas contain Listed Buildings. Within the extent of the Roath Mill Gardens Conservation Area is the Grade II Waterloo Gardens and Roath Mill Gardens Registered Park and Garden.

10.1.3 Scheduled Monuments

Scheduled Monuments are of national importance, and the value of a Scheduled Monument will depend upon its condition. The protection of Scheduled Ancient Monuments is governed by the Ancient Monuments and Archaeological Areas Act 1979, as amended and updated by the Historic Environment (Wales) Act 2016. The Relict Seawall on Rhymney Great Wharf is located approximately 675m to the east of the site extent and is a Scheduled Monument. The seawall is 500m in length, standing between 1m to 2m high. Documentary evidence shows the sea defence was in place as early as 1591, and much of the surviving clay bank is thought to be original. Pen y Lan Roman site, is a settlement site dated to AD74-410 and survives as earthworks, located 1.6km to the north-west of the site.

10.1.4 Historic Parks and Gardens and Historic Landscapes

Historic Parks and Gardens and their settings are protected through the planning system by the maintenance of a register of these assets and the use of the register as part of a material consideration in determining planning applications (Planning Policy Wales 10th edition, 2018, 6.1.19). Two Registered Park and Gardens (Waterloo Garden and Roath Mill Gardens and Roath Park) are located approximately 1.5km to the west of the site.

Historic Landscapes are protected by a similar non-statutory register, with the information included taken into account when determining planning applications where the development requires an EIA, or if the development is of a sufficient scale to have more than a local impact to the historic landscape (Planning Policy Wales 10th edition, 2018, 6.1.21). The western boundary of the Wentlooge Levels, one of the Gwent Levels Registered Historic Landscape (HLW (Gt) 2), is located within the very eastern of the development site.

10.1.5 Archaeological interests

GGAT's desk-based assessment identified a total of 22 sites of archaeological interest; however, since this assessment was undertaken, the scope/area of the scheme has been reduced and revised. The reappraisal of the data against the revised site boundary has identified eighteen sites of archaeological interest within 100m of the site (see Table 10-1 and Figure 10-1). This includes five records of archaeological work which has taken place within the vicinity rather than specific sites (Events). A further four events have taken place within the vicinity of the site (E003705-Desk-based Assessment, E001381-Field Visit, E005343-Watching Brief and E003226-Desk-based Assessment). Three new sites (01453s, 02882s and 06434s) were identified from the search of Archwilio. In addition, the peat deposits identified as an event (E002381) in the GGAT desk-based assessment have been included in the list of sites of interest. The sites have been identified from regional HER and NMR searches and a site walkover undertaken in 2017, with additional appraisal in 2020.

Table 10-1: Features of archaeological interest identified within the study area

ID	Site Name	NGR	Type
01453s	Sites of sea wall	ST2217477804	Sea Defences
02882s	Spearhead	ST2277	Findspot
02324s	Drainage Ditch	ST225777	Drainage Ditch
02788s	Medieval Mill	ST2280077700	Mill
02812.0s	Sea Defences, Splott Moors	ST218773	Sea Defences
03271s/E000988	Borehole BH 21	ST2281077760	Borehole Event

ID	Site Name	NGR	Type
03272s/E000989	Borehole BH22	ST2284077760	Borehole Event
03273s/E000990	Borehole BH23	ST2281077700	Borehole Event
03274s/E000991	Borehole BH24	ST2286077710	Borehole Event
03990s	Slipway	ST2166077502	Slipway
06434s	Small Arms Range	ST21447754	Modern firing range
05866s/RE002	Earthworks, Lamby Fach	ST2167377668	Earthwork
05867s/RE003	Stone	ST2160077515	Stone
05865s/RE001	Pil Melyn Gout Sluice	ST2277077670	Sluice
RE006	Allotment Gardens	ST2146377957	Allotments
05870s/RE007	Anti-invasion Defences/Decoy site	ST2200077600	Anti-invasion or Decoy
RE008	Structure	ST21997718	Airfield Structure?
E002381	Peat Deposits	ST22007700	Peat and estuarine deposits observed in boreholes

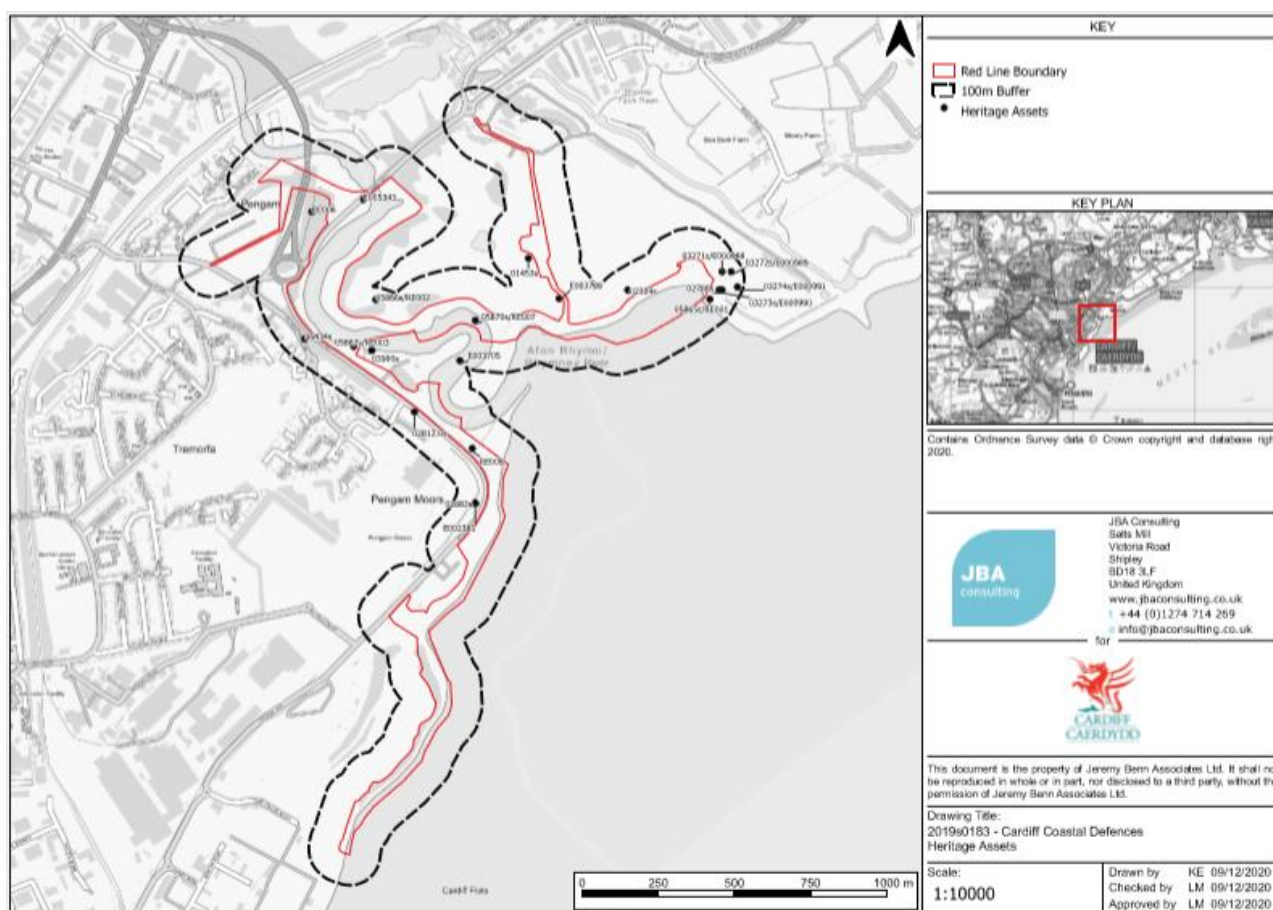


Figure 10-1: Heritage assets within 100m of the proposed development

10.2 Potential impacts and likely significant effects

10.2.1 Direct effects

The Heritage Desk-Based Assessments have determined that the works would have a direct effect on four heritage assets through works associated with the installation of the defences; however, this assessment is based on preliminary designs and is subject to change (see Table 10-2). The effect on sites that extend beyond the study area is considered to be neutral. A

slight adverse effect has been assessed for two sites (0234s and 05870s) with slight/moderate adverse effect on a further two sites – RE008 and Peat/estuarine deposits (E002381). Direct effects on features of archaeological interest are **scoped in** for further detailed assessment.

10.2.2 Indirect effects

Indirect effects on sites of National and Regional importance including Conservation Areas, Listed Buildings, Scheduled Monuments and Registered Historic Landscapes, are also considered as part of the assessment. Indirect effects are largely concerned with the setting of the site.

The Rumney Great Wharf Relict Seawall Scheduled Monument is located within 675m of the site. Works have already taken place to the more recent sea wall situated directly in front of the old wall. Large rocks have been placed beyond the wall and large amounts of spoil have been dumped behind. The setting of the monument has already been largely altered, and further work is unlikely to negatively impact the site further and so it is **scoped out** of further detailed assessment.

The Roman site at Pen y Ian is a Scheduled Monument located approximately 1.6km to the north west of the site and survives as earthworks, with an occupation layer visible on edge of disused quarry, with indications of walls beneath the surface. Roman pottery has been recovered from the site, which is located in an area of waste ground and is recorded as overgrown. There are no direct views from this site and given its distance from the scheme it has been **scoped out** of further detailed assessment.

The Rumney Pottery building is located 580m to the north west of the site. It is considered that the works will have no impact upon the setting of this building, as there are no direct views from the site to the proposed developed area. Similarly, the conservation areas and listed buildings to the west of the site are not considered to be impacted by the works. There are no direct views of the proposed development from the conservation areas, and due to the distant noise during construction is unlikely to impact upon their setting. Indirect impacts on Listed Buildings and Conservation Areas are therefore **scoped out** of further detailed assessment.

To the east of the site is the Wentlooge Levels, one of the Gwent Levels Registered Historic Landscape (HLW (Gt2)). Given that a small extent of the eastern site boundary is within this Historic Landscape, it will be necessary to consider indirect or visual impacts on this landscape. The assessment of the significance of the impact of the development on the Landscape of Historic Interest will be undertaken using guidance outlined in the 2007 '*Guide to Good Practice on Using the Register of Landscapes of Historic Interest in the Planning and Development Process*'. This aspect is **scoped in** to further detailed assessment.

Table 10-2: Initial assessment of impacts on archaeological interest features

ID	Site	Period	Condition	Inter-related value	Asset value	Proposed works	Impact	Effect	Proposed mitigation
01453s	Sites of Sea Walls	Post-medieval	Not known	The asset has the capacity to provide evidential value of how the area was utilised in the Medieval period/defended from flood.	Low	None-within buffer of pre-existing access road	None	None	None
02882s	Bronze- Age Spearhead findspot	Bronze Age	Not known	The asset has the capacity to provide evidential value/physical evidence of prehistoric occupation.	Low	Section1: Rock Armour Defences	Negligible Findspot outside proposed work area and only four figure grid reference provided.	Neutral	None
02324s	Drainage Ditch of unknown date	Unknown	Not known	The asset has the capacity to provide evidential value of how the area was utilised in the past.	Low (GGAT Category C)	Section1: Rock Armour Defences	Moderate Adverse (depends on location) Potential to damage archaeological remains through plant movement/ construction.	Slight adverse	Fence off heritage asset to avoid damage. If construction works to impact site to be recorded prior to works/watching brief maintained.
02788s	Medieval Mill	Medieval	Not known	The asset has the capacity to provide evidential value of how the area was utilised in the Medieval period.	Low (GGAT Category C)	None-within buffer	No change anticipated	Neutral	Fence off heritage asset to avoid damage from construction traffic if operating in this area. .
02812.0s	Post-medieval sea defences, Splott Moors	Post-medieval	Not know	The asset has the capacity to provide evidential value of how the area was defended from flood risk in the past.	Low (GGAT Category C)	Section 2: Raising of Earth Embankment. Requires removal of topsoil/reprofiling existing embankment	No change anticipated Location of sea defences visited as part of a DBA which states that it is improbable that any traces of the old sea bank survive.	Neutral	Watching brief during groundworks as below-ground evidence may survive.
03271s	Borehole-BH21	N/A	N/A	N/A	Negligible (GGAT Category D)	None-within buffer	No change anticipated	Neutral	None

ID	Site	Period	Condition	Inter-related value	Asset value	Proposed works	Impact	Effect	Proposed mitigation
03272s	Borehole-BH22	N/A	N/A	N/A	Negligible (GGAT Category D)	None-within buffer	No change anticipated	Neutral	None
03273s	Borehole-BH23	N/A	N/A	N/A	Negligible (GGAT Category D)	None-within buffer	No change anticipated	Neutral	None
03274s	Borehole-BH24	N/A	N/A	N/A	Negligible (GGAT Category D)	None-within buffer	No change anticipated	Neutral	None
03990s	Modern slipway	Modern	Damaged	The asset has the capacity to provide historic value of the past maritime use of the area.	Negligible (GGAT Category D)	Section 2: Raising of Earth Embankment Site is located away from main proposed works. No impacted anticipated.	No change	Neutral	None.
05865s/R E001	Pil Melyn Gout Sluice	Post-medieval	Not known	The asset has the capacity to provide evidential value of how the area was utilised in the past, as part of a drainage/sea defence network.	Low (GGAT Category C)	None-within buffer	No change anticipated	Neutral	None
05866s/R E002	Earthworks, Lamby Fach of unknown date	Unknown	Not known	The asset has the capacity to provide evidential value of how the area was utilised in the past, possibly as part of a drainage/sea defence network.	Low (GGAT Category C)	Section 3: Piles, timber stakes and brushwood scour protection. Proposed works outside area of earthworks. Earthworks also recorded as buried as part of the extension of Lamby Tip.	No change	Neutral	None
05367s/R E003	Stone of unknown date	Unknown	Not known	The asset has the capacity to provide historical value of the past use of the area.	Low (GGAT Category C)	Section 2: Raising of Earth Embankment	No change as recorded on HER as no longer extant.	Neutral	None
06434s	Modern small arms range	Modern	Recorded as destroyed	The asset has the capacity to provide historic value of the past military defence of the area.	Negligible (GGAT Category D)	Section 2: Raising of Earth Embankment Site is recorded as removed by the Pillbox study group.	No change	Neutral	None

ID	Site	Period	Condition	Inter-related value	Asset value	Proposed works	Impact	Effect	Proposed mitigation
05870s/R E007	Modern anti-invasion defence/decoy site	Modern	Recorded as no longer extant	The asset has the capacity to provide evidential and historic value of the past military defence of the area.	Low (GGAT Category C)	Section 3: Piles, rock-based scour protection and timber stakes brushwood	Moderate Adverse (depends on location) There is potential for buried remains to be impacted through construction works.	Slight adverse	Fence off heritage asset to avoid damage. If construction works to impact site to be recorded prior to works/watching brief maintained.
RE006	Allotment gardens of modern date	Modern	Partially destroyed.	The asset has the capacity to provide historic and communal value of the past military defence of the area.	Negligible (GGAT Category D)	None-proposed works outside area of allotments.	No change anticipated	Neutral	None
RE008	Modern airfield structure?	Modern	Near Destroyed	The asset has the capacity to provide evidential and historic value of the past military defence of the area.	Low	Section 2: Raising of Earth Embankment	Moderate/Major Adverse (depends on location)	Slight/Moderate Adverse	Fence off heritage asset to avoid damage. If construction works to impact site to be recorded prior to works/watching brief maintained.
E002381	Peat Deposits and estuarine deposits observed in boreholes of unknown date	Unknown	Unknown	The asset has the capacity to provide evidential value of the past environmental of the area.	Low	Section 1: Rock armour revetment	Moderate Adverse (depends on location) Peat and estuarine deposits may continue and may be exposed in articular to the south-east of this site where excavation is proposed for new rock armour embankment.	Slight/Moderate Adverse	Examination of GI/borehole records. Watching brief/mitigation may be required in areas of proposed excavation along the beach/foreshore.

10.2.3 Recommended mitigation

Direct impacts to the archaeological resource can be reduced through mitigation. The impact assessment is dependent on the final design and mitigation will be designed once this is known but could include:

- Monitoring of additional GI/borehole surveys through a watching brief and assessment of data to determine the potential for paleoenvironmental/geoarchaeological deposits within the scheme area;
- Archaeological recording and/or investigation of sites which have been identified to be damaged/destroyed in advance of construction works;
- Watching briefs on intrusive groundworks, unless GI/borehole indicate only made ground will be impacted, given the potential for paleoenvironmental deposits/features, prehistoric and Roman activity in the vicinity of the development area; and
- Fencing extant archaeological features which are outside to prevent any accidental damage during construction.

10.3 Proposed assessment methodology

The criteria for assessing the significance of heritage values is established through CADW's Conservation Principles for the sustainable management of the historic environment in Wales (2011) which are based on principles developed by Historic England (2008). Principal 2 outlines four competent values which need to be considered to enable the assessment of a historic asset. These include evidential, historical, aesthetic and communal value. Table 10-2 outlines the values, which has been compiled from 'Understanding heritage values and assessing significance' outlined in Principal 6 of the Conservation Principles (CADW 2011, 16) and Heritage Impact Assessments in Wales (CADW 2017, 7).

Table 10-3: Inter-related heritage values

Value	Description
Evidential value	The extent to which the physical fabric tells how and when the historic asset was made, how it was used and how it has changed over time. There may be buried or obscured elements associated with the historic asset which may also be an important potential source of evidence (CADW 2017,7). <i>'This derives from those elements of an historic asset that can provide evidence about past human activity, including its physical remains or historic fabric. These may be visible and relatively easy to assess, or they may be buried below ground, under water or be hidden by later fabric. These remains provide the primary evidence for when and how an historic asset was made or built, what it was used for and how it has changed over time. The unrecorded loss of historic fabric represents the destruction of the primary evidence. Additional evidential values can be gained from documentary sources, pictorial records and archaeological archives or museum collections. To assess the significance of this aspect of an asset, all this evidence needs to be gathered in a systematic way and any gaps in the evidence identified'</i> (CADW 2011, 16).
Historic value	The potential capacity of an asset to your historic asset may illustrate a particular past way of life or be associated with a specific person or event; there may be physical evidence for these connections which it could be important to retain (CADW 2017,7). <i>'An historic asset might illustrate a particular aspect of past life or it might be associated with a notable family, person, event or movement. These illustrative or associative values of an historic asset may be less tangible than its evidential value but will often connect past people, events and aspects of life with the present. Of course the functions of an historic asset are likely to change over time and so the full range of changing historical values might not become clear until all the evidential values have been gathered together. Historical values are not so easily diminished by change as evidential values and are harmed only to the extent that</i>

Value	Description
	<i>adaptation has obliterated them or concealed them'</i> (CADW 2011 16-17).
Aesthetic value	The design, construction and craftsmanship of a historic asset. This can also include setting and views to and from the historic asset, which may have changed through time (CADW 2017,7). <i>'This derives from the way in which people draw sensory and intellectual stimulation from an historic asset. This might include the form of an historic asset, its external appearance and how it lies within its setting. It can be the result of conscious design or it might be a seemingly fortuitous outcome of the way in which an historic asset has evolved and been used over time, or it may be a combination of both. The form of an asset normally changes over time. Sometimes earlier pictorial records and written descriptions will be more powerful in many people's minds than what survives today. Some important viewpoints may be lost or screened, or access to them may be temporarily denied. To assess this aspect of an asset, again the evidence of the present and past form must be gathered systematically. This needs to be complemented by a thorough appreciation on site of the external appearance of an asset in its setting. Inevitably understanding the aesthetic value of an historic asset will be more subjective than the study of its evidential and historical values. Much of it will involve trying to express the aesthetic qualities or the relative value of different parts of its form or design. It is important to seek the views of others with a knowledge and appreciation of the historic asset on what they consider to be the significant aesthetic values'</i> (CADW 2011, 17).
Communal value	The potential for a historic asset to have a particular significance to people for its commemorative, symbolic or spiritual value, or for the part it has played in local cultural or public life. This will be particularly important in the case of buildings in public use or sites where public access must be maintained or improved (CADW 2017,7). <i>'This derives from the meanings that an historic asset has for the people who relate to it, or for whom it figures in their collective experience or memory. It is closely linked to historical and aesthetic values but tends to have additional or specific aspects. Communal value might be commemorative or symbolic. For example, people might draw part of their identity or collective memory from an historic asset, or have emotional links to it. Such values often change over time and they may be important for remembering both positive and uncomfortable events, attitudes or periods in Wales's history. Historic assets can also have social value, acting as a source of social interaction, distinctiveness or coherence; economic value, providing a valuable source of income or employment; or they may have spiritual value, emanating from religious beliefs or modern perceptions of the spirit of a place'</i> (CADW 2011, 18).

The Design Manual for Roads and Bridges (DMRB; 2020), though not specifically focused on developments of this nature, provides a suitable, general framework for scoping and assessing environmental value, magnitude of impact, and significance. The requirements for this assessment and reporting the effects on the environment as part of the process of construction, operation, and maintenance projects is set out in LA104: 'Environmental Assessment and Monitoring' (formally HA 205/08, HD 48/08, IAN 125/15, and IAN 133/10) and LA106 'Cultural Heritage Assessment' (formerly HA 208/07, HA 60/92 and HA 75/01). This assessment framework will be used alongside JBA Consulting's in-house assessment criteria, to assess value, magnitude of value and significance of effect. The definition of values have been based on Table 3.2N presented in LA104, (DMRB 2020, 13).

Table 10-4: Definition of value of heritage assets

Value	Asset type
Very High	- World Heritage Sites (including those nominated) - Assets of acknowledged international importance due to their 'outstanding universal value' - Assets that can contribute significantly to acknowledged international research objectives

Value	Asset type
High	- Scheduled Monuments (including those proposed) Undesignated monuments which could potentially be worthy of scheduling - Grade I or II* Listed Buildings - Registered Historic Landscapes, Parks and Gardens - Non-designated assets that can contribute significantly to acknowledged national research objectives
Medium	- Grade II Listed Buildings - Conservation Areas - Non-designated assets that contribute to regional research objectives. This includes assets which have particular regional associations or may have important associations at a local level (e.g. they have significance to local population or embody something of the special identity of a locality).
Low	Non-designated assets which are relatively poorly preserved or have limited importance at a local level and low potential to add to local and regional research objectives of local importance Assets compromised by poor preservation
Negligible	Assets with very little or no surviving cultural heritage interest, of very low importance and rarity.
Uncertain	Sites where there is evidence that a heritage asset may exist, but where there is insufficient information to determine its nature, extent and degree of survival given current knowledge.

The assessment criteria for the proposed change(s) and the impact they would have on cultural significance is outlined in Table 10-4. The process of evaluating the consequences of change can be usefully broken down into three distinct analytical stages:

- **Change:** A factual statement of how a proposal would change an asset or its setting including physical, visual appearance, scale, nature and duration.
- **Impact:** An assessment of the degree to which any changes would increase or decrease the cultural significance of an asset. Impact is scaled and the magnitude of impact is a reflection of the extent to which the cultural significance of an asset is changed by a proposal.

A judgement of magnitude of impact can be made based on the following criteria which has been based on the criteria for assigning magnitude of impact provided in Table 3.4N presented in LA104 (DMRB; 2020, 14).

Table 10-5: Definition of magnitude of impact

Magnitude of impact	Criteria
Major Adverse	Causes total destruction or change to, most key elements of the asset that results in substantial loss of integrity and cultural significance. Comprehensive change to the setting of the asset which this is a critical aspect of the assets cultural significance. Any such change would not normally be reversible.
Moderate Adverse	Causes change to, or loss of many key elements which result in a moderate loss of integrity and cultural significance of the asset. Moderate changes to the setting of the asset where this makes an important contribution to the cultural significance of the asset.
Minor Adverse	Change to some elements which lead to a limited loss of integrity and cultural significance of the asset. Change to the setting of the asset where this makes a limited contribution to the cultural significance of the asset.
Negligible / No change	No appreciable change to the cultural significance of the asset or its setting.
Minor Beneficial	Change to some elements which leads to limited improvement in integrity and cultural significance of the asset, or arrests decline. Change to the setting of the asset where this makes a limited contribution to the cultural significance of the asset.
Moderate Beneficial	Causes change to many key elements which result in a moderate

Magnitude of impact	Criteria
	enhancement to integrity and cultural significance of the asset or reverses decline. Moderate changes to the setting of the asset where this makes an important contribution to the cultural significance of the asset.
Major Beneficial	Causes significant change to most key elements of the asset that results in substantial enhancement of cultural significance. Comprehensive change to the setting of the asset which this is a critical aspect of the assets cultural significance.

The significance of the effect of the proposals on heritage assets is determined by the interaction of receptor value/sensitivity and impact magnitude. Effects can be positive (i.e. enhance the heritage asset) or negative (i.e. detrimental to the resource). Table 10-5 below sets out the criteria adopted for this assessment and is based on the criteria set out in the DMRB guidance and JBA Consulting's in-house assessment criteria.

Effect: A conclusion regarding whether an impact matters or not, reflecting the importance of the affected heritage asset. The effect is the measure that brings together the magnitude of the impact and the heritage asset's importance. This a critical stage of the assessment process as this determines the weight that should be given to the matter in either influencing the design of the proposal or ultimately in the test as to whether the proposal will be acceptable and permitted. The effect can be articulated through the use of a matrix, which brings together the importance of an asset and the magnitude of impact on the assets significance. Where there are two options for a level of effect it is a matter of professional judgement which should be articulated in the text description as to the level of effect appropriately. The Table below sets out the criteria adopted for this assessment, which is based on the criteria set out in the DMRB guidance (LA104, 2020 14 and 15; Table 3.7 and Table 3.8.1) and JBA Consulting's in-house assessment criteria.

Table 10-6: Heritage Assets - Significance of effects matrix

		Magnitude of Impact (degree of change)				
		No Change	Negligible	Minor	Moderate	Major
Value (Sensitivity)	Very High	Neutral	Slight	Moderate/ Large	Very Large/ Large	Very Large
	High	Neutral	Slight	Slight/ Moderate	Moderate/ Large/	Large/Very Large
	Medium	Neutral	Neutral/Slight	Slight	Moderate	Moderate/ Large
	Low	Neutral	Neutral/Slight	Neutral/Slight	Slight	Slight/ Moderate
	Negligible	Neutral	Neutral	Neutral/ Slight/	Neutral/Slight	Slight

11 Population and human health

11.1 Introduction

11.1.1 Legislative and planning policy context

Schedule 4 of the EIA Regulations sets out the requirements for information to be included in the ES and includes (inter alia) 'a description of the factors specified in regulation 4(2) likely to be significantly affected by the development: ...population, human health...'. This chapter assesses the potential for the development to result in likely significant effects on the health and wellbeing of the local population and local economy around the proposed works during construction and operation.

Population health concerns the health outcomes of a given population, including the distribution of health outcomes and patterns of health determinants. Consideration is therefore given to the likely significant effects of the proposals on health and wellbeing of the population as a result of changes to distribution of health outcomes and patterns of health determinants (for example access to greenspace and the effect this has on health and wellbeing). Direct effects on individuals' health, for example, as a result of increased levels of exposure to noise, dust or contamination, are considered in Chapter 13: Construction-related effects.

In the UK, the public health profession uses the World Health Organisation (WHO) definition of health, where it is defined as a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. This definition underpins the 'wider determinants of health' model used by public health and is illustrated in Figure 11-1. Figure 11-1 demonstrates that population and human health spans environmental, social and economic aspects.

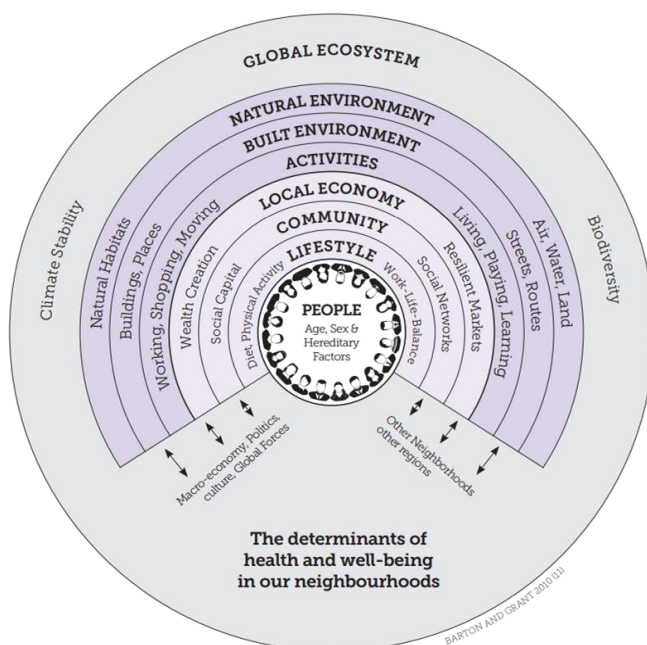


Figure 11-1: Determinants of health and wellbeing in local communities⁵⁷

In Wales, public bodies, some of which (e.g. Local Planning Authorities) are consultees or consenting authorities for EIA, have a statutory duty to promote well-being linked to a wide

⁵⁷ Barton H, Grant M (2006). A health map for the local human habitat. *The Journal of the Royal Society for the Promotion of Health*; 126(6): 252-3

range of determinants under the Well-being of Future Generations Act (Wales) Act 2015⁵⁸. The Well-being Act gives a legally binding common purpose for public bodies, described under seven well-being goals (Table 11-1). It details the way in which public bodies must work to achieve these goals, described under five ways of working⁵⁹ (Table 11-2).

Table 11-1: The seven wellbeing goals of the Well-being Act⁵⁹

Goal	Description of the goal
A prosperous Wales	An innovative, productive and low-carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work.
A resilient Wales	A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change).
A healthier Wales	A society in which people's physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood.
A more equal Wales	A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio-economic background and circumstances).
A Wales of cohesive communities	Attractive, viable, safe and well-connected communities.
A Wales of vibrant culture and thriving Welsh language	A society that promotes and protects culture, heritage and the Welsh Language, and which encourages people to participate in the arts, and sports and recreation.
A globally responsible Wales	A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being.

Table 11-2: The five ways of working within the Well-being Act⁵⁹

Way of Working	Description
Long term	The importance of balancing short-term needs with the need to safeguard the ability to also meet long-term needs.
Prevention	How acting to prevent problems occurring or getting any worse may help public bodies meet their objectives.
Integration	Considering how the public body's well-being objectives may impact upon each of the well-being goals, on their other objectives, or on the objectives of other public bodies.
Collaboration	Acting in collaboration with any other person (or different part of the body itself) that could help the body meet its well-being objectives.
Involvement	The importance of involving people with an interest in achieving the well-being goals and ensuring that those people reflect the diversity of the area which the body serves.

⁵⁸ <https://www.legislation.gov.uk/anaw/2015/2/contents/enacted>

⁵⁹ Welsh Government (2016) Shared Purpose: Shared Future – Statutory guidance on the Well-being of Future Generations (Wales) Act 2015

11.2 Baseline conditions

The proposed scheme is within the city of Cardiff, South Wales. With a population of 363,000, it is both the largest city and largest local authority in Wales⁶⁰. The Cardiff Urban Area, which also includes the towns of Caerphilly, Pontypridd, Penarth, Dinas Powys, Taff's Well and Radyr, has a population of 447,000, equating to 14% of the population of Wales.

Cardiff is broadly characteristic of other Core Cities⁶¹ in the UK in terms of both its population age structure and socio-economic status. It has a young population – 86% of its population are younger than retirement age, compared with 79% across Wales. Cardiff has a mixed socio-economic status, containing several of the most deprived and most affluent areas in Wales. The most deprived areas of Cardiff are concentrated within the wards of Trowbridge, Pentwyn, Splott, Caerau and Ely. The more affluent areas of the city are generally in the north, in the wards of Cyncoed, Llanishen, Heath, and Llandaff.

The Coastal Community Typology Report⁶² defines the site area as falling within Category C: Cosmopolitan Coast. These areas are described as city and market town service centres with highly skilled populations and dynamic economics, but relatively high levels of deprivation among older people and children. These areas tend to have higher levels of people qualified to degree level, crime, private rented housing, poverty and professional occupations, and lower levels of people of pensionable age, long-term sick, car ownership, and people with no qualifications⁶³. This categorisation is fairly broad however, and population and labour market statistics of Splott ward in many ways do not reflect this categorisation.

The proposed defence scheme along the Rhymney River is within the Cardiff South East Neighbourhood, according to the Cardiff Liveable City Report⁶⁴. This area is characterised as having a large student population, high satisfaction with physical health, low overall satisfaction with public services and mental health, and high concentration of airborne NO₂.

The properties benefiting from increased flood protection as a result of the scheme are in the areas of Tremorfa and Pengam Green, which are both within the ward of Splott. Splott is a relatively deprived area of Cardiff, entirely falling within the most deprived 30% of Wales. Particular issues for the ward include income levels (approximately 40% of children in Splott are living in low income households⁶⁵), education, quality of housing, and the physical environment (which includes propensity to flooding).

Residents of Splott ward are more likely to work in Personal Services, Sales and Customer Services, Machine Operations, or Elementary Occupations than residents of Cardiff as a whole and are less likely to work in Manager or Professional roles. They are also almost twice as likely to have no qualifications as the average Cardiff resident⁶⁶.

Approximately 89,000 people commute into Cardiff every day from nearby local authorities and 33,000 people commute out. This constitutes a gross commuting flow of 121,000 people

⁶⁰ StatsWales (2018). Population estimates by local authority, upper super output area and age group [Online]. Available at: <https://statswales.gov.wales/Catalogue/Population-and-Migration/Population/Estimates/Small-Area/populationestimates-by-localauthority-uppersuperoutputarea-agegroup>

⁶¹ The UK Core Cities Group is an advocacy group of the city councils of ten of the largest urban areas in the UK outside of London: Birmingham, Bristol, Cardiff, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield.

⁶² Welsh Government (2016). Development of a Coastal Community Typology for Wales. <https://gov.wales/sites/default/files/publications/2018-05/development-of-a-coastal-community-typology.pdf>

⁶³ Welsh Government (2015) Development of a Coastal Community Typology for Wales.

⁶⁴ Cardiff City Council (2017) – Cardiff Liveable City Report.

⁶⁵ Cardiff in 2018

⁶⁶ Nomisweb: 2011 Labour Market Profile for Splott Ward – [Online] Available at: <https://www.nomisweb.co.uk/reports/lmp/ward2011/1140858963/report.aspx>

and a net daily inflow of 56,100 people into Cardiff⁶⁷. Commuting patterns between Cardiff and local authorities to those closest to the scheme, in the east and north-east (Newport, Caerphilly) show a total of 28,200 individuals commuting between these areas (18,800 in, 9,400 out). Rover Way, which would be protected by the proposed scheme and is very close to the proposed defences, is a key route into central Cardiff and Cardiff Bay, from the east. The scheme falls within the Cardiff 037 Middle Super Output Area (MSOA). Approximately 1,900 people commute into this area every day, and approximately 2,400 people commute out. Most of this commuting flow is from, and to, other areas of Cardiff (66% and 82%, respectively), but significant numbers come from elsewhere, including Newport and the Vale of Glamorgan⁶⁸. The majority of all these journeys are via private car.

Infrastructure assets relevant to the proposed development are summarised in Table 11-3.

Table 11-3: Material assets relevant to the scheme

Material Asset	Owner	Proximity to the proposals	Location
Main roads e.g. Rover Way, Lamby Way	Cardiff Council	Within	Above ground
Residential roads	Cardiff Council	Adjacent	Above ground
High voltage lines (11kV to 66kV)	Western Power	Within and adjacent	Underground
High voltage line (132kV)	Western Power	Adjacent	Overhead
High voltage line	National grid	Within	Overhead
Gas lines	Wales & West Utilities	Within and adjacent	Underground
Telecommunications infrastructure/fibre optic cables	Openreach	Within and adjacent	Underground
Telecommunications infrastructure/fibre optic cables	Virgin Media	Adjacent	Underground
Telecommunications infrastructure/fibre optic cables	Vodafone	Adjacent	Underground
Railways and associated infrastructure	Network rail	Adjacent	Above ground
Water lines	DCWW	Adjacent	Underground
Water Treatment Works	DCWW	Adjacent	Underground
Lamby Way Landfill	Cardiff Council	Within and adjacent	Above and below ground
Street lights	Cardiff Council	Adjacent	Above ground
Telephone masts	Numerous	Adjacent	Above ground

The health of Cardiff residents is broadly similar to residents of Wales as a whole. Approximately 32% of residents are, on average, not active on any occasion in a week, whilst

⁶⁷ Cardiff Research Centre (2018): The Cardiff Economy and Labour Market [Online] Available at: https://www.cardiff.gov.uk/ENG/Your-Council/Have-your-say/Ask%20Cardiff%20Library/The%20Cardiff%20Economy%20and%20Labour%20Market_Apr%2017_Mar%2018.pdf

⁶⁸ ONS (2011): Origin-destination statistics on migration, workplace and students for local authorities in the United Kingdom. [Online] Available at: <https://webarchive.nationalarchives.gov.uk/20160107192813/http://www.ons.gov.uk/ons/guide-method/census/2011/census-data/2011-census-data-catalogue/origin-destination/index.html>

26% are active, on average, on at least five days in a week (34% and 30% respectively in Wales).

Open space and areas for recreation are an important resource for a local population, as they offer a means to enjoy the local area and undertake physical activity. This benefits health and wellbeing. The Wales Coast Path is within the proposed site, which is a recreational walking route that stretches the entire coastline of Wales, from Chepstow to the Wales/England border outside Chester.

All residential properties within 2km of the scheme are within the catchment of Willows High School, a secondary school on the western edge of Pengam Green, and Baden Powell Primary School, adjacent to Splott Park.

To the west of the Rhymney River, the main industrial activities taking place include metal salvage yards, reclamation yards, and vehicle repairers in Tremorfa Industrial Estate, and steelworks and waste disposal associated with the Celsa Steelworks north and south of Rover Way. In addition, a large Water Treatment Works (WTW) facility operated by DCWW is located immediately west of the project area. Within the Cardiff Council Deposit LDP (2006-2026), the industrial area along Rover Way is defined as Existing Employment Land; Policy EC1.3 Rover Way states that this area displays strong potential to continue playing an important economic role and is protected for employment uses.

The land north and west of Rover Way consists of a mix of green space, residential properties, and local amenities, such as schools, leisure facilities, and a large supermarket. There are also two allotment sites located close to the western bank of the Rhymney River towards the northern end of the project area. In addition, there is a Traveller site located directly off Rover Way between the road and the coastline. The area east of the Traveller site has been included within Policy EN4 in the LDP, which seeks to protect and enhance the natural heritage and character of the Rhymney River corridor, whilst facilitating access and recreation.

To the east of the river is Lamby Way Landfill site, which is the principal waste disposal facility in Cardiff. This area is defined in the Cardiff LDP as Land for Waste Management under Policy W1. The landfill site is no longer active and has been capped and landscaped. Much of the western portion of the site is currently undergoing redevelopment as a large-scale solar farm. The site also retains its function as a municipal recycling facility taking household waste.

In addition, to the north of the landfill site and Lamby Way highway, a short distance to the east of the Rhymney River, is Tredelerch Park, which is managed by Cardiff Council for recreation purposes. It provides cycling and walking opportunities, and also includes a large angling lake. The park forms part of The Rhymney Trail, which is being developed by Cardiff Council along the length of the river to provide a new walking and cycling route from the coastline to the county border to the north and linking into the wider regional network.

The Rhymney River supports a wide range of recreational activities. The Rhymney River Motorboat, Sail and Angling Club is located on the west bank of the river adjacent to Rover Way, whilst other river and coastal users include Glamorgan Angling Club, Cardiff Sea Cadets and Cardiff Canoe Club. The area is also a popular bird-watching location and is known to support a large number of overwintering and coastal bird species.

The Wales Coast Path follows the coastline for much of the project area west of the Rhymney River. To the east of the river, the path diverts away from the coastline in order to circumvent Lamby Way Landfill site, before running over the Lamby Way road bridge and then diverting southwards, running parallel to Rover Way, back to the coastline. The section of the path between the Water Treatment Works and the roundabout connecting Rover Way to Lamby Way is also designated as a Public Right of Way. Sections of the path along Rover Way are in a poor state of repair and at risk from coastal erosion in the short term. The section of the

Wales Coast Path that runs through this area is in relatively poor condition, and there are currently works to create a more welcoming and suitable place for walkers to enjoy⁶⁹.

The Wales Coast Path is a nationally important recreation and amenity resource and is used by both local residents and visitors. Proposals have been developed by NRW and Cardiff Council to realign the path east of the river so that it follows the western boundary of the landfill site before connecting back into the coastline.

11.3 Potential impacts and likely significant effects

Population health concerns the health outcomes of a given population, including the distribution of health outcomes and patterns of health determinants. Consideration is therefore given to the likely significant effects of the proposals on health and wellbeing of the population as a result of changes to distribution of health outcomes and patterns of health determinants (for example, increased traffic congestion and the effect this has on general wellbeing). Direct effects of the physical health of individuals resulting from construction, for example reduced air quality, is considered in Chapter 13 'Construction-related effects'.

The operation of the scheme could cause, or contribute to, improvements in health and wellbeing to residents of Splott Ward and further afield. An increase in the standard of protection from flooding could cause a reduction in community anxiety in neighbourhoods that stand to benefit from the scheme and improve the local physical environment, contributing to an improvement of the local area's multiple deprivation scores. The proposed development also includes improvement to this stretch of the Wales Coast Path, which could contribute to an increase in levels of physical activity, and thereby physical health, in the area. Early community engagement associated with this scheme has shown that residents in the study area are very positive about the increased flood protection and potential improvement of the Wales Coast Path. The scheme would also improve flood protection to local greenspace in Tremorfa Park and Pengam Green, potentially increasing their use and value as recreational greenspace.

For the duration of the construction stage, it is anticipated that the local stretch of the Wales Coast Path would be diverted. This has the potential to have a minor adverse impact upon the health and wellbeing of local residents and visitors. It is also anticipated that whilst construction works are taking place close to Rover Way, the highway would need to be partially closed. This has the potential to impact upon wellbeing of both local residents and users of Rover Way, by increasing travel times and congestion, and increasing the incidence of the Spillover Effect, where drivers attempt to find alternative, less congested routes, affecting neighbourhood quality of life.

There are proposals, as part of the scheme, to improve the quality of the local stretch of the Wales Coast Path. This would have the potential to make a substantial improvement to the local amenity and recreational value of the path and the area surrounding the Rhymney River. This could, in turn, improve the health and wellbeing of the local population, by providing enhanced amenity locally. The Wales Coast Path is frequented by tourists, and therefore could increase local tourist numbers, benefitting the economy.

In addition, should the contractors be appointed locally, the proposed scheme has the potential to directly support the local economy during the construction phase, including the potential for job creation in the local area within the construction industry. Use of local amenities may also increase as members of the workforce spend more time in the area, benefitting the local economy.

A reduction in flood risk in the areas of Tremorfa and Pengam Green would likely contribute towards the area becoming a more desirable place in which to live and purchase property.

⁶⁹ Cardiff section of the Wales Coast Path: www.outdoorcardiff.com/walks/wales-coast-path

This could have a mixed impact upon population health. It would likely lead to an increase in house prices and a decrease in insurance premiums, which could in turn lead to a decrease in local stress levels. It could also however render the area less affordable, and more difficult to move into for low-income families and first-time buyers, increasing stress in these groups.

The potential issues, constraints, and opportunities to the local community are summarised in Table 11-4, together with recommended mitigation measures as required.

Table 11-4: Likely significant effects on the local population and human health

Likely environmental effect	Proposed mitigation	Requirement for further assessment in an ES?
A significant reduction in flood risk and coastal erosion will provide long-term benefits to the local community, commercial properties, and highways infrastructure.	None. Further stakeholder engagement will be undertaken during detailed design – including statutory pre-application consultation (PAC) – and during the construction phase to communicate flood risk reduction benefits of the proposed development.	No. A Flood Consequences Assessment (FCA) will be prepared in support the consent applications for the proposed development, which will describe the effects of the development on flood risk and the benefits provided to local community, properties, and infrastructure.
Potential to deliver substantial improvements to public access and recreational amenity within the area, including safeguarding the Wales Coast Path and potentially delivering improvements to the path.	None. The proposed scheme has the potential to reduce erosion and flooding of the Wales Coast Path and secure its long term alignment along the coastline in this area. In addition, the scheme may include improvements to the path to further promote access and amenity. This has the potential to benefit recreational use of the path and enjoyment of the area, as well as supporting positive health and wellbeing outcomes.	No. Any such impacts are likely to be positive and will be difficult to predict as they are influenced by a wide range of external, socio-economic factors.
Potential for reduced or lower quality access along the affected section of the Wales Coast Path during construction.	Temporary diversion of the Wales Coast Path in the scheme area so that the route does not pass through the construction site boundary is likely to be required so as to safeguard public safety. This may require diversion away from the coastline to a route along Rover Way or through adjacent residential areas. This could affect user enjoyment of this section of the footpath or reduce usage during construction. Further stakeholder consultation will be undertaken during the detailed design and construction phases to communicate the temporary effects on the Wales Coast Path and diversion proposals.	No. Temporary diversion of the path will be agreed with Cardiff Council and NRW to agree an appropriate alternative route. The Wales Coast Path will remain open during the construction phase and only the section relevant to the construction area will be affected. Whilst any diversion may affect use of the footpath, any such impact is not likely to be significant.
Affects to the recreational use of the Rhymney River during construction, particularly in relation to boating use during construction works to the adjacent sections of the river.	Engagement will be undertaken with recreation groups that utilise the stretch of the Rhymney River and adjacent stretch of the Severn Estuary to understand recreational usage and requirements, and to communicate the likely effects of the proposed development. The purpose will be to support continued recreation use of the	No. The construction contractor will adopt an appropriate construction method to facilitate continued recreational use of the river and coastline during construction.

Likely environmental effect	Proposed mitigation	Requirement for further assessment in an ES?
	river and coastline during the construction phase where feasible. Requirements will be incorporated into the contractor's construction Method Statement for the scheme.	
Potential for construction jobs creation in the local area, with knock on benefits to local businesses.	None. The appointed contractor will be encouraged to provide employment opportunities for the local community. The construction workforce will likely utilise local retail services, which will provide a positive effect on the local economy.	No. Any effects on the local community or local economy are likely to be positive.

Whilst the proposed development is likely to have effects, both positive and negative, on the local population and local economy, these effects are not likely to be significant. Therefore, no further assessment of the likely effects of the proposed development on local community health and wellbeing or the local economy is proposed as part of the EIA process. This topic is therefore **scoped out** of further assessment in the EIA.

12 Traffic and transport

12.1 Introduction

This Traffic and Transport chapter considers the likely impacts on receptors arising from traffic generated from construction of the proposed development. The proposed development is not anticipated to generate significant vehicle movements once operational – movements will be limited to periodic inspections of the flood defence assets and vegetation management, but are not likely to equate to more single figure values each week – and so potential impacts of the scheme on traffic and transport once operational have not been considered further. Rather, this assessment focuses on potential impacts during the construction of the proposed development associated with the movement of materials, plant/machinery and construction personnel.

Schedule 4 of the EIA Regulations, sets out the requirements for information to be included in the ES (*inter alia*) 'a description of the factors specified in regulation 4(2) likely to be significantly affected by the development: ...material assets...'.

12.1.1 Legislative and planning policy context

Planning Policy Wales

Planning Policy Wales: Edition 10 (PPW) was published in December 2018 and sets out Welsh land use planning policy. Chapter 6 relates partly to transport and sets out policy for sustainable transport, public transport, traffic management and car parking.

Points relevant to this scheme include:

- 'Transport Assessments can be required for any proposed development if the planning authority considers that there is a justification or specific need.'
- 'Local authorities should consider which routes are most suitable for use by road freight and encourage the location or relocation of distribution and operating centres to sites which have good access to these routes.'

PPW also outlines the factors taken into account when determining a planning application for a development that has transport implications. Those factors relating to the proposed development include:

- The impacts of the proposed development on travel demand;
- The environmental impact of both transport infrastructure and the traffic generated (with a particular emphasis on minimising the causes of climate change associated with transport); and
- The effects on the safety and convenience of other users of the transport network.

Technical Advice Note 18: Transport

Technical Advice Note (TAN) 18 is intended to be read in conjunction with PPW. It states the aims of an environmental assessment are to:

- Understand the transport impacts of the development; and
- Clearly communicate the impacts to assist the decision-making process.

TAN18 also states that Transport Assessments (TAs)...*'should be incorporated into an ES where the transport impacts of an application are 'significant' within the scope of the EIA regulations.'*

Cardiff Council's Local Development Plan

Regarding assessment of transport impacts, Cardiff Council's Local Development Plan states that:

'Planning applications for development schemes at or above the size thresholds specified in TAN18: Transport will need to be supported by a Transport Assessment (TA). The TA will provide the basis for assessing all the potential travel impacts of developments including their effect on the highway network and the likely modal split of the trips that would be generated. This assessment will help establish the gaps in existing transport provision and the measures necessary to make a development accessible by sustainable modes.'

12.2 Baseline conditions

At this stage in the project, detailed information on the construction method or construction programme is not available. A contractor-produced Construction Method Statement will be developed in due course and this will be submitted as part of the consent applications for the proposed development. This will also inform preparation of the Environmental Statement, with the assessment of relevant construction phase effects based upon the proposed construction method. Therefore, this chapter is based upon the environmental impacts we can reasonably anticipate as a result of construction of the proposed development.

Given the large scale of the proposed development and likely extended duration (18 months) of the construction phase, there will be significant construction works and vehicle, plant and machinery movements along the Severn Estuary and Rhymney River corridors during construction.

Construction of the proposed development would likely require the haulage of construction materials via the local highway network. The likely haulage roads adjacent to the development site are single carriage way with a 40mph speed restriction. Given the industrial character of the area, there are generally few restrictions to heavy goods vehicles (HGVs) on the local highway network.

There are several routes by which construction materials, plant/machinery and construction staff could access the proposed development site. The nearest trunk road to the site is the M4 motorway. There are two main access routes from the M4. Both routes access the construction site via the A4232 to the Rover Way/Lamby Way roundabout; from there, access to the site is via one of three roads (Lamby Way, Rover Way (south) or Rover Way (north)) depending on which part of the construction site needs to be accessed. The likely access routes from the M4 are detailed as follows:

- Route 1: M4 westbound – M4 (J29) → A48(M) → A48 → A4232 → Lamby Way/Rover Way/A4232 roundabout
- Route 2: M4 eastbound – M4 (J30) → Pentwyn Link Road → A4232 → A48 → A4232 → Lamby Way/Rover Way/A4232 roundabout

In addition, construction materials and machinery could access the construction site from Cardiff Docks (Port of Cardiff), located a short distance to the west. Access from Cardiff Docks to the Rover Way/Lamby Way/A4232 roundabout would be direct via Rover Way:

- Route 3: Cardiff Docks – Rover Way → Lamby Way/Rover Way/A4232 roundabout

Baseline traffic count data has been obtained from the Department for Transport's 'Road Traffic Statistics' website⁷⁰ along the likely access routes. The annual average daily flow (AADF) of vehicles and HGVs (over 11.6m) in 2018 at relevant traffic count monitoring locations is provided in Table 12-1.

⁷⁰ <https://roadtraffic.dft.gov.uk/#6/55.254/-6.064/basemap-regions-countpoints>

Table 12-1: Baseline data for traffic counts

Traffic count point ID/location	Total Vehicle count	HGV count
30528 / A48: A4232 – A48M	77517	3155
30664 / A4161: A4232 – A48	55004	3401
50524 / A48: A4161 – A4232	91559	3723
70056 / A4232: A4232 – End	26625	2794
73227 / A48(M)	46626	3208
78439 / A4232: A48 – Road to Llanedeyrn	26346	922
99608 / A4232: A48 – M4 J30	27440	961
99609 / M4	90021	7716

There are no traffic count points for either Rover Way or Lamby Way. However, both highways are very busy, with very significant traffic movements through the development area in both east and west directions throughout the average day, and particularly during the working week. Given the industrial nature of parts of the area surrounding the proposed development (i.e., Tremorfa Industrial Estate, Celsa Steelwork, DCWW WWTW, Lamby Way Landfill, etc), proximity to Cardiff Docks and Cardiff Bay, and the importance of Rover Way and Lamby Way as highways connecting the city centre with the major trunk roads (i.e., M4, A48M), both highways experience significant HGV movements.

12.3 Potential impacts and likely significant effects

There is potential for an impact on highway users (and associated effects) as a result of construction of the scheme, due to the increased traffic movements associated with the delivery of bulky materials (rock, stone, soil, and sheet piles). Increased traffic associated with development can give rise to a number of environmental effects on human receptors including:

- Severance;
- Driver delay;
- Pedestrian delay;
- Pedestrian amenity;
- Fear and intimidation; and
- Accidents and safety

Other effects associated with construction traffic including visual impacts, noise and vibration, and air pollution and dust are considered in Chapter 9 (Landscape and visual) and Chapter 13 (Construction-related effects).

The Institute of Environmental Assessment (IEA) publication '*Guidelines on the Environmental Assessment of Road Traffic*' provide various thresholds above which it is considered necessary to assess the environmental effects of traffic in more detail. The guidelines set out the following rules used to determine the need, scale, and extent of further assessment:

- Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and
- Rule 2: Include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more (sensitive areas being defined as accident blackspot locations, conservation areas, hospitals, and links with high pedestrian flows).

Increases in traffic flows below 10% are generally regarded as insignificant given that daily variations in background traffic flows on any given highway link can fluctuate by this amount. Changes in traffic flow levels below 10% are therefore assumed to result in no discernible environmental impact.

At this stage, it is not known how many traffic movements will be generated to facilitate construction of the scheme or when these movements will be take place within the construction programme. However, it is unlikely that percentage increases of over 30% will occur for any of the highway routes/traffic count points, either for overall increase in traffic or increase in HGV movements. The greatest increase in traffic movements is likely to occur on Rover Way or the A4232 link from the A48. However, an increase of traffic movements of more than 30% on either highway is very unlikely.

12.4 Proposed assessment methodology

Notwithstanding this, given that the construction of the proposed development is likely to generate substantial vehicle movements, and given the lack of construction phase information available at this time, a precautionary approach has been adopted in relation to likely impacts on the local highway network and other highway users. Therefore, a Transport Assessment will be produced to assess construction phase impacts, to be documented in a Traffic and Transport ES Chapter. This assessment would also be used to support other ES chapters, including Biodiversity, Landscape, and Construction-related effects (construction traffic noise) where the change in traffic flow would meet established criteria for screening traffic impacts. Therefore, traffic and transport is **scoped in** to the EIA for further detailed assessment.

The methodology to be used will follow the IEA '*Guidelines for the Environmental Assessment of Road Traffic*' (IEA 1993). The IEA guidelines identify a number of potential environment effects that may arise from changes in vehicular travel demand and set out the broad principles of how to assess the magnitude of effect for each category, summarised as follows:

- **Severance** – This is the perceived division that can occur within a community when it becomes separated by a major artery. Such division may result from the crossing of a heavily trafficked road or a physical barrier created by the road itself. The IEA guidelines refer to the Manual of Environmental Appraisal, which suggests that changes in traffic flow of 30%, 60% and 90% would be likely to produce 'slight', 'moderate' and 'substantial' changes in severance, respectively.
- **Driver Delay** – The IEA guidelines note that driver delay can occur at several points on the network, although the effects are only likely to be significant when the traffic on the highway network is predicted to be at, or close to, the capacity of the system.
- **Pedestrian Delay** – The IEA guidelines note that a change in the volume, composition and/or speed of traffic may affect the ability of a person to cross a road. Typically, an increase in the traffic level results in increased pedestrian delay, although increased pedestrian activity itself may also contribute. The guidelines do not set any thresholds for assessing pedestrian delay, recommending instead that assessors use their judgement to determine the significance of the effect.
- **Pedestrian Amenity** – This is broadly defined as the relevant pleasantness of a journey. It is affected by traffic flow, traffic composition, footway width and separation from the carriageway. The IEA guidelines suggest a tentative threshold for judging the significance of a change in pedestrian amenity where the traffic flow (or the HGV component) is halved or doubled.
- **Fear and Intimidation** – The impact of fear and intimidation is dependent upon the volume of traffic, the HGV composition, the proximity of traffic to people and the lack of protection caused by factors such as narrow footway width.
- **Accidents and Safety** – The IEA guidelines do not include a definition in relation to accidents and safety, suggesting that professional judgement will be needed to assess the implications of local circumstance or factors which may increase or decrease the risk of accidents, i.e. junction conflicts.

The IEA guidelines set out that where a projected change in traffic flow of less than 10% in any sensitive area, there is generally no discernible environmental impact, given that daily

variations in background traffic flow may fluctuate by this amount under normal operating conditions. Elsewhere a 30% change in traffic flow represents a reasonable threshold for including a highway link within the assessment. Where there are major changes in the composition of traffic flow, say a much greater flow of HGV's, a lower threshold may be appropriate.

There are assumptions made with the data presented and limitations in the assessment methodology. Total amount of construction materials may change as the scheme develops and evolves, which will influence the number of construction HGV movements. Number of construction HGV movements will not be split evenly across the entire year, and it is likely that certain times of the year will be busier than others, therefore there is the potential for significant increases in traffic to occur. Past data has been used to predict future traffic counts along the relevant link roads. However, traffic counts are likely to increase in the future and so current percentage increases are likely to be more sensitive. Certain traffic count points also used an 'estimation method' for the AADF for a road link, as opposed to a more concrete 'manual count', so data for these road links may be less reliable.

Proposed mitigation could include delivery of materials outside of peak hours (e.g., between 08:00 and 17:00) and potential resurfacing of roads following completion of the proposed scheme if it is deemed necessary.

13 Construction-related effects

13.1 Introduction

This chapter considers impacts on receptors arising specifically during the construction phase that are not considered in each of the other specialist ES topic chapters.

With reference to Schedule 4 of the EIA Regulations this chapter provides, where relevant, *'an estimate, by type and quantity, of expected residues and emissions (such as water, air, oil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction phase'*.

Consideration is particularly given to impacts from construction activities associated with:

- Air quality
- Noise and vibration
- Light spill
- Land and water contamination

As the proposed development is a coastal defence scheme, heat and radiation will not be created during either construction or operation and is therefore **scoped out**.

At this stage in the project, detailed information on the construction method or construction programme is not available. A contractor-produced Construction Method Statement will be developed in due course and this will be submitted as part of the consent applications for the proposed development. This will also inform preparation of the Environmental Statement, with the assessment of relevant construction phase effects based upon the proposed construction method. Therefore, this chapter is based upon the environmental impacts we can reasonably anticipate as a result of construction of the proposed development.

Given the large scale of the proposed development and likely extended duration (18 months – 2 years) of the construction phase, there will be significant construction works and vehicle, plant, and machinery movements within the Severn Estuary and Rhymney River corridors during construction. This will include construction works and vehicle movements on the Severn Estuary foreshore and within the Rhymney River channel. It is possible that construction materials for the coastal sections (Section 1) will need to be stockpiled on the estuary foreshore. Significant excavation of the foreshore would be required to construct the toe of the rock armour revetment.

13.2 Baseline conditions

Given the location of the development proposals within the metropolitan area of Cardiff, there are a number of residential and business properties in close proximity to the site extent (Table 13-1). Depending on the nature and timing of construction activities, these receptors could be subject to impacts arising from emissions to air, noise and vibration, and light spill. Being also within the Rhymney Estuary the work would also take place immediately adjacent to and within the marine environment, which could impact on fish, marine mammals and wetland bird species (refer to Chapter 8: Biodiversity and nature conservation).

Table 13-1: Potentially sensitive receptors to the impacts of construction within 50m of the site boundary

Sensitive receptor	Closest distance to the site
Fish and marine mammals in the Rhymney River and Severn Estuary	On site
Wintering birds in the Rhymney River and Severn Estuary	On site
Users of the Wales Coast Path	On site
Residential receptors on Page Drive and Glan Rhymni	<10m
Rover Way Traveller's site	<10m

Sensitive receptor	Closest distance to the site
Residential/business receptors on Beckgrove Close/Ffordd Pengam	<30m
Users of Rhymney River Motor Boat, Sail & Angling Club	<30m

13.3 Legislative and planning policy context

National legislation

Part IV of the Environment Act (1995), requires the UK Government to produce a National Air Quality Strategy which contains standards, objectives and measures for improving air quality. The strategy sets out National Air Quality Objectives (NAQOs) for certain air pollutants, which are maximum ambient concentrations not to be exceeded, or with a permitted number of exceedances over a set timescale.

The Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC replaced previous EU Framework Directives 96/62/EC, 1999/30/EC, 2000/69/EC, 2002/3/EC and the Council Decision 97/101/EC. The directive maintains the air quality objectives of the previous directives and sets new objectives for fine particles objectives. Directive 2008/50/EC is transcribed into UK law by the Air Quality Standards Regulations 2010, which came into force on 11th June 2010 and replaced the existing Air Quality Standards Regulations 2007. The objective of the legislation is to improve air quality by reducing the impact of air pollution on human health and ecosystems. The limit values set out in this legislation are the basis of the NAQOs.

The National Air Quality Objectives (NAQOs) and their Limit Values will form the basis of this assessment. The NAQOs are based on an assessment of the effects of each pollutants on public health, and so are a good indicator in assessing whether the air quality in the vicinity of the development during construction is likely to have a detrimental impact upon human health. The Air Quality Standards are displayed in Table 13-2.

Table 13-2: Air Quality Standards

Pollutant	Objective	Average period
PM10	50µg/m ³ not to be exceeded more than 35 times a year	24 Hours
	40µg/m ³	Calendar year
PM2.5	25µg/m ³	Calendar year
Nitrogen dioxide	200µg/m ³ not to be exceeded more than 18 times a year	1 hour
	40µg/m ³	Calendar year
Sulphur dioxide	350µg/m ³ not to be exceeded more than 24 times a year	1 hour
	125µg/m ³ not to be exceeded more than 3 times a year	24 hours
Benzene	5µg/m ³	Calendar year
Carbon monoxide	10µg/m ³	Maximum daily running 8 hour mean
Lead	0.5µg/m ³	Calendar year

The Control of Pollution Act 1974 Section 61 sets out procedures for those undertaking works to obtain 'Prior Consent' for construction works within agreed noise limits. Applications for such consent are made to the relevant local authority and contain a method statement of the works and the steps to be taken to minimise noise. Under Section 60 of the Act, the local authority has powers to attach conditions to, limit or qualify any consent to allow for changes and limit the duration of any consents.

Section 71 of the Control of Pollution Act (COPA) gives Welsh Ministers the power to approve a code of practice by order which they consider suitable for the purposes of providing guidance on appropriate methods for minimising noise on construction sites. The Welsh Ministers may

also approve other codes of practice providing guidance on minimising noise from other kinds of sites. Under COPA 1974 'noise' includes 'vibration'. The Control of Noise (Codes of Practice for Construction and Open Sites) (Wales) Order 2017 approves BS 5228 as the code of practice relating to noise and vibration from construction works. BS 5228: 2014 Code of Practice for noise and vibration control on construction and open sites is divided into two parts – Part 1: Noise⁷¹ & Part 2: Vibration⁷². BS 5228 provides guidance for predicting construction noise and also provides advice on noise and vibration control techniques. When using its powers under section 60 of Control of Pollution Act, the Local Authority must have regard to the approved code (BS 5228) when imposing requirements on works of construction or demolition. Similarly, contractors will refer to BS 5228 when drawing up their own noise management plans under a Section 61 application.

Under Part III of the Environmental Protection Act 1990 local authorities have a duty to investigate noise complaints from premises (land and buildings) and vehicles, machinery or equipment in the street. It does not apply to road traffic noise but may be applicable to some construction activities. The Noise and Statutory Nuisance Act 1993 amended Part III of the Environmental Protection Act 1990 by placing additional definitions in the list of statutory nuisances in Section 79 of the Environmental Protection Act. The definitions relate to nuisance caused by vehicles, machinery and equipment in the road.

Under section 79 of the Environmental Protection Act, if a local authority's Environmental Health Officer is satisfied that a complaint amounts to a statutory nuisance then the authority must serve an abatement notice on the person responsible or in certain cases the owner or occupier of the property. If a developer or construction contractor were to appeal an abatement notice or be prosecuted under this legislation, the courts must have regard to the approved code in determining whether 'best practicable means' have been employed to minimise noise impacts. The notice could require that the noise or nuisance must be stopped altogether or limited to certain times of the day.

Planning Policy Wales

Planning Policy Wales: Edition 10 (PPW) was published in December 2018 and sets out Welsh land use planning policy. The Policy ensures that a commitment to sustainability is adopted into the planning system. PPW also requires Local Planning Authorities (LPAs) in Wales to develop their own LDP. The PPW is supported by the supplementary Technical Advice Notes, which provide detailed planning advice and are to be taken into account by LPAs in Wales when they are preparing development plans.

PPW states that *"The planning system manages the development and use of land in the public interest, prioritising long term collective benefit, contributing to improving the economic, social, environmental and cultural well-being of Wales. It must reconcile the needs of development and conservation, securing economy, efficiency and amenity in the use of land, ensuring the sustainable management of natural resources and protecting, promoting, conserving and enhancing the built and historic environment."*

Section 7.7.26 deals specifically with managing environment risks that arise during construction, and states: *"Planning authorities must consider the potential for temporary environmental risks, including airborne pollution and surface and subsurface risks, arising during the construction phases of development. Where appropriate planning authorities should require a construction management plan, covering pollution prevention, noisy plant, hours of operation, dust mitigation and details for keeping residents informed about temporary risks."*

⁷¹ BSI (2014). BS 5228.Code of practice for noise and vibration control on construction and open sites. Part 1 Noise.

⁷² BSI (2014). BS 5228.Code of practice for noise and vibration control on construction and open sites. Part 2 Vibration.

Technical Advice Note (TAN) 11 (1997): noise

Technical Advice Note (TAN) 11 (1997), provides national advice on how to use the planning system to reduce the adverse impact of noise. TAN 11 states that *"Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance."*

However, TAN 11 clarifies this statement by stating: *"There may be circumstances when it is acceptable, or even desirable in order to meet other planning objectives, to allow noise generating activities on land near or adjoining a noise-sensitive development. In such cases, local planning authorities should consider the use of conditions or planning obligations to safeguard local amenity. Care should be taken to keep the noisiest activities away from the boundary or to take measures to reduce the impact of noise. Authorities should also take into account the fact that the background noise level in some suburban and rural areas is very low, and the introduction of noise generating activities into such areas may be especially disruptive."*

Regarding construction sites, TAN 11 states: *"Detailed guidance on assessing noise from construction sites can be found in BS 5228, parts 1 to 4. In particular, Part 1: 1984 "Code of practice for basic information and procedures for noise control" describes a method for predicting noise from construction sites as well as giving general advice."*

Cardiff Council's Local Development Plan

Cardiff Council's LDP is intended to be used by the council to guide and manage development in Cardiff. In regard to Air Quality and Noise Pollution, Cardiff City Council's LDP states that *"Development will not be permitted where it would cause or result in unacceptable harm to health, local amenity, the character and quality of the countryside, or interests of nature conservation, landscape or built heritage importance because of air, noise, light pollution or the presence of unacceptable levels of land contamination."*

13.4 Air quality**13.4.1 Potential impacts and likely significant effects**

There are seven Local Air Quality Management Areas (AQMA) in the Cardiff Council administration area, all of which relate to elevated nitrogen dioxide levels. The closest to the site is the Cardiff City Centre AQMA, located approximately 2.5km west of the scheme area. The closest air quality monitoring site is located on Newport Road, which is approximately 1.5km to the west.

Whilst the proposed development is not located within an AQMA, significant emissions to air are generated from traffic using Rover Way, Lamby Way, and the A4232 highways. Rover Way in particular, generates significant volumes of dust that affect adjacent coastal areas. In addition, dust is generated from the operation of Lamby Way Landfill and from the significant industrial activities at Tremorfa Industrial Estate and the Celsa Steelworks at the western end of the development area.

Although weather dependant, construction activities can generate significant quantities of dust and other airborne particulate matter, as a result of moving vehicles, moving and tipping of materials, exhaust of diesel-powered machinery, and topsoil stripping and earth excavation. These emissions have the potential to cause soiling to local properties and vehicles.

The closest residential properties to the proposals are located on Page Drive and Glan Rhymni, and within the Rover Way Traveller's site. Properties located in these areas are within 10-20m of the construction site boundary. Other residential and business properties are located within 30-50m of the site extent at Beckgrove Close and Ffordd Pengam. Construction works adjacent to these areas are likely to include a range of construction activities, such as topsoil

stripping, earth movements, and the placing of rock boulders, and it is likely that construction vehicles and plant will be moving within 10-20m of these properties for periods during the construction phase. Given the close proximity of residential receptors to the construction works site, there is potential for dust and particulate emissions from construction activities to affect these properties.

However, it is anticipated that dust and other emissions to air from construction activities and vehicle movements can be effectively managed through application of appropriate good construction practices, to be implemented through a Construction Environmental Management Plan (CEMP) and construction Method Statements. These measures will form part of the contract documents controlling the appointment of the construction contractor and prior approval of these documents by Cardiff Council and NRW can be secured through appropriately worded pre-commencement conditions attached to consent approvals for the scheme. Therefore, impacts on air quality during construction will be **scoped out** of the EIA because any such impacts can be effectively managed through controls on the construction methodology.

In addition, the operational phase of the development would not impact upon air quality, with any associated vehicle movements for monitoring or maintenance activities likely to be very limited. Therefore, impacts on air quality during operation of the proposed development will be **scoped out** of the EIA.

In relation to the Severn Estuary and Rhymney River, these are sensitive ecological receptors that support a range of inter-tidal, coastal, fluvial, and terrestrial habitats and associated species. Significant construction works are proposed within and immediately adjacent to these receptors. Construction works within the Severn Estuary and Rhymney River and adjacent areas will include topsoil stripping, excavation of existing flood defence structures, earth movements, installation of sheet piles, and the placing of rock armour blockstones. Given the immediate proximity of these ecological features to the construction works and large scale and duration of the construction works, there is potential for construction activities and the movement of construction plant to generate emissions of dust and particulates that could affect these ecological receptors. Assessment of likely air quality effects on ecological receptors will be considered in the Biodiversity and Nature Conservation chapter of the ES.

13.5 Noise and vibration

13.5.1 Potential impacts and likely significant effects

The scheme area already experiences significant noise as a result of traffic movements along Rover Way, Lamby Way, and the A4232 highways, and noise generated from Lamby Way Landfill and from the industrial areas at the western end of the development area. In addition, there are high ambient noise levels from wind and wave and tidal movements in the Severn Estuary and from significant bird populations utilising the area.

Construction noise

A number of noisy construction activities would be required along the length of the works. Such activities could include moving vehicles, moving, tipping, and placing of construction materials, excavation works, use of generators and compressors, and piling works. These construction activities should not occur across the entire site simultaneously; rather a phased construction methodology would be employed. Nevertheless given the location of some parts of the proposals within the intertidal zone, it is possible that night time working may be required in some areas to fit with tidal patterns, which would increase the sensitivity of noise receptors for some construction activities.

The closest residential properties to the proposals are located on Page Drive and Glan Rhymni, and within the Rover Way Traveller's site. Properties located in these areas are within 10-20m of the construction site boundary. Other residential and business properties are located

within 30-50m of the site extent at Beckgrove Close and Ffordd Pengam. Construction works adjacent to these areas are likely to include topsoil stripping, earth movements, and the placing of rock boulders, and it is likely that construction vehicles and plant will be moving within 10-20m of these properties for periods during the construction phase. Given the close proximity of residential receptors to the construction works site, there is potential for noise from construction activities to give rise to affect these properties.

However, it is anticipated that noise from construction activities and vehicle movements can be effectively managed through application of appropriate good construction practices, to be implemented through a Construction Environmental Management Plan (CEMP) and construction Method Statements. These measures will form part of the contract documents controlling the appointment of the construction contractor and prior approval of these documents by Cardiff Council and NRW can be secured through appropriately worded pre-commencement conditions attached to consent approvals for the scheme. Therefore, impacts on residential and business receptors from construction noise will be **scoped out** of the EIA because any such impacts can be effectively managed through controls on the construction methodology.

In addition, the operational phase of the development would not likely generate noise impacts, with any associated vehicle movements for monitoring or maintenance activities likely to be very limited. Therefore, noise impacts during operation of the proposed development will be **scoped out** of the EIA.

In relation to the Severn Estuary and Rhymney River, these are sensitive ecological receptors that support a wide range of protected and notable species, including very substantial populations of wintering birds. Given the immediate proximity of these ecological features to the construction works and large scale and duration of the construction works, there is potential for construction activities and the movement of construction plant to generate elevated noise levels that could cause disturbance of birds and other species utilising these areas. Assessment of likely effects of noise disturbance on ecological receptors will be described in the Biodiversity and Nature Conservation chapter of the ES.

Construction vibration

As well as the potentially noisy operations from construction identified above, where construction works take place in very close proximity to residential receptors, there is potential for likely significant effects arising from the impact of vibration. In particular receptors on Page Drive and Glan Rhymni, and within the Rover Way Traveller's site would be in close proximity to works that could give rise to vibration impacts. Other residential and business properties where piling options are being considered are located within 30-50m of the site extent at Beckgrove Close and Ffordd Pengam. Given the proximity of these receptors, and the increased sensitivity of some receptors as a result of the likely requirement for night-time working in some area, there is potential for effects arising from construction activities in these locations.

However, it is anticipated that vibration from construction activities and vehicle movements can be effectively managed through application of appropriate good construction practices, to be implemented through a Construction Environmental Management Plan (CEMP) and construction Method Statements. These measures will form part of the contract documents controlling the appointment of the construction contractor and prior approval of these documents by Cardiff Council and NRW can be secured through appropriately worded pre-commencement conditions attached to consent approvals for the scheme. Therefore, impacts on residential and business receptors from construction vibration will be **scoped out** of the EIA because any such impacts can be effectively managed through controls on the construction methodology.

In addition, the operational phase of the development would not likely generate vibration impacts, with any associated vehicle movements for monitoring or maintenance activities

likely to be very limited. Therefore, vibration impacts during operation of the proposed development will be **scoped out** of the EIA.

The construction works could also give rise to underwater noise, potentially from beach works and piling. However, the potential noise levels from construction works in the intertidal zone would be minimal given that works would be likely to be undertaken in dry conditions i.e., when the tide is out or fluvial flows are low. Where piling is proposed adjacent to the Rhymney River when the tide is in, there is potential for underwater noise impacts on fish and marine mammals. Assessment of likely effects of vibration on ecological receptors will be described in the Biodiversity and Nature Conservation chapter of the ES.

Construction traffic noise

Initial review of readily available traffic data has indicated no significant changes in traffic flows are likely to arise from bulk material delivery to the site during construction, either for overall increase in traffic or increase in HGV movements. Given that there were no traffic count points for either Rover Way or Lamby Way, the potential significant changes along these links is not currently known. However, given the significant volume of traffic carried by these highways, the proposed development is not likely to generate significant additional traffic movements. Notwithstanding this, given that the construction of the proposed development is likely to generate substantial vehicle movements, and given the lack of construction phase information available at this time, a precautionary approach has been adopted in relation to likely impacts on the local highway network and other highway users. Therefore, a Transport Assessment will be produced to assess construction phase impacts. If significant traffic changes are predicted traffic noise will be **scoped in** to the EIA for further detailed assessment.

13.5.2 Proposed assessment methodology

Construction traffic noise assessment

Depending on the outcome of detailed traffic assessment, a traffic noise assessment would be undertaken to assess impact of the changes in road traffic flows on noise levels, at nearby sensitive residential receptors (specifically in relation to construction traffic). The assessment will be undertaken in accordance with BS 7445-2: 1991 '*Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use*' and the Shortened Measurement Procedure of the Calculation of Road Traffic Noise. Representative existing residential receptor locations are identified and predictions of changes in traffic noise are calculated. Baseline traffic noise measurements would be collected from representative locations to inform the assessment. Change in noise levels at the existing sensitive receptor locations as a result of the development is determined in terms of traffic noise and used to assess the acceptability and significance of the noise impact.

13.6 Light spill and glare

13.6.1 Potential impacts and likely significant effects

As some aspects of the construction are reliant on tidal patterns, it is likely that they would need to be undertaken at low tide. When low tide coincides with the night or low light conditions, particularly during the winter months, construction work areas, construction compounds and haul routes may need to be artificially lit.

Existing street lighting columns are present on Rover Way and Lamby Way and there is already a high degree of existing light pollution from surrounding residential and commercial areas, and so it is unlikely that large areas of the construction site would need to be lit to facilitate night-time working. Lighting units are likely to be concentrated around construction compounds and storage areas, and so it is within these areas where any light spill impacts would be most likely to occur. Typically 7m VT2 or VT Hybrid LED lighting towers are specified

for illuminating areas for construction. These lighting towers provide directional lighting and so can be positioned to minimise light spill.

There are no residential properties in close proximity to the likely compound or storage locations on the Lamby Way Landfill site, and so no further assessment would be required. However the proposed compound and storage location on Rover Way are immediately adjacent to the Rover Way Traveller's site, and so there is potential for light spill impacts to occur on these residential receptors. Although the receptors immediately adjacent to Rover Way are lit by street lighting columns, the receptors to the sides and rear of the Traveller's site are unlit. The closest receptors would be located within 10-20m of the compound and storage locations and are therefore considered potential sensitive receptors to both light spill and glare.

However, it is anticipated that light spill during construction can be effectively managed through application of appropriate good construction practices, to be implemented via a Construction Environmental Management Plan (CEMP) and construction Method Statements. These measures will form part of the contract documents controlling the appointment of the construction contractor and prior approval of these documents by Cardiff Council and NRW can be secured through appropriately worded pre-commencement conditions attached to consent approvals for the scheme. Therefore, it is proposed to **scope out** likely impacts on light spill during construction from assessment within the ES because any such impacts can be effectively managed through controls on the construction methodology.

In addition, the operational phase of the development would not impact upon light spill, with no permanent lighting proposed. Therefore, lighting impacts during operation of the proposed development will be **scoped out** of the EIA.

As well as light spill impacts on human receptors, there could be potential for construction activities undertaken at night to give rise to light spill impacts on ecological receptors in the Severn Estuary and Rhymney River. In particular, there is potential for impacts on wintering bird populations and mammals using the foreshore and bankside areas. Assessment of likely effects of light spill and glare on ecological receptors will be described in the Biodiversity and Nature Conservation chapter of the ES.

13.7 Land contamination

13.7.1 Potential impacts and likely significant effects

A Phase I Preliminary Risk Assessment (PRA)⁷³ has previously been undertaken to determine the presence and likely extent of any potential environmental contamination within the project area and the geo-environmental risks associated with the project. This desk-based study utilised data detailing topography, geology, hydrogeology, and historical mapping combined with site walkover visits.

The key receptors of potential contamination and associated risks comprise the following:

- Workers and site visitors/users who may encounter contaminated materials during construction works.
- The shallow groundwater system may act as a potential pathway for migration of contaminants that may be present in Made Ground deposits.
- Surface water may be affected by encountering higher permeability sand and gravels during construction works (e.g., groundworks), which may allow preferential migration pathways to surface water via groundwater baseflow, or increased groundwater levels upgradient of the new defences. Therefore, the design of the flood defence measures should take account of this in order to avoid disruption or alteration of shallow groundwater flow paths.

⁷³ JBA Consulting, 2017. Cardiff - Geo-Environmental and Geotechnical Desk Study Assessment, January 2017.

- Part of the Lamby Way Landfill site exists within the boundary of the Gwent Levels SSSI. Works should be designed in such a way to avoid creation of potential new migration pathways within the landfill.

Ground contamination, waste management and pollution prevention

There is the potential for encountering contaminated materials within deposits of Made Ground and areas of historic landfilling during construction related activities. Therefore, a range of measures will be adopted during and throughout the construction phase of the works through consideration of the following key aspects:

- Adopting procedures and methodologies to limit the potential for exposure to contaminated materials in the vicinity of the works to protect the construction workforce, site visitors and the surrounding environment;
- Avoiding the creation of potential new contaminant migration pathways during groundworks (e.g. during excavations or piling activities);
- Where construction involves the re-use of site won materials referring to and making use of relevant legislation on waste and guidance such as the CL:AIRE Definition of Waste Code of Practice; and
- Adopting appropriate procedures for dealing with unexpected or unidentified contamination that might potentially be encountered during construction works.

Construction is one of the most significant producers of waste of any industry, creating 25-30% of UK waste by weight⁷⁴. The nature of construction waste can also make disposal difficult – most construction sites will create some waste of a hazardous nature. The proposed scheme therefore has the potential to create significant quantities of waste. Therefore, consideration will be given throughout the design and construction phases of avoiding the creation or excessive quantities of waste; for example, through seeking to re-use site won materials where the opportunity arises.

Plant and vehicles on site during construction have the potential to result in a small increased risk of pollution to the marine environment. In particular, this would relate to the operation of machinery, and the requirement for refuelling. There is a risk of oil leaking from machinery and accidental spillage of fuel, and so there is potential for small quantities of hydrocarbons to escape into the marine environment during construction. Where contained in storage areas, there is also a risk of the potential pollutants to mix with rainwater/sea water, which if inundated during flooding, could become overwhelmed resulting in an unintentional discharge. Given the environmental sensitivities of the marine environment immediately adjacent to and within construction working areas on the site, further assessment of construction activities and working practices would need to be undertaken to ensure that any residual risk of pollution to the marine environment is minimised.

13.7.2 Proposed assessment methodology

Ground contamination

A Phase 1 Geo-Environmental Desk Study has previously been undertaken and a follow-up intrusive geotechnical ground investigation has recently been completed to characterise ground conditions along the line of the proposed defences. As part of the construction related effects assessment, the findings of these investigations will be used to evaluate environmental impact of proposed construction activities. This will include identification of any mitigation measures or requirements that may need to be adopted during future site works as highlighted above, together with the assessment of residual effects on any identified receptors.

⁷⁴ European Commission, 2018. Construction and Demolition Waste (CDW). [Online] Available at: http://ec.europa.eu/environment/waste/construction_demolition.htm

Waste management and pollution prevention

A review of required construction activities, vehicle and plant requirements, together any with waste management and pollution prevention proposals, will be undertaken and used to inform an Outline Construction Environmental Management Plan. Recommendations for the sustainable use of materials and waste management would be provided as part of the review. Reference will be made to best practice CIRIA guidelines provided in *Control of water pollution from construction sites. Guidance for consultants and contractors* (C532D) (Masters-Williams, 2001).

14 Other environmental effects

14.1 Introduction

This chapter considers impacts on receptors that are not considered in each of the other specialist EIA topic chapters. This includes flood risk, land use, and material assets, and also considers the likelihood of major accidents and/or disasters as a result of the proposed development.

14.2 Flood risk

The Severn Estuary SMP policy for the section of coastline affected by the proposed development is to 'Hold the Line' (HTL). This means that the flood defences should be maintained and upgraded or replaced in their current position. Therefore, substantial new flood defences are required to maintain and improve the level of protection currently provided.

The primary objective of the proposed development is to reduce flood risk to local communities, residential and commercial property, and critical infrastructure in the Pengam Green and Tremorfa areas of Cardiff.

The proposed development will improve the standard of flood risk protection for the scheme area to a 1 in 200 year flood event (0.5% AEP) in the year 2117. This will manage flood risk to 2,576 residential and 204 non-residential properties over 100 years, as well as preventing erosion of landfill material, key road/rail infrastructure, and the Rover Way Travellers Site.

In-accordance with Welsh Government policy, a Flood Consequences Assessment (FCA) will be prepared and submitted as part of the planning application for the proposed scheme. It will demonstrate the flood risk associated with the proposed scheme. However, it is not anticipated that the proposed scheme will increase flood risk.

Therefore, this aspect of the water environment will be **scoped out** of the EIA and no assessment of flood risk will be included in the ES.

14.3 Land use

The proposed development will directly permanently impact the coastline of the Severn Estuary and Rhymney River in the scheme area. This will include temporary impacts on adjacent areas immediately landward of the defence line within the construction footprint during the construction of the proposed development. These areas include the historic Frag Tip, which was, until recently, used as motocross track, Lamby Way Landfill, a large area of which is currently being redeveloped as a solar farm, Rover Way and Lamby Way highways, and the Wales Coast Path area. No impacts beyond these areas are likely. Impacts are likely to include temporary changes in land use to facilitate construction access and support construction staff, and to store construction plant and materials. However, these impacts will be temporary and relatively short in duration and the affected areas will be reinstated to their former uses at the end of construction.

As such, no significant impacts on land or land use are anticipated and this aspect will be **scoped out** of the EIA. Therefore, no further assessment of impacts on land use as a result of the proposed development will be included within the ES.

14.4 Material assets

The scheme area contains a range of important and critical infrastructure and other material assets. This includes:

- Critical highways infrastructure – Rover Way, Lamby Way, the A4232, local residential roads.
- The Cardiff to Newport mainline railway.

- DCWW Cardiff East WWTW.
- Utilities infrastructure including power lines, gas pipes, water pipes, and telecommunications cables.
- Lamby Way Recycling Centre.
- The Wales Coast Path.
- Parc Tredelerch.
- Allotments.
- Open green space.

Temporary impacts on the use of many of these assets may occur during construction of the proposed development. In particular, there may be short duration disruption to users of Rover Way, Lamby Way and the A4232 during construction to facilitate certain construction activities and enable construction access. Temporary diversion of the Wales Coast Path from its current alignment west of the Rhymney River will likely be necessary in order to maintain public safety where the path currently passes through the proposed construction footprint. Temporary disruption to utilities infrastructure – pipes and cables – may also occur to facilitate construction and agreement with the relevant utility providers will be necessary to enable such works to proceed.

Likely significant effects on the road network and traffic and transport will be assessed as part of the EIA (see Chapter 12 for further information). Impacts on other material assets in the scheme area are not likely to be significant. Any such impacts can be effectively managed through application of appropriate good construction practices, to be implemented via a Construction Environmental Management Plan (CEMP) and construction Method Statements. These measures will form part of the contract documents controlling the appointment of the construction contractor and prior approval of these documents by Cardiff Council and NRW can be secured through appropriately worded pre-commencement conditions attached to consent approvals for the scheme.

Therefore, it is proposed to **scope out** material assets assessment within the ES because any associated impacts can be effectively managed through standard controls on the construction methodology.

14.5 Risk of major accidents and/or disasters

The risk that the proposed scheme would cause a significant accident (defined as causing significant damage e.g., loss of life or permanent injury and/or permanent or long-lasting damage to an environmental receptor that cannot be restored through minor clean up and restoration efforts) is likely to be low.

Taking account of the location and characteristics of the proposed development and the likelihood of significant environmental effects outlined in this Screening & Scoping Report, the only risks identified relate to:

- Potential accidents during the construction phase resulting in disturbance, injuries and/or fatalities to construction workers or members of the public;
- A major flood event that could flood areas of built development or essential infrastructure;
- Road traffic accidents; and
- Pollution incidents during the construction phase, resulting in potential pollution migration and adverse effects on specific receptors, including soils, habitats, and species.

Health and safety is a key consideration in the construction sector and will be managed in accordance with legal requirements and best practice. It is proposed that a CEMP will be submitted with the ES and will outline methods to avoid, minimise, and mitigate construction

effects on the environment. This document will be updated as the project progresses to enable the plan to be effective and account for any changes that occur during construction works. Potential major risks related to the proposal are therefore considered to be addressed and the proposed development is not considered to be vulnerable to major accidents and/or disasters with the potential to lead to significant adverse environmental effects. Therefore, this aspect will **scoped out** of the EIA.

15 Cumulative effects

15.1 Introduction

Regulation 17(3) of the EIA Regulations requires with reference to paragraph 5 of Schedule 4, a consideration of cumulative effects is included in the Environmental Statement:

'A description of the likely significant effects of the development on the environment resulting from...(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources...

The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(1) and Directive 2009/147/EC(2).'

Cumulative effects are therefore assessed with regard to: (i) the environmental impacts of the development proposals when considered cumulatively with the environmental impact of other existing adjacent and approved developments at the time of submission of the ES; and (ii) the cumulative effect of inter-relationships between different environmental impacts considered in the ES.

Regarding (i), the spatial and temporal scope of the EIA would take into account the following:

- the physical extent of the proposed works, as defined by the limits of land to be used (temporarily or permanently) as denoted in the planning application by the Red Line Boundary ('development boundary') of the site;
- the nature of the existing baseline environment, including the location of sensitive receptors;
- the geographical extent of impacts beyond the site, e.g. effects from traffic, visual effects and disturbance of ecological receptors;
- the geographical boundaries of the political and administrative institutions and authorities, which provide the planning and policy context for the project; and
- the timing of the works.

Cumulative effects would therefore consider the impacts of any other committed developments where these would coincide with the temporal and spatial scope of the development proposals. The environmental impacts of the respective developments are assessed collectively on individual receptors to determine where this could give rise to likely significant effects, which would otherwise be not significant.

15.2 Baseline conditions

15.2.1 Inter-relationship effects between topics

The following interrelationship effects have been identified at this stage and would be assessed in detail in the Environmental Statement (Table 15-1).

Table 15-1: Inter-relationship cumulative effects identified at the EIA Scoping stage

Issue	Relevant EIA topics	Potential impacts for detailed assessment
Climate change adaptation	Chapter 6: Climate Change Chapter 7: Geomorphology and Coastal Processes Chapter 8: Biodiversity and	Future patterns of sediment erosion and deposition along the Rhymney River and Severn Estuary coastline resulting from the interaction of the coastal/fluvial defences with change to climatic

Issue	Relevant EIA topics	Potential impacts for detailed assessment
	Nature Conservation	conditions. Impact of coastal squeeze on ecological receptors and designations.
Climate change resilience	Chapter 6: Climate Change Chapter 7: Geomorphology and Coastal Processes Chapter 8: Biodiversity and Nature Conservation	Protection of environmental receptors from the effects of future climate change.
Construction impacts within the water environment	Chapter 7: Geomorphology and Coastal Processes Chapter 8: Biodiversity and Nature Conservation Chapter 13: Construction Related Effects	Pollution of the water environment caused by release of site runoff or contaminants into the environment during construction. Impact on WFD and ecological designations as a result of construction sediment disturbance resulting in increased levels of sediment entrainment, suspension turbidity and deposition.
Alteration of coastal processes	Chapter 7: Geomorphology and Coastal Processes Chapter 8: Biodiversity and Nature Conservation	Long-term impact of changes to baseline patterns of sediment erosion, transportation and deposition on ecological receptors and designations.
Construction road traffic impacts on the wider environment	Chapter 6: Climate Change Chapter 12: Traffic and Transport	Impact of bulk material construction road traffic on carbon emissions. Impact of construction traffic noise on sensitive environmental receptors.
Multiple construction stage impacts on human receptors	Chapter 3: Climate Change Chapter 13: Construction Related Effects	Combined impact on residential receptors arising from construction stage impacts relating to noise, vibration, dust, congestion, visual and night-time light spill.

15.2.2 Cumulative effects with other committed developments

A search of Cardiff Council planning applications⁷⁵ undertaken on the 8th December 2020 identified several developments which may cause cumulative effects. Development projects that meet the above criteria have been identified as (further details provided in Table 15-2):

- 19/00397/MJR – Installation of a ground-mounted photovoltaic solar farm and ancillary development;
- 18/02065/MJR – Proposed industrial building (class B2) to house scrap metal sorting machinery, in addition to related works, associated with existing site use;
- 17/02130/MJR – The removal of fill material and the construction of a biomass power plant (up to 9.5MW) and a maximum of 130,000Sq.ft of industrial accommodation (B8 Use Class), new access roads and associated landscape works.

NRW publishes lists⁷⁶ of Marine Licence applications received and determined. As of the 18th January 2021, there were no marine licenses of concern with regards to the proposed development.

The National Infrastructure Planning⁷⁷ website was also consulted to check for proposed major infrastructure projects within England and Wales. National Infrastructure Planning is responsible for assessing Nationally Significant Infrastructure Projects (NSIPs). The closest such project is the Cardiff Tidal Lagoon. A planning application is yet to have been submitted

⁷⁵ <https://planningonline.cardiff.gov.uk/online-applications/>

⁷⁶ <https://naturalresources.wales/permits-and-permissions/marine-licensing/applications-received-and-determined/?lang=en>

⁷⁷ <https://infrastructure.planninginspectorate.gov.uk/>

for the project, and as such, it is not assessed further within this report. No other NSIPs identified on the National Infrastructure Planning website are considered likely to be of relevance to the proposed development.

Table 15-2: Relevant planning applications within close proximity to the proposed development

Reference No.	Description	Location	Cumulative effects	Status
19/00397/MJR	Installation of a ground-mounted photovoltaic solar farm and ancillary development.	Lamby Way Landfill Site, Lamby Way, Wentloog, Cardiff, CF3 2HP	Potential to increase construction-related traffic along similar routes. Noise and air quality impacts from both schemes could impact upon residents of Pengam and Tremorfa and users of the Wales Coast Path. Noise, vibration, air quality and lighting impacts on Severn Estuary Ramsar, SAC, SPA and SSSI, Gwent Levels – Rumney and Peterstone SSSI, River Rhymney SINC and Lamby Saltmarsh SINC.	Permission Granted
18/02065/MJR	Proposed industrial building (class B2) to house scrap metal sorting machinery, in addition to related works, associated with existing site use.	Sims Metal, UK Metal Recovery Plant, Rover Way, Pengam, Cardiff, CF24 2RX	Potential to increase construction-related traffic along similar routes. Could create cumulative noise impacts on Pengam Moors SINC	Permission Granted
17/02130/MJR	The removal of fill material and the construction of a biomass power plan (up to 9.5MW) and a and a maximum of 130,000sqft of industrial accommodation (B8 Use Class), new access roads and associated landscape works.	Land at Rover Way, Pengam	Potential to increase construction-related traffic along similar routes. Potential to create cumulative noise, vibration, air quality and lighting disturbance to Severn Estuary Ramsar, SAC, SPA and SSSI and Pengam Moore SINC. Potential to result in cumulative disturbance to users of the Wales Coast Path arising from either concurrent diversions or noise and light impacts arising from construction. Potential pollution events from both schemes could create significant cumulative impacts on designated sites.	Permission Granted

15.3 Assessment methodology and assessment criteria

15.3.1 Cumulative effects with other committed development

Committed development that overlap spatially and temporally with the proposed scheme will be assessed in detail for cumulative effects in the ES. The additive and interactive effects between the proposed scheme and other developments will be included in the cumulative effects assessment.

The cumulative effect of inter-relationships between multiple environmental impacts would consider any impacts assessed individually, the synergistic effect of which would either be made greater as a result of the cumulative effect on the individual receptors, or which otherwise would not be considered significant on its own.

16 Conclusions

16.1 EIA scoping outcomes

The EIA Scoping Report provides an overview of the potential for likely environmental impacts and effects of the proposed development. Based upon this, a professional judgement was made on which these topics or particular aspects of them can be 'scoped in' and those that can be 'scoped out' of the EIA.

A summary of the environmental issues which will comprise the technical scope of the EIA and reported in the ES are set out in Table 16-1.

Environmental issues that are 'scoped in' require further detailed technical studies undertaken to inform the ES. Where environmental issues are 'scoped out', these would not be considered further unless there is a material change in the development proposals.

Table 16-1: Summary of environmental issues screened in/out of EIA

Topic	Likely significant effect	Construction	Operation
Key: Scoped in (✓); Scoped out (×); Provisionally scoped in but requiring further information (?✓)			
Climate change	Greenhouse gas emissions.	✓	×
	Future GHG emissions associated with adapting the proposals beyond the design life.	×	×
	Impacts relating to climate change adaptation.	×	✓
	Impacts relating to climate change resilience.	✓	✓
Geomorphology and coastal processes	Impacts associated with sediment erosion, transport, and deposition.	✓	✓
	Impacts on coastal processes.	✓	✓
	Impacts on fluvial geomorphology.	✓	✓
	Impacts on biological WFD quality elements.	✓	✓
	Impacts on chemical WFD quality elements/water quality.	✓	×
	Impacts on hydromorphological WFD quality elements.	✓	✓
	Impacts on bathing water quality.	×	×
Biodiversity and nature conservation	Physical damage or disturbance to intertidal habitats within the proposed development site.	✓	✓
	Permanent loss of intertidal habitat.	✓	✓
	Impacts on wintering and migratory bird species arising from loss of habitat.	✓	✓
	Impacts on the features of the adjacent Severn Estuary European Marine Site and SSSI	✓	✓
	Non-physical (air/noise/vibration/lighting) disturbance to wintering and migratory bird species.	✓	✓
	Non-physical (air/noise/vibration/lighting) disturbance to aquatic/marine and terrestrial species.	✓	✓
	Spread of non-native invasive species.	✓	×
	Impacts on terrestrial and marine mammals.	✓	×
	Impacts on fish and nursery habitat.	✓	×
	Physical disturbance to other habitats and species within and adjacent to the site.	✓	×
Landscape and visual	Effects on landscape features.	✓	✓
	Effects on landscape character (including marine	✓	✓

Topic	Likely significant effect	Construction	Operation
	character areas).		
	Effects on visual receptors	✓	✓
Cultural heritage	Direct impacts on features of archaeological interest.	✓	x
	Indirect setting impacts on Rumney Great Wharf Relict Seawall Scheduled Monument.	x	x
	Indirect impacts on listed buildings and conservation areas.	x	x
Traffic and transport	Severance.	?✓	x
	Driver delay.	?✓	x
	Pedestrian delay.	?✓	x
	Pedestrian amenity.	?✓	x
	Fear and intimidation.	?✓	x
	Accidents and safety.	?✓	x
Population and human health	Reduction in flood risk and coastal erosion impact on the local community, commercial properties and highways infrastructure.	x	x
	Construction jobs creation in the local area with knock on benefits to local amenity.	x	x
	Potential temporary loss of access along the Wales Coast Path during construction.	x	x
	Affects to the recreational use of the Rhymney River during construction.	x	x
	Potential to deliver improvements to public access and recreational amenity within the area including safeguarding the Wales Coast Path and potentially delivering improvements.	x	x
Construction-related effects	Air quality impacts on (non-ecological) sensitive receptors from dust emissions and vehicle/machinery emissions.	x	x
	Traffic noise impacts from delivery of bulk materials during construction.	?✓	x
	Terrestrial noise impacts on (non-ecological) sensitive receptors from noisy construction activities.	x	x
	Vibration impacts as a result of piling and other construction activities in close proximity to (non-ecological) sensitive receptors.	x	x
	Impacts on (non-ecological) sensitive receptors as a result of light spill during night time construction activities.	x	x
	Impacts on sensitive receptors as a result of land contamination and ground stability issues.	✓	✓
	Vulnerability impacts arising from the potential for marine pollution.	✓	x
	Impacts associated with bulk waste generation and disposal.	✓	x
Cumulative effects	Cumulative effect from other proposed developments.	✓	✓
	Interrelationship effect on a single resource/receptor when combined with other effects of the proposed scheme.	✓	✓

16.2 Recommended content and structure of the Environmental Statement

The combined EIA Screening and Scoping Report considered the potential for likely significant effects associated with the development proposals. An appropriate scope for assessing the likely significant effects is set out, and the Scoping Request now seeks the views of the Statutory Environmental Consultees. As well as EIA scope, the EIA Screening and Scoping Report also sets out a proposed content and structure of the ES, which is summarised as follows.

In accordance with Regulation 17(3) of the aforementioned Town & Country Planning EIA Regulations (Wales), and Regulation 12(2) of the Marine Works EIA Regulations, the ES shall contain:

- (a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;
- (b) a description of the likely significant effects of the proposed development on the environment;
- (c) a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
- (d) a description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment;
- (e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and
- (f) any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.

The Non-Technical Summary (NTS) will summarise the development proposals, its likely significant environmental effects, and the proposed mitigating measures in non-technical language. The NTS is intended to inform those who have an interest in the development but who are not concerned with the detail of the technical assessment provided in the ES. The NTS will be provided as a stand-alone document and in an electronic format.

The ES will be organised on an environmental topic basis as set out in Regulation 4(2). For each environmental topic, a brief overview of the legislative and planning policy context will be provided as required to set the context of the topic chapter. The topic-specific baseline conditions will be used to inform the assessment, and the potential impacts and likely significant effects of the proposed development on the environment will be determined for each of the 'scoped' in environmental issues, plus any relevant additional information that has come to light. Mitigation measures will be proposed to reduce the significance of effects where possible, and the resulting residual effect will be reported. The approach to EIA is iterative, whereby the assessment and ongoing consultation with stakeholders influence the design evolution of the development proposals. Further detail on the EIA process is provided in Section 5.1.

For consistency and ease of cross reference, each environmental topic chapter presented in the ES will be structured with the following headings:

- X.1 Introduction
- X.2 Legislative and Planning Policy Context
- X.3 Baseline Conditions
- X.4 Assessment Methodology and Significance Criteria

- X.5 Potential Impacts and Significant Effects
- X.6 Mitigation Measures
- X.7 Residual Effects

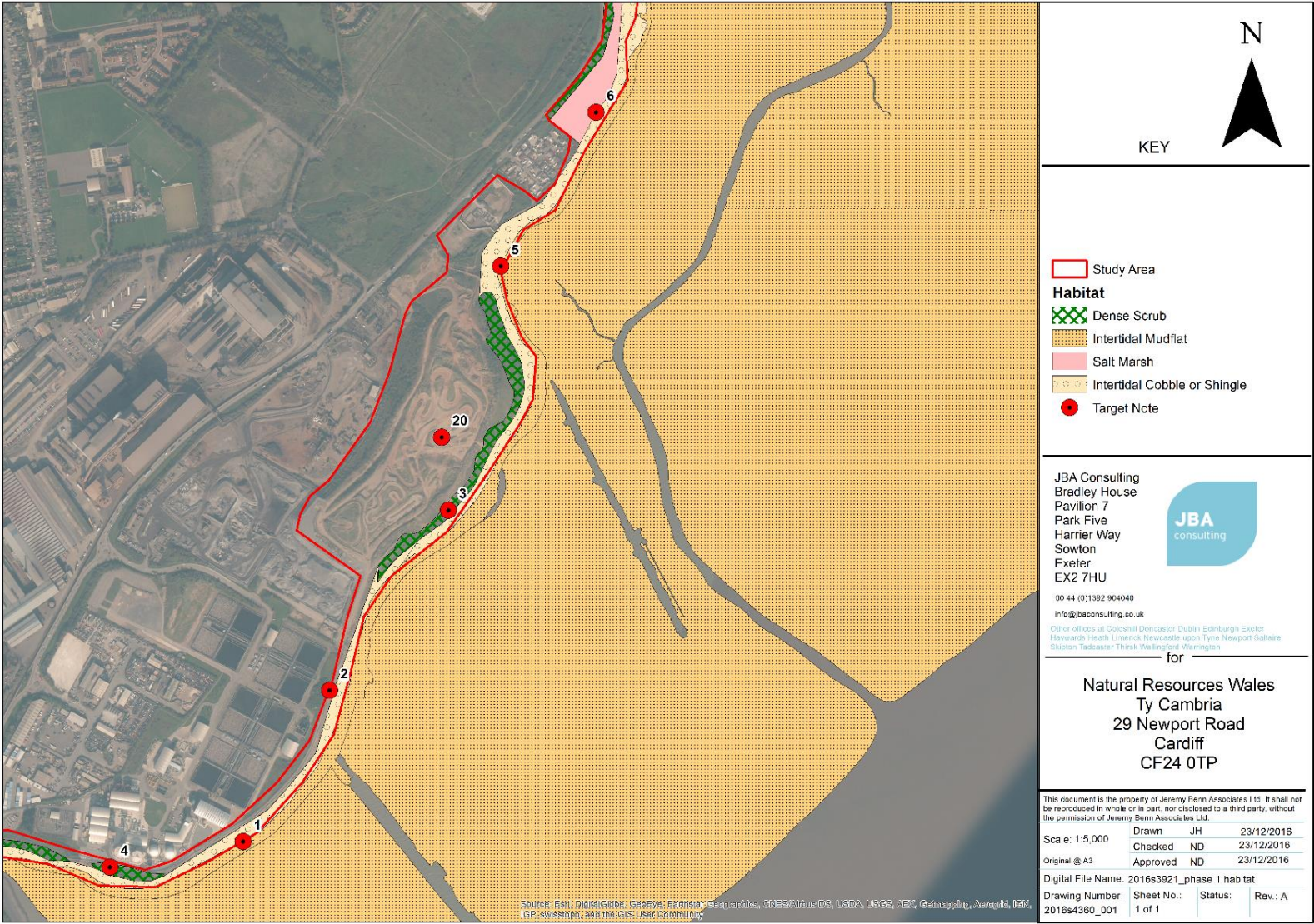
The proposed structure of the ES is set out below:

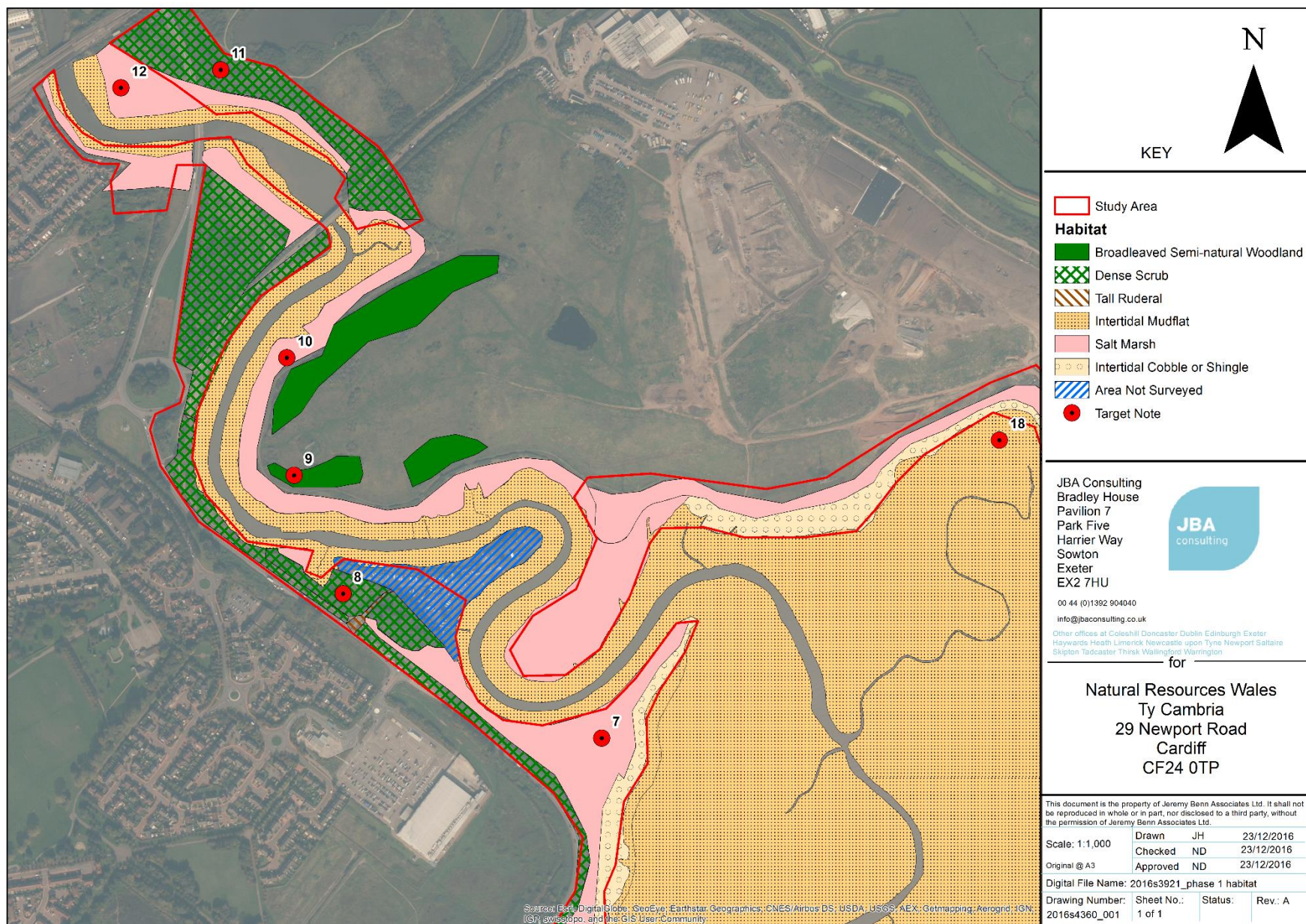
Non-Technical Summary

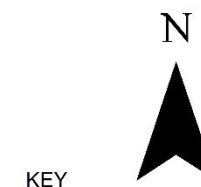
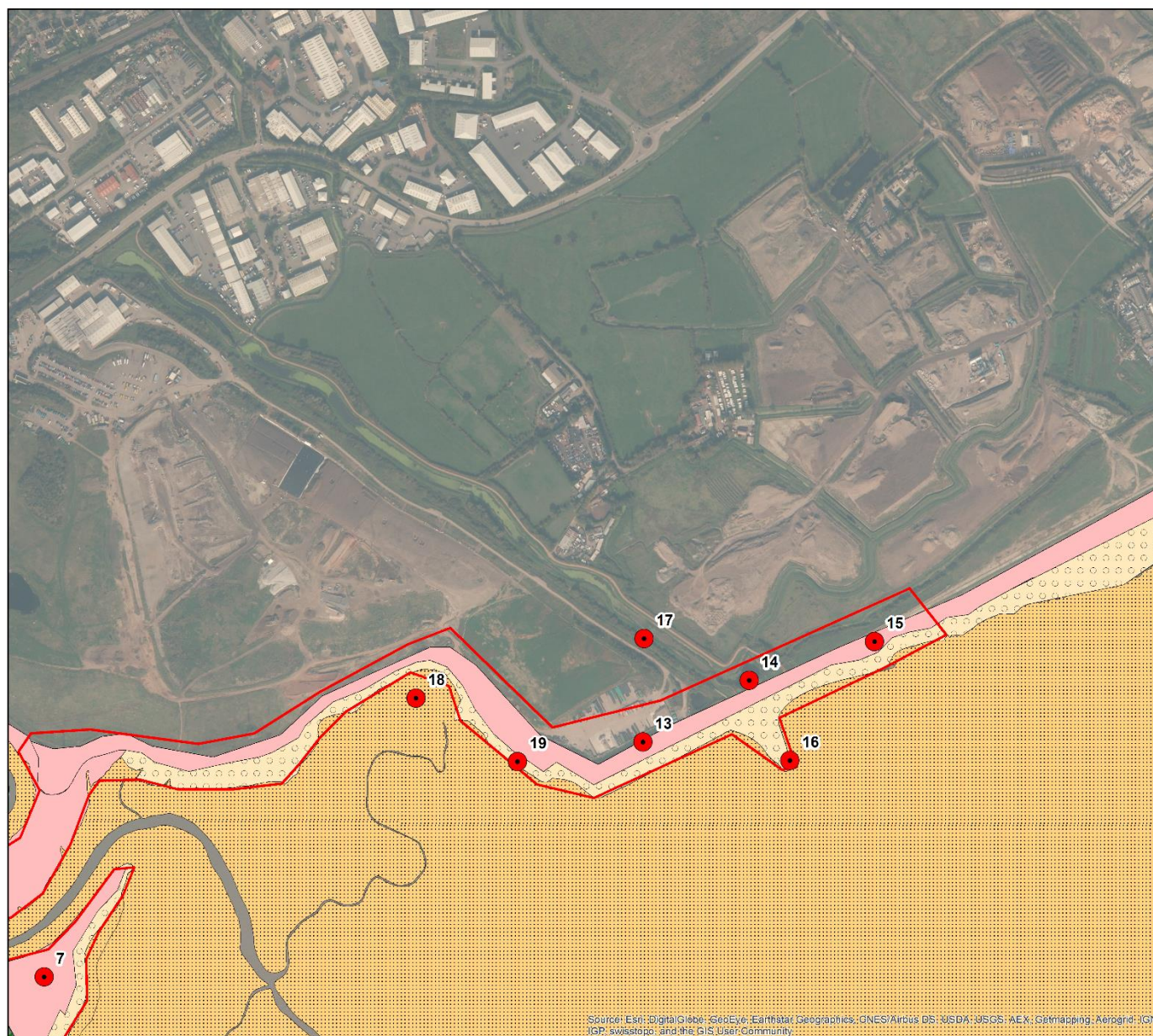
Chapter 1	Introduction
1.1	Background
1.2	Site description and history
1.3	Legislative basis of the Environmental Statement
1.4	Scope and content of the Environmental Statement
1.5	Related Technical Information
Chapter 2	The proposed development
2.1	Planning policy context
2.2	Environmental constraints
2.3	Alternatives and design evolution
2.4	Description of the proposed development
Chapter 3	Environmental Impact Assessment methodology
3.1	The EIA process
3.2	EIA screening and scoping
3.3	The Environmental Statement
3.4	EIA method of assessment
Chapter 4	Climate change
Chapter 5	Geomorphology and coastal processes
Chapter 6	Biodiversity and nature conservation
Chapter 7	Landscape and visual impact
Chapter 8	Cultural heritage
Chapter 9	Traffic and transport
Chapter 10	Construction related effects
Chapter 11	Cumulative effects
12.1	Interrelationship effects between topics
12.2	Cumulative effects with other committed developments
Chapter 12	Conclusions

A Appendix A: Environmental Constraints Plan

Appendix B: Phase I Habitat Map







KEY

- Study Area
- Habitat**
- Dense Scrub
- Intertidal Mudflat
- Salt Marsh
- Intertidal Cobble or Shingle
- Target Note

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Scale: 1:5,000	Drawn: JH	23/12/2016
	Checked: ND	23/12/2016
Original @ A3	Approved: ND	23/12/2016

Digital File Name: 2016s3921_phase 1 habitat

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