Central Rhyl Coastal Defences

EIA Screening and Scoping Report

February 2021

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1 Introduction

1.1 Background

This Environmental Impact Assessment (EIA) Screening and Scoping Report has been prepared by Mott MacDonald Ltd for Balfour Beatty Civil Engineering Ltd (BB) on behalf of Denbighshire County Council (DCC) to accompany a request for an EIA combined Screening and Scoping Opinion. It sets out the proposed scope of the EIA to be undertaken in respect of the Central Rhyl Coastal Defences Scheme (hereafter referred to as the 'Scheme').

The Scheme, located in the central area of Rhyl waterfront, Denbighshire, North Wales, is dependent on obtaining sufficient funding and comprises coastal defence works in the form of new rock armour, stepped concrete revetment, promenade raising, sea wall works, access and promenade improvements, along with associated tie-in works.

Following the completion of an internal EIA Screening exercise it was determined that given both the size of the Scheme and the potential for significant environmental effects, an EIA would be required. Given the time pressures for the Scheme, this report combines both the internal EIA Screening Opinion and subsequent EIA Scoping Report to accompany the EIA Screening and Scoping Opinion Request. The EIA scoping process brings together the results of early desk-based assessments and previous works completed which enable the proposed scope and methodology of the EIA to be established.

1.2 The Scheme

Rhyl is a Victorian coastal resort and the largest town in Denbighshire, with a well-established history as a tourist destination. There are ongoing and future plans to regenerate Rhyl to enhance its appeal to tourists and investors, however the coastal defences for the Central Rhyl frontage are deteriorating and there is therefore the risk that this integral asset for Rhyl's regeneration could be lost without intervention.

Historically, Central Rhyl has been protected from coastal flooding by hard engineered defence structures constructed from at least the 1950s onwards. These comprise a series of stepped revetments, recurve walls and vertical walls in various states of repair.

The Central Rhyl defences no longer meet acceptable performance standards and are currently deteriorating with defects associated with the structures consistent with the age and materials of the structure (e.g. spalling, honeycombing, corrosion of rebar). In addition, beach lowering processes have been noted, leaving the toe of the defence vulnerable to failure through scour and beach lowering in the short term.

The central section is no longer able to prevent wave overtopping for the desired standard of protection under present day conditions. With climate change resulting in increased sea levels and storm frequency/severity, the future effectiveness of the existing defences will continue to decline. The structures are likely to deteriorate to such a condition that failure would occur by the year 2068 if the current maintenance regime continues (in a "Business as Usual" scenario). However, if the maintenance is withdrawn (in a "Walkaway" scenario), the structures will deteriorate over a shorter timeframe, and are likely to fail by the year 2038. Once the current defence structures are compromised, the coastline will recede leading to loss of the promenade and associated assets including the Wales Coastal Path and National Cycle Route 5. Failure and subsequent breach of the defences would lead to an increase in flood risk to people and

property in the central Rhyl area which would have a significant impact on the tourism economy of central Rhyl and the wider North Wales area.

Therefore, subject to funding this Scheme aims to improve the existing coastal defences to provide increased flood and erosion protection to people and property in Rhyl along with supporting local regeneration, achieving wider community benefits alongside flood risk management. The Scheme is proposed to manage flood risk to 548 residential and 44 non-residential properties over 100 years and manage erosion to key tourism infrastructure.

1.3 Location and Context

The Scheme includes the area from the eastern section of the West Rhyl Coastal Defence Scheme to the western edge of the East Rhyl Coastal Defence Scheme (currently under construction) as represented within Figure 1.1.

Figure 1.1: Scheme Location

Source: Central Rhyl Coastal Defence Scheme OBC, DCC, October 2019

The proposed Scheme Red Line Boundary (RLB) (maximum extent) is included as Figure CR-MMD-00-00-DR-EN-3006 within Appendix A.

It should be noted that given site access points across the promenade and construction compound locations have not yet been finalised, the RLB includes a conservative landward boundary following the edge of the principal promenade highway with some additional areas for potential compound locations. It is anticipated that for the ES production, the Scheme RLB would be rationalised to include the area of permanent construction plus the minimum intertidal and promenade working areas possible, construction compound areas and access locations from the promenade highway.

The national grid references for the western and eastern Scheme boundaries are (300223,381323) and (301998,382433) respectively. The Scheme is located along approximately 2.15km of coastline from the western end of the children's play area near River Street in the west to Tynewydd Road in the east. The existing coastal defences to the west of the play area (where the Scheme joins with the West Rhyl Coastal Defence Scheme, referred to as Section I on Drawing CR-JBA-01-00-DR-C-3001 in Appendix A) are not currently proposed to be modified.

The area of permanent construction is located along the beach adjacent to and over the northern-most area of the promenade. In this area, the beach predominantly comprises intertidal soft sediment and sand with some intertidal gravel and cobbles, predominantly at the landward edge. There are a limited number of slipways for vehicular beach access.

The long (and in sections heavily developed) promenade and the associated National Cycle Route 5 and Wales Coast Path follow the waterfront from the link with the West Rhyl Coastal Defence Scheme in the west through to the eastern transition to the East Rhyl Coastal Defence Scheme area. From west to east notable developments along the promenade to the immediate south of the Scheme include the Drift Park, Sun Centre 2, Sky Tower, Vue Cinema, Children's Village and Rhyl Central car park, SeaQuarium, Rhyl Events Arena, Skatepark, Green Bowls Centre, RNLI Lifeboat Station, war memorial, public house, Travelodge and Pavilion Theatre.

The principal highways bounding the southern side of the promenade are West Parade for the western half of the Scheme area (west of the SeaQuarium) and East Parade becoming Marine Drive to the far east.

1.4 Environmental Sensitivity – Overview

The area of permanent construction is not located within a European Site of Conservation Importance, however the Liverpool Bay Special Protection Area (SPA) is located approximately 350m northwards from the sea wall at its closest point which is designated for its over-wintering, migratory and breeding bird populations.

In addition, the River Dee Estuary Special Area of Conservation (SAC) and SPA is located approximately 5.0km east of the Scheme, designated for the tidal river and intertidal habitats and species it supports. Gronant Dunes and Talacre Site of Special Scientific Interest (SSSI) and Gronant Dunes Local Nature Reserve (LNR) are also located within this area.

The Kinmel Dunes LNR is located to the west of the Clwyd Estuary, approximately 900m west of the western Scheme boundary and the Brickfields Pond LNR is located around 1.2km to the south-east at its closest point. Local Wildlife Sites (LWS) are also present in the area.

With regard to designated heritage assets, there are a number of Grade II listed buildings along the promenade and wider area, of which one (the war memorial) is located on the promenade itself. There are also two aircraft crash sites and two conservation areas (Rhyl Central and Rhyl, River Street) in close proximity to the promenade. A number of undesignated assets including archaeological finds and shipwrecks are also present in the area along with the potential for palaeo-environmental remains and other foreshore structures.

The Scheme is located in close proximity to residential and business properties, the Royal Alexandra Hospital and a number of care homes.

The Rhyl beach area is frequently used by both residents and visitors. The Wales Coast Path and National Cycle Route 5 run along the promenade within the Scheme area.

More detailed baseline environmental information specific to each environmental discipline is located within Chapters 7 to 17. An Environmental Constraints Plan is provided in Appendix A of the Preliminary Environmental Impact Report (PEIR, located in Appendix D of this report).

1.5 Aim of EIA Scoping Process

EIA Scoping forms the second stage in the EIA process after Screening and involves identifying the environmental disciplines that should be considered within the EIA through the consideration of environmental factors and potential existing and/or new receptors. EIA scoping initiates the process of defining the potential for significant effects, which in turn results in the identification of the environmental factors which require consideration and assessment as part of the EIA.

Under Regulation 15 of the Town and Country Planning (EIA) (Wales) Regulations 2017 and also according to the Marine Works EIA Regulations 2007 (as amended), hereafter referred to together as the 'EIA Regulations', (unless specific reference needs to be made to one or the other specifically in which case they will be referred to as the 'T&CP EIA Regulations' and the 'MW EIA Regulations' respectively) "*a person who is minded to make an EIA application may ask the (appropriate authority) to state in writing their opinion as to the scope and level of detail of the information to be provided in the environmental statement (a "scoping opinion")*.

1.6 Report Objectives

The objectives of this Report are to:

- Set out the proposed scope of the EIA (i.e. identify which environmental disciplines are to be 'scoped in' or 'out'), taking into account what is currently known about the application site and the Scheme;
- Facilitate consultation with the Local Authority (DCC), Natural Resources Wales (NRW) and other relevant statutory and non-statutory bodies on the environmental issues to be addressed as part of the EIA and design development process;
- Set out what additional information needs to be collected (i.e. through desk-based studies or field survey work) to characterise the baseline environment of the application site;
- Define the assessment methods to be used to determine the likely significant environmental effects of the Scheme;
- Identify potential effects and opportunities for mitigation; and
- Set out the proposed structure of the Environmental Statement (ES).

1.7 Report Structure

Following the introduction, this report covers the following key areas:

- Chapter 2: Proposed development scope – outlines the high level specification of the Scheme based on current design information available;
- Chapter 3: Planning context summary – covers both national and local planning policy;
- Chapter 4: Overview of EIA screening and scoping – establishes the approach undertaken to date;
- Chapter 5: Consultation; and
- Chapter 6: Potential for cumulative effects.

Subsequent to this, each environmental discipline undergoes a scoping assessment which comprises an introduction to the discipline and definition of the study area, summary of the

baseline conditions along with any assumptions/limitations followed by a brief assessment of the likely effects relating to the Scheme according to current legislation and guidance, identification of supplementary mitigation measures that should be considered and identification of any supporting work required.

- Chapter 7: Air Quality;
- Chapter 8: Archaeology and Cultural Heritage;
- Chapter 9: Biodiversity;
- Chapter 10: Climate;
- Chapter 11: Coastal Processes;
- Chapter 12: Geology and Soils;
- Chapter 13: Landscape and Visual;
- Chapter 14: Materials and Waste;
- Chapter 15: Noise and Vibration;
- Chapter 16: Population and Health; and
- Chapter 17: Traffic, Transport and Access.

Following the scoping assessments, the proposed final scope and the necessary actions required in order to align the ES with the EIA Regulations is summarised in Chapter 18 and a list of abbreviations and acronyms used throughout this report is provided in Chapter 19.

Appendices provided comprise the following:

- Appendix A: Supporting Drawings;
- Appendix B: Outline EIA methodologies are provided for each EIA discipline;
- Appendix C: Outline Business Case (OBC) Report, DCC, October 2019;
- Appendix D: Central Rhyl Coastal Defences – preliminary Environmental Impact Report, JBA Consulting, April 2019, including the following as appendices:
  - Environmental Constraints Plan;
  - NRW Consultation Response;
  - Landscape Appraisal and Indicative Landscape Plan;
  - Preliminary Ecological Appraisal;
  - Habitats Regulations Assessment Screening Appraisal;
  - Heritage Desk Based Assessment; and
- Appendix E: 2018s1313 / 2018s1347 - Central Rhyl and Central Prestatyn Coastal Processes Report, JBA Consulting, November 2018.

1.8 List of Appended Drawings

Drawings (as included in Appendix A):

- Red Line Boundary Drawing CR-MMD-00-00-DR-EN-3006; and
- Coastal Defence Works Drawings (preliminary arrangements and sections subject to change during detailed design):
  - Central Rhyl OBC Shortlist Option 3 – Concept Design, CR-JBA-01-00-DR-C-3001 (Preferred Option, illustrating the location and extent of the proposed rock-toe and concrete revetment solutions);

- Central Rhyl OBC Shortlist Option 2 – Concept Design, CR-JBA-01-00-DR-C-2001 (included for the purpose of illustrating the typical concrete revetment detail only); and
- Central Rhyl OBC Shortlist Option 1 – Concept Design, CR-JBA-01-00-DR-C-1001 (included for the purpose of illustrating the typical rock toe detail only).

2 Proposed Scheme

2.1 Scheme Critical Success Factors

The October 2019 OBC (Appendix C) defines the Critical Success Factors for the Scheme as follows:

- "*Must comply with Shoreline Management Plan and DCC local flood risk management plans;*
- *Must be economically viable option to manage coastal erosion and flood risk;*
- *Must match the capacity of potential suppliers to deliver;*
- *Must be affordable by DCC and Welsh Government;*
- *Must be technically feasible and sustainable in the long-term;*
- *Must minimise impacts on the environment and provide enhancements where possible; and*
- *Must assist the economy… by working with tourism and amenity use*."

2.2 Option Selection

A longlist of options to manage the flood and erosion risk was developed and from this extensive list, a shortlist was chosen to take forwards including the "Walkaway" and "Business as Usual" baseline options.

Following this process, the selected option comprised a combination of raising the promenade with a new concrete sea wall and new stepped revetment mainly to the west side of the project area and rock armour scour protection and concrete repairs mainly along the east side of the project area:

- Scour protection and concrete repairs: Under this option, concrete repair works to the existing defences would be undertaken to extend the residual life of the defence, and rock armour scour protection would be added to the defence toe to manage scour and prevent undermining and failure of the defence. Through prevention of erosion and failure of the defences this option would maintain the amenity value of the frontage.
- Raised promenade with new sea wall and stepped revetment: This would involve placing a precast concrete stepped revetment over the existing seawalls to create a higher promenade along the seafront and to help dissipate wave energy. The design of this option would help prevent erosion of the revetment toe, as well as reduce the risk of wave overtopping and still water flooding and enhancing the amenity value of the seaside town. At the rear of the raised promenade new retaining walls would be installed to provide a higher crest level and improve flood protection. National Cycle Route 5 along with the Wales Coastal Path would be integrated into the defence.

Through maintaining the promenade, access to the beach, the Wales Coastal Path, National Cycle Route 5 and the many amenity assets located along the seafront, the Scheme would support the regeneration plans of this deprived coastal town and support the Council's obligations under the Well-Being of Future Generations (Wales) Act 2015.

2.3 Scheme Scope

The coastal and promenade general arrangement and typical cross-section drawings as listed in Section 1.8 should also be referred to.

2.3.1 Coastal Works

The current design in summary includes the following key features:

- The construction of rock armour scour protection and concrete repairs along sections A to D (approximately 7m in cross sectional width and approximately 1.45km in length);
- The construction of a new concrete revetment along sections E to H (approximately 15m in cross sectional width and approximately 750m in length);
- New pedestrian beach accesses through the proposed revetments to replace the existing ones and extension of existing beach accesses through the rock armour scour protection; and
- The extension of outfalls and protection works to existing outfalls that would be covered by the new revetment.

2.3.2 Promenade Works

The current design in summary includes the following key features:

- Raised promenade from opposite the Drift park to the SeaQuarium (section E to H of the OBC) for coastal protection purposes with consideration for climate change;
- New rear seawalls at the back of the promenade opposite Drift park to the SeaQuarium for coastal protection purposes;
- New flood gates for access points through the new rear seawalls opposite Drift park to the SeaQuarium for coastal protection purposes;
- New retaining structures where appropriate at the back of the promenade opposite Drift park to the SeaQuarium to accommodate level differences between the raised promenade and existing;
- New ramps or steps to provide access to raised promenade opposite Drift park to the SeaQuarium;
- Repair work to existing seawalls opposite the Events Arena and Splash Point (section A to D of the OBC); and
- Consideration for future provision of concession buildings along the promenade opposite Drift park to the SeaQuarium

2.3.3 Other Works

In addition, the following works are being considered as part of the Scheme:

- Enabling works;
- Civils work for footpath / cycleway / highway tie ins;
- Drainage alterations to accommodate the above;
- Signage and surface markings for the above;
- Diverting or raising or protection works to existing services;
- Street lighting works;
- Landscape works / considerations;
- Public realm works / considerations where appropriate; and
- Environmental enhancements where appropriate.

2.3.4 Management and Maintenance

The Scheme also includes future management and maintenance actions comprising:

- Inspection, maintenance and repair of coastal defence structures;
- Inspection, maintenance and repair of Promenade and sea wall;
- Inspection, maintenance and repair of accesses, drainage, highways, lighting and other minor assets;
- Management of wind-blown sand;
- Maintenance of landscaping; and
- Beach management.

2.4 Preliminary Methodology

Design for the Scheme is currently ongoing and the following high-level information is based on our current best understanding. The below is a preliminary outline methodology only and is subject to detailed design, amendment, consent and construction stage contractor methodology and risk assessments.

2.4.1 Timescales

Due to funding constraints, construction is anticipated to commence by March 2022 at the latest and last for approximately two years.

Given the scale of the Scheme there is the potential for the works to be completed in more than one phase.

2.4.2 Outline Methodology

Enabling works are considered likely to include the setup and provision of accesses to construction compounds and work locations, rock processing and storage areas and mobilisation of site welfare facilities.

Several access points to the promenade would be required and their exact location has yet to be finalised. When finalising the location of the access points, consideration would be given to any implications for wider regeneration projects.

A summary of the anticipated construction activities is provided below. Work along all the seafront sections would have an element of tidal working and normal hours working. Tidal working would be likely to consist of one tidal working window within a 24 hour tidal cycle. Normal working hours would be between 07:00 and 19:00.

2.4.2.1 Sections A-D Summary of Construction Activities

- Import of 1-3t revetment rock;
- Excavation of the beach to formation and installation of rock toe to design profile; and
- Concreting operations for provision of access steps onto the beach at designated locations (pre-cast concrete will be used to rationalise working time during tidal window).

2.4.2.2 Sections E-H Summary of Construction Activities

- Construction of temporary access for plant along working area;
- Installation of sheet piles at revetment toe;
- Construction of capping beam – tidal concrete operation;

- Building up of revetment profile – drainage layer and concrete blinding for pre-cast concrete revetment steps;
- Installation of pre-cast revetment steps – likely to be by 120-180t crawler crane, depending on design weight of pre-cast units; and
- Promenade construction – concrete works.

2.4.3 Construction Compounds and Beach Access

Potential temporary compound locations would be required at locations along the main road (B5118). Due to the linear length and narrow works access along the promenade, multiple satellite compounds are likely to be necessary to ensure works can progress and be finished-off in a timely manner, reducing the time any length of promenade is required.

The locations of the construction compounds have not yet been finalised, however all would be located within the conservative RLB (Appendix A) provided.

Temporary storage and sorting of rock armour across the intertidal area is considered likely to be required.

To minimise impacts on existing infrastructure and manage conflict around the existing RNLI Lifeboat Station, access to the foreshore would be gained by construction of temporary access ramps as necessary (to be removed on completion). Sections of the promenade would need to be used for construction plant access to the intertidal working area as well as for the physical promenade works aspects. Access for the RNLI to the intertidal area would be maintained throughout.

2.4.4 Sourcing of Revetment Rock

Rock sources and potential pre-cast suppliers would vary depending on when the project is likely to commence and normal market competition for natural resources in the region. An estimated 25,000t of rock armour would be incorporated into the new toe. This quantity is suited to output achieved by local North Wales quarries.

The delivery of revetment rock by barge directly to site has been ruled out for this Scheme.

2.4.5 Construction Traffic Route

Two likely main traffic routes to supply the project are summarised below:

- From the A55 following the A525 before turning west onto Fordd Abergele and then north onto St Asaph Avenue. At this point the route would turn east onto the A548 Foryd Road before crossing the ‘Blue Bridge’ Ffordd Wellington and then north onto West Parade, entering the Scheme area from the west; and
- A secondary route is anticipated to enter the area from the east via the A548 (Marine Road, Victoria Road West, Rhyl Coast Road, Tynewydd Road and Marine Drive.

Both routes have proven suitable for supply of rock and other materials (such as concrete) sourced locally and materials originating further afield during delivery of the East Rhyl Coastal Defence Scheme.

The final construction routes would be confirmed prior to ES commencement.

No road closures are anticipated to be required as part of this Scheme although some minor temporary traffic management may be necessary for certain project phases.

3 Policy Context

3.1 National Policy

3.1.1 Planning Policy Wales (Edition 10, December 2018)

Planning Policy Wales (PPW) sets out current land use planning policy for Wales. It provides the policy framework for the effective preparation of local planning authorities' development plans. Sections of particular relevance are presented below.

3.1.1.1 Relevant to the Coastal Defence Scheme Aspects

(6.5 Coastal Areas) 6.5.20 *"In considering new coastal defence works, account should be taken of all potential environmental effects, both on and off-shore, including the impacts on habitat fragmentation and consequential 'coastal squeeze', as well as information contained in Shoreline Management Plans and other relevant documents such as Area Statements".*

(6.6 Water and Flood Risk) 6.6.28 "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 Shoreline Management Plan 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. Nature based solutions should be the first consideration given the opportunity to deliver other multiple benefits, including habitat creation, biodiversity enhancement and water quality improvements. Overall, green infrastructure opportunities can benefit ecosystem resilience and provide opportunities for leisure facilities or renewable energy generation".

3.1.1.2 Relevant to Regeneration Aspects

3 Strategic Spatial Choices: Promoting Healthier Places

3.20 "Disadvantaged and deprived communities tend to be disproportionately affected by health problems. There are links between the built and natural environment and health throughout a person's lifetime and an understanding of the wider determinants of health should be a key component of development plan preparation. The planning system should identify proactive and preventative measures to reduce health inequalities. This will include enabling opportunities for outdoor activity and recreation, reducing exposure of populations to air and noise pollution, promoting active travel options and seeking environmental and physical improvements, particularly in the built environment".

3.1.2 The Well Being of Future Generations (Wales) Act 2015

"The Well-being of Future Generations (Wales) Act 2015 – places a duty on the Welsh Ministers (and other public bodies) to produce well-being objectives and take reasonable steps to meet those objectives in the context of the principle of sustainable development".

The Well-being of Future Generations (Wales) Act 2015 (WBFGA) is legislation requiring

Welsh public bodies to put long-term sustainability at the forefront of their thinking, and work to prevent and tackle persistent problems such as poverty, health inequalities and climate change. In order to create a more sustainable Wales, public bodies must work towards seven Well-being

Goals and enact the five Ways of Working, whilst showing how they are doing this by publishing Local Well-being Plans.

The Seven Well-being Goals are:

1. A prosperous Wales;
2. A resilient Wales;
3. A healthier Wales;
4. A more equal Wales;
5. A Wales of cohesive communities;
6. A Wales of vibrant culture and thriving Welsh language; and
7. A globally responsible Wales.

The Act also sets a requirement on Public Bodies in Wales to set and publish well-being objectives, that are designed to maximise their contribution to achieving each of the well-being objectives. For the sake of the practice of this Act, Conwy and Denbighshire have merged to form Conwy and Denbighshire Public Services Board and have published a set of three Priorities and four Additional Principles.

Priorities:

1. People – Good Mental Well-being for All Ages;
2. Community – Community Empowerment; and
3. Place – Environmental Resilience.

Additional principles:

1. To address inequalities and treat everyone equally;
2. To support and promote the Welsh Language;
3. To support access to appropriate accommodation; and
4. To avoid duplication.

Within the OBC an assessment was made of the Scheme opportunities for contributing to the Well-being Goals as expanded upon in Table 3.1.

Table 3.1: Project Opportunities for Well-being Goals

Well-being Goal	Project Opportunity
A prosperous Wales	Reduces flood and erosion risk to an important tourist destination in Wales and supports the planned regeneration of Central Rhyl. Aims to use local labour and materials where possible, including the use of local rock sources.
A resilient Wales	Manages flood and erosion risk into the future, including capacity for predicted climate change. Designed with consideration of the habitat and biodiversity of the area.
A healthier Wales	Reduces stress to communities currently at flood and erosion risk (reduces flood risk to residential properties). Provides improvements to/continuation of the Wales Coastal Footpath and North Wales Cycle Route, encourages people into sports and recreation such as walking, running and cycling.
A more equal Wales	Provides benefits to a deprived community.
A Wales of cohesive communities	Provides increased flood protection to residential and non-residential properties over 100 years.
A Wales of vibrant culture and thriving Welsh language	Provides improvements to/continuation of the Wales Coastal Footpath and North Wales Cycle Route, encourages people into the area.
A globally responsible Wales	Responsible use of sustainable materials.

Source: Rhyl Central OBC, Appendix C

3.1.3 Technical Advice Notes

PPW is supplemented by 21 topic-based Technical Advice Notes (TANs). Procedural guidance is given in Welsh Office / National Assembly for Wales / Welsh Government Circulars. Each TAN provides detailed planning advice on a different subject. The TANs considered to be relevant to this Scheme are:

- TAN 5: Nature Conservation and Planning;
- TAN 11: Noise;
- TAN 12: Design;
- TAN 13: Tourism;
- TAN 14: Coastal Planning;
- TAN 15: Development and Flood Risk;
- TAN 16: Sport, Recreation and Open Space;
- TAN 18: Transport;
- TAN 20: Planning and the Welsh Language;
- TAN 21: Waste;
- TAN 23: Economic Development; and
- TAN 24: The Historic Environment.

TAN 15 is of particular relevance. This TAN provides technical guidance which supplements the policy set out in PPW in relation to development and flooding. It advises on development and flood risk and provides a framework within which risks arising from both river and coastal flooding, and from additional run-off from development in any location, can be assessed. TAN 15 recognises that sea level rise and increased storminess are some of the most likely effects of climate change to which Wales would need to adapt in the future.

3.1.4 Wales Spatial Plan 2008 and the Draft National Development Framework (NDF)

3.1.4.1 Wales Spatial Plan 2008

Denbighshire falls into two Spatial Plan areas, the North East Wales – Borders and Coast, and Central Wales Areas, of which the former is of relevance for the Scheme. Priorities within the Wales Spatial Plan that have implications for the Scheme area can be summarised as:

Coastal Area

- The identification of a Hub centred around Rhyl, St Asaph, Bodelwyddan and Prestatyn with the aim of fostering economic and social growth and inclusiveness, addressing socio-economic deprivation and improving access to services and employment inland;
- Providing a realistic scale of development. Developing a distinct identity, unique sense of place, outward looking, safe communities, enhancing Welsh language and culture, improved accessibility to the rural hinterland;
- Coastal tourism resorts need to diversify their economies to improve their image and leisure offer; and
- Regeneration programmes centred around Rhyl and Colwyn Bay are identified.

3.1.4.2 Draft NDF

The Wales Spatial Plan 2008 is to be replaced by the NDF, the draft of which is currently under consideration by the Senedd. It will sit alongside PPW at the top of the planning policy hierarchy.

It is a new 20 year strategy which sets out the Welsh Government's policies on development and land use in a spatial context and will be known as 'Future Wales: the national plan 2040'. The NDF is required under the Planning (Wales) Act 2015 and must be reviewed at least every five years.

The publication date is anticipated to be February 2021.

3.1.5 Welsh National Marine Plan (November 2019)

This Welsh National Marine Plan (WNMP) is the first marine plan for Wales and represents the start of the process of shaping Welsh inshore and offshore marine waters to support economic, social, cultural and environmental objectives. It sets out how proposals will be considered by decision makers for the sustainable development of the marine area. Marine planning will guide the sustainable development of the marine area by setting out how proposals will be considered by decision makers.

It has been prepared and adopted under the MCAA 2009. The WNMP and supporting material should be used by applicants to shape proposals and licence applications for the sustainable development of the Plan area.

The Plan vision will be delivered through the Plan's objectives supported by general, cross-cutting policies and sector-specific objectives and policies. Plan objectives describe the desired outcomes this Plan is seeking to achieve, thereby supporting the UK High Level Marine Objectives (HLMOs) and the UK Marine Policy Statement (MPS).

3.1.6 National Strategy for Flood and Coastal Erosion Risk Management (FCERM) in Wales, October 2020

The second National Strategy for FCERM in Wales replaces the first strategy published in 2011, prepared under the terms of the Flood and Water Management Act 2010.

The strategy sets out how the risks from flooding and coastal erosion are to be managed and provides key objectives and measures for all partners to work towards over the next decade.

Key changes to this National Strategy include the clarification of roles and responsibilities around flood and coastal erosion, the promotion of natural measures and catchment approaches, new objectives on improving understanding and preventing exposure to risk, highlighting the importance of good information and effective planning, and direction on how investment is prioritised.

The key aim of the National Strategy is *"to reduce the risks to people and communities from flooding and coastal erosion".* The key objectives are:

1. *"Improving our understanding and communication of risk;*
2. *Preparedness and building resilience;*
3. *Prioritising investment to the most at risk communities;*
4. *Preventing more people becoming exposed to risk; and*
5. *Providing an effective and sustained response to events."*

3.2 Local Policy

3.2.1 Shoreline Management Plan

The North West England and North Wales Shoreline Management Plan (August 2016) provides the policy decisions for flood and coastal management including the North Wales Coast (SMP22, sub-cell 11a) August 2016, further broken down into Sub Cell 11a4 - Clwyd Estuary to Point of Ayre. The recommended policy for Central Rhyl is "*Hold the Line' by maintaining, improving or raising the existing defences*". The long-term plan is to continue to manage flood and erosion to property and infrastructure in the built-up areas of Rhyl, including commercial, residential and amenity assets, infrastructure, cycle routes and footpaths. Improvement to the existing defences is therefore in line with the overall strategic policy for this area and approved by statutory stakeholders.

3.2.2 Denbighshire Local Development Plan (LDP) 2006-2021

The Denbighshire LDP (adopted in June 2013) and contains local planning policies designed to take forward the LDP objectives, spatial strategy and county vision. Policies are grouped under five key themes: Respecting Distinctiveness (RD), Building Sustainable Communities (BSC), Promoting a Sustainable Economy (PSE), Valuing Our Environment (VOE) and Achieving Sustainable Accessibility (ASA).

Sections of particular relevance are provided below.

3.2.2.1 Key Issues

Key issues identified within the LDP which are particularly relevant to this Scheme:

- *"Rhyl is currently underperforming as a sub-regional retail centre…*
- *Areas of flood risk exist across the County; the coastal areas are particularly affected.*

- *Climate change – responses are required to address its potential impacts both in Denbighshire and on a wider scale."*

3.2.2.2 Relevant Key Objectives

Design

14. The Local Development Plan will ensure that new developments are sustainable and of good quality design whilst taking into account the requirements of flood risk.

Tourism

15. The Local Development Plan will seek to enhance and sustain sustainable tourism in the rural and coastal areas of the County.

Areas of Protection

16. The Local Development Plan will seek to protect and enhance the natural and built heritage of the County including aspects such as landscape, biodiversity, geo-diversity, designated sites and buildings and protected species. Environmental services and goods will additionally be enhanced and developed.

3.2.2.3 Relevant Policies

The following LDP policies are considered to be particularly relevant to the Scheme:

- Policy RD 1 - Sustainable development and good standard design;
- Policy RD 5 - The Welsh language and the social and cultural fabric of communities;
- Policy BSC 11 – Recreation and Open Space;
- Policy PSE 1 – North Wales Coast Strategic Regeneration Area;
- Policy PSE 13 - Coastal tourism protection zones;
- Policy PSE 14 – Outdoor activity tourism;
- Policy VOE 1 – Key Areas of importance;
- Policy VOE 5 – Conservation of natural resources; and
- Policy ASA 2 – Provision of sustainable transport facilities.

3.2.3 Denbighshire Supplementary Planning Guidance (SPG)

DCC have a number of SPG Notes – additional advice provided by DCC on a particular topic or policy area and related to and expanding upon statutory policies. Relevant Notes include:

- Access for all;
- Archaeology;
- Conservation and Enhancement of Biodiversity;
- Conservation Areas;
- Planning and the Welsh Language;
- Planning for Community Safety; and
- Recreational Public open Space.

3.2.4 Denbighshire Local Flood Risk Management Strategy (Denbighshire County Council, 2014)

This strategy sets out how DCC as Lead Local Flood Authority (LLFA) will work with at-risk communities and alongside other risk management authorities to reduce flood risk. This strategy outlines the Council's objectives for managing flood and coastal erosion and describes the measures that will be taken to reduce flood risk to the residents of Denbighshire. Although there are no specific actions for Rhyl, Rhyl and Prestatyn are identified as one of the significant flood locations, and objectives include: "*Prioritising investment in the most at-risk communities."*

3.2.5 Denbighshire Strategic Flood Consequence Assessment (SFCA), DCC, January 2018

DCC updated their SFCA in January 2018. The purpose of an SFCA is to identify the strategic flood risks to key communities in Denbighshire to support the preparation of the Local Development Plan. Rhyl is highlighted as one of the key flood risk locations in Denbighshire and refers to future schemes to reduce the risk of coastal flooding in Rhyl.

4 EIA Screening and Scoping

4.1 EIA Regulations

4.1.1 EIA Directive

The amended EIA Directive (2014/52/EU) (hereafter referred to as the Directive) requires an EIA to be carried out in support of an application for development consent for categories of project listed in the Directive at Annexes 1 and 2. For schemes included within Annex 1, EIA is mandatory, while within Annex 2, an EIA is required if the development is likely to have *significant* effects on the environment.

4.1.2 EIA Regulations

The Scheme requires consent under the Town and Country Planning Act 1990 and must be assessed under the T&CP EIA Regulations.

In addition, the MW EIA Regulations transpose the EIA Directive so that where applicable, EIAs are carried out prior to granting permission for the deposit of substances or articles within UK waters or UK controlled waters, either in the sea or under the sea bed, from various structures, vessels, containers or structures on land, or anywhere in the sea (where a Marine Licence is required). UK Waters include any area which is submerged at mean high water spring tide. A Marine Licence is required for the elements of the Scheme below mean high water and consideration is necessary under the MW EIA Regulations.

4.1.3 The EIA Process

The stages of the EIA process are as follows:

- Screening – determine whether EIA is required;
- Data Review – draw together and review available data;
- Scoping – identify significant issues, determine scope of EIA;
- Baseline Surveys – undertake baseline surveys and monitoring;
- Assessment and iteration – assess likely significant effects of development, evaluate alternatives, provide feedback to design team on adverse effects, incorporate any necessary mitigation, assess effects of mitigated development; and
- Preparation of the ES.

4.2 Screening

The Scheme does not fall within Annex 1 of the EIA Directive (Schedule A1 of the MW EIA Regulations, Schedule 1 of the T&CP EIA Regulations), within which EIA would be mandatory.

However, the Scheme does fall under Annex 2 of the EIA Directive (Schedule A2(69) in the MW EIA Regulations, Schedule 2 Clause 10(m) of the T&CP EIA Regulations) – Infrastructure Projects, which includes certain coastal works (including land reclamation):

- *"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".*

While in the EIA Regulations for coastal works there is no minimum area limit for triggering EIA (all development has to be considered), Welsh Office Circular 11/99 identifies the 'Indicative Thresholds and Criteria for identification of Schedule 2 Development Requiring EIA' determining significant effects as detailed in Table 4.1.

Table 4.1: Indicative Criteria and Threshold

Development Type	Schedule 2 Criteria and Thresholds	Indicative Criteria and Threshold
Coastal works to combat erosion and maritime works capable of altering the coast	All development	Works would exceed 1ha.

Source: Welsh Office Circular 11/99

The maximum area of coastal defence works north of the sea wall (permanent construction) totals approximately 2.0ha while south the landward permanent construction comprises approximately 1.0ha.

As previously discussed, the current RLB is conservatively set to include all potential site accesses and construction compound areas. The area within this red line is currently 54.5ha. The area within the red line for the ES is anticipated to be much lower than this once it has been rationalised however the conservative boundary is to be used for the purposes of EIA Scoping.

Therefore, the requirement for EIA needs to be established, based on whether the Scheme is considered to have potential 'significant' effects on the environment.

A screening opinion has not been requested however for the following reasons it has been assumed that an EIA would be required:

- The area of the proposal exceeds the 1ha threshold above which paragraph A29 of Welsh Office Circular 11/99 advises that an EIA is more likely to be required;
- The area of the proposal is situated on and above the intertidal zone, which is of biodiversity interest, and is close to the Liverpool Bay SPA. The proposal has the potential for significant effects on biodiversity interests within and neighbouring the development site, including potential impacts on the SPA (see the Habitats Regulations Screening Assessment, JBA Consulting April 2019 in Appendix D); and
- The Promenade and beach form recreational and tourism assets which are significant to the economic and social well-being of Rhyl. The proposal could have potentially significant impacts on the appearance, amenity and accessibility of those assets.

4.3 Scoping

As discussed in Section 1.3, under Regulation 15 of the T&CP EIA Regulations and Regulation 13 of the MW EIA Regulations, a Scoping Opinion can be requested from the appropriate authority to determine the scope and level of detail required in the ES.

According to Regulation 15 of the T&CP EIA Regulations and Schedule 4 of the MW EIA Regulations, the Request for a scoping opinion must be accompanied by:

1. A chart, plan or map sufficient to identify the land, location of the regulated activity and of other activities to be carried out in the course of the project/development;
2. A brief description of the nature and purpose of the project/development, including its location and the regulated activity;
3. An explanation of the likely significant effects of the development on the environment; and

4. Such other information or representations as the applicant may wish to provide or make.

5 Consultation

5.1 Consultation Completed to Date

5.1.1 NRW Pre-Workshop Advice

Early consultation with NRW was completed before a stakeholder engagement workshop. NRW advised in a letter dated April 2nd, 2019 (included as an appendix to the PEIR, Appendix D), that the following matters should be considered prior to planning application submission:

- Request for an EIA screening opinion from DCC;
- The consideration of potential cumulative impacts with other committed development; and
- A WFD Assessment should be carried out to determine compliance with objectives for river and coastal waterbodies.

NRW also recommended that a Flood Consequence Assessment (FCA) would be required, they noted that large scale coastal defence structures can cause changes to local coastal processes, and that a smaller scheme would be desirable. They also noted the loss of intertidal habitat resulting from stepped revetment and combined options. NRW stated that climate change, foreshore steepening, sea level rise and increased storminess should all be considered during the development of the final design.

5.1.2 Stakeholder Engagement Event

According to the PEIR (Appendix D), "*a stakeholder engagement workshop on the proposed scheme was held at Rhyl Community Fire Station on April 3rd, 2019. Representatives from DCC, NRW, Sustrans, Ion Developments, Balfour Beatty, JBA Consulting, Flintshire County Council, the Clwyd-Powys Archaeological Trust (CPAT) and the Royal Society for the Protection of Birds (RSPB) were in attendance. The short-list of the options was presented to the attendees, who were asked their opinions, which went on to influence the preferred option decision.*

At the workshop, NRW expressed concerns that the footprint of the proposed scheme and the associated loss of intertidal habitat was too great. They asked whether less intensive options, such as sheet piling, could be considered. JBA responded by explaining that less intensive options had been considered during the options appraisal process, but they did not have a long enough design lifetime (a sheet pile wall would have a lifetime of approximately 50 years). NRW also questioned whether the proposals were in line with SMP policy for this coastal sub-cell. A representative from DCC confirmed that the current policy was Hold The Line, and therefore it did meet the local SMP policy.

A representative for CPAT noted that the proposals have minimal intrusion into the beach levels. They stated that precise depths and areas would need to be confirmed to them once they are known. They noted that any scheme more intrusive than a Do Nothing or Do Minimum option would require archaeological assessment."

5.2 Future Consultation

5.2.1 Scoping Consultation

The following are considered statutory consultees for the purposes of EIA:

- Conwy County Borough Council (CCBC);
- NRW;
- Cadw; and
- Crown Estates.

A number of other consultees would also be consulted on the Scoping Report. The organisations to be consulted directly on the Scoping Report would be identified in consultation with DCC, and are likely to include:

- Welsh Water;
- Scottish Power;
- Sustrans;
- Rhyl Town Council;
- Local anglers' associations;
- Clwyd Powys Archaeological Trust;
- Royal National Lifeboat Institution; and
- Conwy East and Denbighshire Local Access Forum.

The list about is not exhaustive and the stakeholder engagement team are in the process of undertaking stakeholder mapping and identification. The results of this will further inform the organisations that will be directly consulted with on the Scoping Report.

The Scoping Opinion and comments received would be taken into account in the EIA and in preparing the ES. The ES would summarise the comments received and describe how the feedback influenced the scope of the EIA and ES. When submitted, the ES would be publicised by the Council and subject to consultation with the above organisations, other notified parties, and the public.

In accordance with the EIA Regulations, DCC have a 5 week period to consider this report and adopt a formal Scoping Opinion.

5.2.2 Other Future Consultation

The Stakeholder Engagement Plan details the proposed approach to consultation which is in the process of being confirmed. This is in addition to the community and stakeholder engagement would also be required under the Planning (Wales) Act 2015 to undergo the Statutory Pre-Application Consultation Period prior to submission of the Planning Application, as is compulsory for all applications for major development in Wales. Advertisement of the Scheme for stakeholders to comment would also be required for the Marine Licence Application.

6 Potential for Cumulative Effects

6.1 Overview

The EIA Regulations require the assessment of the likely significant effects from the cumulation of effects with other existing and/or approved projects.

A full assessment would be completed as an ES Chapter, however at the current time, the principal potential for cumulative impacts and considered to relate the schemes discussed below.

6.2 The Coastal Risk Management Programme (CRMP)

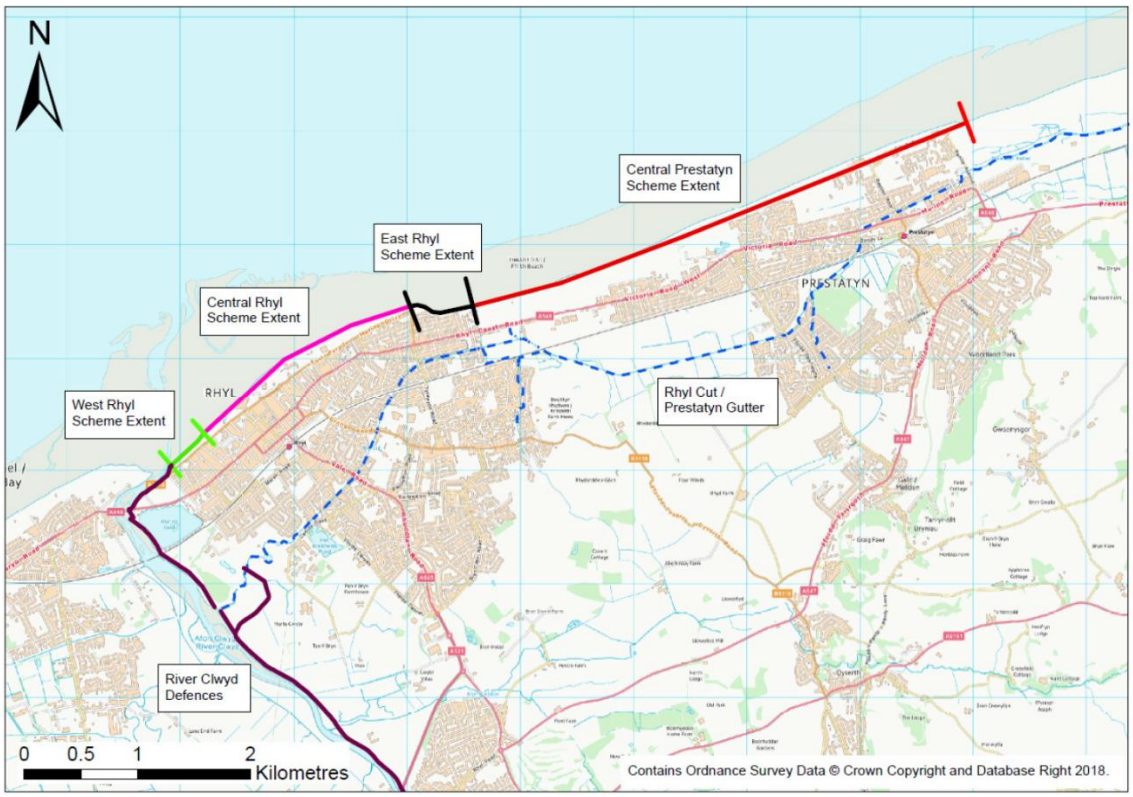
This project is part of the Welsh Government's CRMP. The CRMP is based around the use of long-term borrowing and low interest rates by Welsh Government to support a programme of capital investment in coastal risk management infrastructure.

The CRMP is a time limited programme to enable the funding of coastal protection schemes in Wales. A strategic and integrated approach to coastal cells is the best way of prioritising locations of greatest FCERM need. A Coastal Strategy has not been completed for the coastal cell that includes Central Rhyl and the timeframe for CRMP funding means that individual schemes are being promoted in advance of a Strategy. However, the Central Rhyl scheme is being developed with consideration of existing and upcoming schemes. This was considered in the OBC (Appendix C):

"An integrated coastal model has been produced extending from the mouth of the River Clwyd to Barkby Beach, to include the extent of all Denbighshire schemes across this frontage, including West Rhyl, East Rhyl, Central Rhyl and Central Prestatyn schemes. This integrated model enables the interaction between each of the schemes to be considered, identifying any potential detriment to adjacent frontages or 'backdoor' flood risk between schemes so that these can be avoiding through scheme design. This approach also avoids the double counting of flood benefits between schemes.

A summary of the interaction is provided below, with the locations of each scheme presented in (Figure 6.1)*."*

Figure 6.1: Extent of Schemes in Development or Recently Completed in the Vicinity of the Central Rhyl Scheme (and location of Rhyl Cut and Prestatyn Gutter water courses)



Source: Central Rhyl Coastal Defence Scheme OBC, DCC, October 2019

6.2.1 Central Prestatyn

A business case for Central Prestatyn has been developed alongside Central Rhyl. If Central Prestatyn goes ahead it is likely to progress at the same time as the Scheme.

"The two schemes are separated by the East Rhyl scheme, however due to the topography the flood areas of Central Prestatyn and Central Rhyl interact inland and as such benefits apportionment and backdoor flooding are addressed through the integrated modelling approach."

The majority of the works at Prestatyn are located above the mean high water mark meaning the potential for cumulative effects on the marine environment are limited.

6.2.2 East Rhyl

The East Rhyl rock revetment scheme is currently under construction. Construction may progress beyond March 2022.

"This scheme was driven by the severe flooding in 2013. This scheme has been prioritised by DCC and so is the most advanced of the schemes on the Denbighshire coastline. The East Rhyl coastal cell has little interaction with Central Rhyl due to the higher ground separating them. However, an integrated model has been produced showing the flood reduction benefits of the East Rhyl scheme."

6.2.3 West Rhyl

*"The West Rhyl Scheme comprises the coastline adjacent to the mouth of the River Clwyd, immediately (*west*) of the Central Rhyl scheme. The scheme includes new coastal revetment and wave walls, and primary and secondary flood defence walls to manage flood risk, with a new, widened promenade to provide amenity space and support regeneration of the area. Construction of the scheme was completed in 2015 and the new defences are represented within the Central Rhyl modelling."*

6.2.4 Clwyd Estuary

The Tidal Clwyd Flood Risk Management Strategy was produced by Environment Agency Wales (now NRW) in 2011 in consultation with DCC and CCBC. *"A review of the Strategy was undertaken in 2018 on behalf of Natural Resources Wales to check whether the original preferred Strategy remained the best way of managing flood risk across the tidal Clwyd east and west flood cells. The Strategy and Review conclude that the Standard of Protection (SoP) of the defences along the east bank of the river, adjacent to the West Rhyl scheme, is currently good, and no scheme is proposed for the defences along this section within the next 20 years. As such the River Clwyd Flood risk has not been included in the Central Rhyl inundation modelling."*

6.2.5 Rhyl Cut and Prestatyn Gutter

Tidal risk from Rhyl Cut/Prestatyn Gutter is low and will only be realised in future epochs, there is no justification for works here at the present time and the risk can be seen as residual and acceptable. NRW are undertaking a fluvial risk assessment of the watercourse but this is for a maintenance management plan and will not lead to any capital works. As such there is so no double counting between the proposed scheme and these watercourses.

6.3 Queen's Market Development

Denbighshire County Council in partnership with Ion Developments are proposing to redevelop the former Queens Market building complex on West Parade, Rhyl[1]. The site is proposed to be converted into a mixed use development including residential, commercial, community and public realm, and it is intended that the development would act as a catalyst for wider regeneration within the town centre, along with creating employment and new services and facilities for the local community.

The proposed development currently comprises of:

- 80 residential units (including 32 one and 48 two bed units);
- 16 permanent market stalls with flexible space for additional stalls;
- Multi-use event space;
- 1358 m^2 of Food & Beverage / Retail Space;
- 5480 m^2 of Public Library / Offices; and
- 4850 m^2 of External Public Space.

6.4 Rhyl Central Parade

A Masterplan has been developed to inform the regeneration of the Central Rhyl area. Recent developments include SC2, the Pavilion Theatre, Travelodge, Premier Inn and public house.

[1] ION Development [Online] Available at: https://iondevelopments.co.uk/rhyl-consultation/, accessed November 2020

Any development of the promenade would have the potential for cumulative effects and careful consideration would be required of the interfaces between Masterplan-related development and the Scheme.

6.5 Colwyn Bay Waterfront Scheme

Colwyn Bay is located around 13km to the west of the Scheme. The Colwyn Bay Waterfront Project was conceived in 2007 as a result of the strategic assessment of options for future flood and coastal erosion risk management (CCBC, October 2007)[2]. During the strategic assessment process it was identified that maintaining or improving the aging defences alone would not attract people to Colwyn Bay as this approach would not address the low beach levels present and there was strong public support to determine a more robust solution to be used as the catalyst for regeneration within the wider Colwyn Bay area.

The North Wales coast was defined as a Strategic Regeneration Area (SRA) in 2008 and in 2009, CCBC established the Bay Life+ Programme[3], providing the framework for development of the Colwyn Bay Waterfront Project, combining coastal defence with regeneration. There are numerous phases of work with some phases complete and others due to commence construction (funding and permission dependent) within the next two years:

- Phase 1 (a, b, c): 150m rock groyne structure, linear rock revetment and sheet piled wall, beach recharge and promenade enhancement works including the construction of Porth Eirias. Completed October 2014;
- Phase 2a: Coastal regeneration, improved coastal defences (sea wall), access and promenade enhancements. Complete September 2017;
- Splashpoint: Emergency works completed, comprising a short section of 30m deep rock revetment. Complete July 2020;
- Phase 2b: Future phase, currently progressing to detailed design stage. Beach recharge works and promenade enhancements. Potential for construction period to overlap with Rhyl Central; and
- Old Colwyn Waterfront Coastal Defence and Active Travel Scheme (formerly Phase 3): Future phase, comprising construction of a 1.15km long ~30m wide rock revetment against the sea wall between Port Eirias and Splashpoint. Potential for construction period to overlap with Rhyl Central.

[2] Colwyn Bay Coastal Defence Strategy Plan, CCBC, October 2007

[3] Bay Life Regeneration Programme [Online] Available at: https://www.conwy.gov.uk/en/Business/Regeneration/Colwyn-Bay-Regeneration/Bay-Life-Regeneration-Programme/Bay-Life-Regeneration-Programme.aspx Accessed November 2020

7 Air Quality

7.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential effects of the Scheme on air quality, namely:

- Nuisance, loss of amenity and health impacts caused by construction dust. These have been considered in line with the Institute of Air Quality Management's (IAQM) *'Guidance on the assessment of dust from demolition and construction'*[5]; and
- Air quality impacts caused by additional traffic generation during construction and operation of the Scheme, in line with the Environmental Protection United Kingdom (EPUK) and the IAQM[6] Land-Use Planning and Development Control: Planning for Air Quality guidance.

The requirement to assess potential effects from dust deposition, and changes in concentrations of nitrogen dioxide (NO_2) and particulate matter (PM_{10}[7] and $PM_{2.5}$ [8]) only are considered, as these are the key pollutants associated with the Scheme.

7.1.1 Reporting/Assessment Completed to Date

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C); and
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D).

In addition, the adjacent East Rhyl Coastal Defence Scheme (currently under construction) had a Traffic Assessment (October 2018) completed by JBA Consulting, which contains traffic data for a similar adjacent project.

7.2 Study Area

For potential impacts related to dust and PM_{10} from construction, the study area for the air quality assessment would cover human health receptors within 350m and ecological sites within 50m of the Scheme

For potential impacts related to changes in concentrations of NO_2, PM_{10} and $PM_{2.5}$ from traffic, human health receptors and designated ecological sites within 200m of roads that meet the EPUK and the IAQM[9] criteria would be considered. The criteria are:

- A change of Light Duty Vehicles (LDV) flows of more than 500 Annual Average Daily Traffic (AADT); and/or
- A change of Heavy-Duty Vehicles (HDV)[10] flows of more than 100 AADT.

[5] Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction.

[6] Environmental Protection UK and Institute of Air Quality Management (January 2017) Land-Use Planning and Development Control: Planning for Air Quality (version 1.2)

[7] Particulate matter with a diameter of less than 10 microns

[8] Particulate matter with a diameter of less than 2.5 microns

[9] Environmental Protection UK and Institute of Air Quality Management (2017) Land-Use Planning and Development Control: Planning for Air Quality (version 1.2)

[10] A heavy-duty vehicle is any vehicle with a gross weight greater than 3.5 tonnes and usually consists of HGVs, buses and coaches

Where the above criteria are met, sensitive human and ecological receptors, at worst-case[11] locations up to 200m from the kerb of an affected road would be assessed.

7.3 Baseline Conditions

Information on air quality in the UK can be obtained from local authorities, national network monitoring sites and other published sources. The baseline data most representative of the Scheme has been obtained from the North Wales Combined Authority Air Quality Progress Report 2019[12] and Defra[13]. The most recent full year of monitoring data available is for 2018.

7.3.1 Local Authority Monitoring

DCC has declared no Air Quality Management Areas (AQMAs)[14] for its administrative area as there are no monitored exceedances of the relevant national objectives.

DCC has no automatic monitoring stations and monitors NO_2 using passive diffusion tubes at 26 locations within Denbighshire County Borough. Two diffusion tubes are within 1.5km of the Scheme, the monitoring data for which are presented in Table 7.1.

No exceedances of the NO_2 annual mean objective have been recorded at the nearest diffusion tube locations. The highest 2018 concentration, measured at Wellington Road, is 25.3µg/m^3, which is well within the annual mean objective of 40µg/m^3.

Table 7.1: Air Quality Monitoring Data for NO_2

Site ID	Site Name	Site Classification	Distance (m)	National Grid Reference		Annual Mean Concentration (µg/m^3)		
				X	Y	2016	2017	2018[(a)]
DBK1	Wellington Road, Rhyl	Roadside	260	300846	381407	23.5	24.9	25.3
DBK2	10 Kinmel Street, Rhyl	Roadside	390	300903	381292	26.4	25.7	25.1

Source: North Wales Combined Authority, 2019
Note: [(a)] Data capture for all site was 100%. Bias adjustment factor for 2018 was 0.76

The locations of these sites are presented in Figure 7.1.

Note: The RLB for the scheme has not yet been finalised. The boundary used is an indicative conservative boundary including all potential areas for access, construction compounds and working areas. It therefore represents a worst-case scenario.

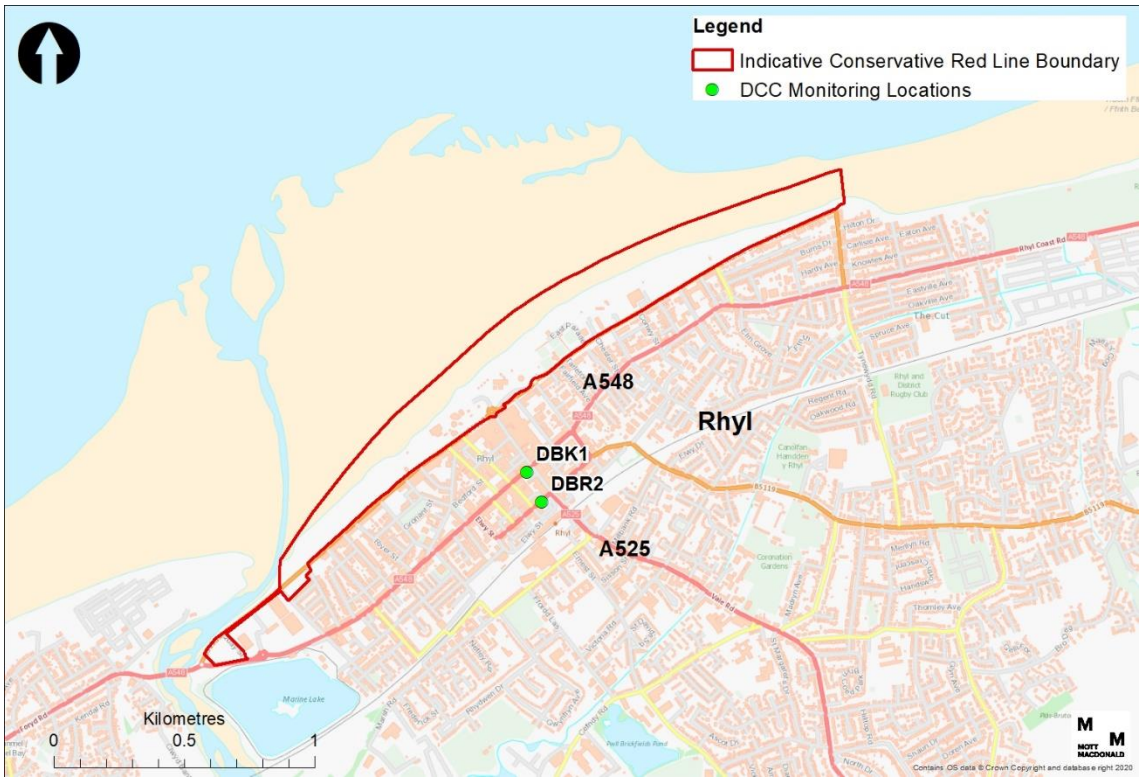
[11] Worst case refers to locations that are closest to the road, roads with the largest flows, where the Scheme causes the greatest change in traffic or where ambient air quality is known to be poor.

[12] North Wales Combined Authority (2019) Air Quality Progress Report

[13] Defra (2019). Background mapping data for local authorities. [Online] Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015 Accessed November 2020

[14] Part IV of the Environment Act 1995 requires local authority to periodically carry out a review of air quality within its area. As part of this review, the authority must assess whether air quality objectives are being achieved. Locations where they are not or are unlikely to be achieved within the relevant period must be identified and declared as an Air Quality Management Area (AQMA).

Figure 7.1: Local Authority Monitoring Locations



Source: North Wales Combined Authority, 2019

7.3.2 Defra Projected Background Concentrations

Defra provides mapped future year projections of background pollution concentrations for NO_X, NO_2, PM_{10} and $PM_{2.5}$ for each 1.0km grid square across the UK for all years between 2018 to 2030[15]. The maps include a breakdown of background concentrations by emission source, including road and industrial sources, which have been calibrated against 2018 (the baseline year) UK monitoring data. Table 7.2 presents background concentrations for the 1.0km grid squares containing the Scheme in the current year of 2020. The maximum background concentrations at the site are all within the relevant objectives.

Table 7.2: Projected Background Concentrations (µg/m^3) of NO_x, NO_2, PM_{10} and $PM_{2.5}$ (maximum concentrations across Scheme area)

Pollutant	2020
NOx	9.5
NO_2	7.5
PM_{10}	10.9
$PM_{2.5}$	7.3

Source: Defra 2020. https://uk-air.defra.gov.uk/data/laqm-background-maps max square is (301500_381500)

[15]Defra Background maps (2018) [Online] Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps, Accessed November 2020

7.3.3 Summary

The closest monitoring locations to the Scheme met the annual mean NO_2 objective in 2018. The monitoring sites are located in Rhyl Town Centre where there are several busy intersecting roads, as opposed to the Scheme which is on the seafront. It is, therefore, likely that the objectives are met at the Scheme site.

DCC does not monitor particulate matter (PM_{10} and $PM_{2.5}$) but it is recognised that where concentrations of NO_2 are low and road traffic is the primary source of emissions, the concentration of PM_{10}/$PM_{2.5}$ would also likely be lower than the air quality objectives. In the case of the Scheme, another primary source of particulate matter is contributions from sea salt due to its coastal location. It can be seen in the Defra predictions, however, that these are not expected to exceed the objectives for PM_{10} or $PM_{2.5}$.

Defra's TG16[16] document indicates that the hourly NO_2 air quality objective of 200µg/m^3 (not to be exceeded more than 18 times per year) is unlikely to be exceeded at roadside locations where the annual mean concentration is less than 60µg/m^3. Following this guideline, as the monitored mean NO_2 concentrations are less than 60µg/m^3, the hourly objective is therefore considered to also be met.

The Defra predictions indicate that the background concentrations at the Scheme site are unlikely to exceed the relevant objectives.

7.4 Assumptions and Limitations

The number of LDV and HDV movements required and the traffic management measures during the construction and operational phases are currently unknown. The October 2018 JBA Consultants Traffic Assessment for the East Rhyl Coastal Defence Scheme predicted 40 additional HDV and 80 additional LDV movements during construction. This is expected to be similar to the construction traffic required for the Central Rhyl Coastal Defences.

The Scheme proposes improvements to the existing coastal defences, as such there would be no operational changes to the transport network.

In scoping out construction and operational traffic, assumptions have been made that the Scheme:

- Will not lead to an increase in vehicle movements exceeding the EPUK/IAQM thresholds; and
- Will not lead to road closures or diversions during construction of the Scheme.

The scoping out of these assessments may be revised in consultation with DCC when more detailed traffic information is available.

7.5 Key Guidance and Best Practice

In the UK, the Air Quality Standards Regulations (2010)[17] came into force in June 2010 to implement EU Directive 2008/50/EC[18] on ambient air quality. The air quality objectives, specifically for use by local authorities in carrying out their air quality management duties, are set out in the Air Quality (Wales) Regulations 2000[19], the Air Quality (Wales) (Amendment)

[16] Defra (February 2018) Local Air Quality Management – Technical Guidance (16)

[17] Statutory Instrument. (2010), 'The Air Quality Standards Regulations', No. 1001. Queen's Printer of Acts of Parliament.

[18] European Union. (April 2008) Directive on ambient air quality and cleaner Air for Europe, Directive 2008/50/EC Official Journal, vol. 152, pp. 0001-0044

[19] Statutory Instrument. (2000) Air Quality (Wales) Regulations, No. 1940 (W.138).

Regulations 2002[20] and the Air Quality Standards (Wales) (Amendment) (EU Exit) Regulations 2019[21]. In most cases, the air quality objectives have the same numerical values as limit values specified in the EU Directives although compliance definitions and dates differ.

The Welsh Government have published a 'Clean Air Plan' for Wales[22], as an equivalent to the Clean Air Strategy (CAS)[23] produced for England in 2019 to provide a framework for air quality improvements. Table 7.3 presents the relevant air quality objectives and limit values against which the Scheme has been assessed.

Table 7.3: Air Quality Objectives and Limit Values

Pollutant	Averaging Period	Air Quality Objectives and Limit Values		Attainment Date	
		Concentration	Allowance	Air Quality Objectives	EU Limit Values
Nitrogen dioxide (NO_2)	Annual	40 µg/m^3	-	31 December 2005[(a)]	1 January 2010[(b)]
	1-Hour	200 µg/m^3	18	31 December 2005[(a)]	1 January 2010[(b)]
Nitrogen oxides (NO_x)[(c)]	Annual	30 µg/m^3	-	-	31 December 2000[(b)]
Particulates (PM_{10})	Annual	40 µg/m^3	-	31 December 2004[(a)]	1 January 2005[(b)]
	24-Hour	50 µg/m^3	35	31 December 2004[(a)]	1 January 2005[(b)]
Particulates ($PM_{2.5}$)	Annual	25 µg/m^3	-	1 January 2015[(a)]	-
		20 µg/m^3	-	-	1 January 2020[(b)]

Notes: (a) Air Quality (Wales) Regulations 2000 as amended in 2002 and 2019.
(b) EU Directive 2008/50/EEC on ambient air quality and cleaner air for Europe and The Air Quality Standards Regulations 2010. Derogations (time extensions) have been agreed by the EU for meeting the NO_2 limit values in some zones/agglomerations.
(c) Designated for the protection of vegetation and ecosystems and referred to as the 'critical level' for NO_x.

It should be noted that the UK air quality objectives only apply at locations where members of the public might reasonably be exposed to pollutants for the respective averaging periods. Table 7.4 provides details of where the respective objectives should and should not apply and therefore the types of receptors that are relevant to the assessment.

Table 7.4: Locations Where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply at:	Objectives Should Not Apply at:
Annual	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location

[20] Statutory Instrument. (2002) Air Quality (Amendment) (Wales) Regulations, No. 3182 (W.298).
[21] Statutory Instrument (2019) Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations, No. 390 (W. 95).
[22] Welsh Government (2020) 'The Clean Air Plan for Wales, Healthy Air Healthy Wales'
[23] Department for Environment Food and Rural Affairs. (January 2019), 'The Clean Air Strategy'.

		where public exposure is expected to be short-term.
24-Hour	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1-Hour	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Source: LAQM-TG16[24]

This scoping assessment has been carried out in accordance with the methodologies set out within:

- IAQM's '*Guidance on the assessment of dust from demolition and construction';*
- EPUK and IAQM's '*Land-Use Planning and Development Control: Planning for Air Quality'*; and
- Defra Local Air Quality Management Technical Guidance 2016 (TG16).

7.6 Potential Effects

The potential effects generated by the Scheme are likely to be limited to dust effects arising from construction activities. As detailed above, it is considered unlikely that construction or operational traffic would cause a significant effect. Table 7.5 summarises whether the impacts on air quality from dust have the potential to cause significant effects, and whether they have been scoped in or out of the ES.

7.6.1 Construction Dust

The main risks to sensitive receptors during the construction phase include dust emissions arising from construction activities and construction vehicle movements. Dust can arise from numerous construction activities such as concrete-batching, piling, wind erosion on material stockpiles and earth-moving activities. It can be mechanically transported either by wind or through the movement of vehicles onto the public highway (transport of debris on vehicle wheels, or uncovered loads).

There are human health receptors within 350m and ecological receptors within 50m of the Scheme boundary, including the statutory Liverpool Bay / Bae Lerpwl (Wales) Special Area of Conservation (SPA), which is located adjacent to the Scheme site.

[24] Department for Environment, Food and Rural Affairs (2018), Local Air Quality Management – Technical Guidance (16)

Whilst unlikely to lead to significant effects, following appropriate mitigation a dust risk assessment would be undertaken to determine the risk of nuisance and the level of mitigation required. The dust risk assessment would be carried out in accordance with the Institute of Air Quality Management (IAQM) guidance[25].

7.6.2 Construction Site Plant Emissions

Construction can require the use of different equipment such as excavators, cranes and on-site generators. All construction plant has an energy demand; with some plant resulting in direct emissions to air from exhausts. Guidance from the IAQM notes that effects from on-site plant exhausts would likely not be significant. Given the nature of the site plant, effects of plant emissions on local air quality are considered of negligible significance relative to the surrounding road traffic contributions on the local road network. Construction plant emissions have therefore been scoped out of the ES as the impacts would likely be *de minimis*.

7.6.3 Construction Traffic

Construction traffic from the Scheme is considered unlikely to have a significant impact on air quality, as construction traffic flows are not anticipated to exceed the EPUK/IAQM thresholds for further assessment and have been scoped out of the ES.

7.6.4 Operational Traffic

Operational traffic from the Scheme is considered unlikely to have a significant impact on air quality, as there would be no changes to the public highway and the Scheme is unlikely to increase usage of the area by motorists. Additional operational traffic flows are not anticipated to exceed the EPUK/IAQM thresholds for further assessment and have been scoped out of the ES.

7.6.5 Summary of Potential Effects

Table 7.5 presents whether construction or operational effects have currently been scoped out of the ES. A confirmatory scoping opinion is requested from all relevant statutory consultees.

Table 7.5: Potential Effects

Effects	Construction	Operation
Effects Potentially Not Significant	Construction dust – adverse effects on human and ecological receptors due to dust impacts.	N/A
Effects Potentially Significant	N/A	N/A
Scoped In/Out	**Scoped Out***	**Scoped Out**

Source: Mott MacDonald Ltd, 2020

*However a construction dust risk assessment would be required.

[25] Holman et al (2014). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. www.iaqm.co.uk/ text/guidance/construction-dust-2014.pdf

7.7 Additional Information Required

A Transport Statement (TS) would be required to provide additional clarity on the vehicle distribution across local roads during closure of the Promenade during construction. This would enable a revised scoping to be undertaken and, if necessary, further assessment within the ES.

A Construction Dust Risk Assessment would be required.

7.8 Proposed Methodology

The proposed methodology for the Construction Dust Risk Assessment can be found in Appendix B.1.

8 Archaeology and Cultural Heritage

8.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential effects of the Scheme on archaeology and cultural heritage. Construction of the Scheme has the potential to affect archaeological remains, predominantly relating to former submerged land surfaces.

For the purpose of this assessment, the historic environment encompasses three sub-topics as defined by the Design Manual for Roads and Bridges (DMRB) as:

- Archaeological Remains (including scheduled monuments, protected wrecks, aircraft crash sites and non-designated assets);
- Historic Buildings (listed buildings, non-designated buildings, conservation areas); and
- Historic Landscapes.

8.1.1 Reference Reports

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C);
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D); and
- Central Rhyl Coastal Flood Defence Scheme, Denbighshire, Desk Based Assessment, Clwyd Powys Archaeological Trust (November 2019) (Appendix D).

8.2 Study Area

The Study Area used consists of a buffer[26] from the Scheme boundary, which extends across the intertidal zone north of the Scheme and part of Central Rhyl town to the south. This allows a consideration of all known heritage assets which may indicate the presence of further unrecorded remains within the Scheme boundary. This is considered a wide enough area to take into account any impacts on designated heritage assets and their setting. There are no world heritage sites, scheduled monuments, protected wrecks, registered battlefields or registered parks and gardens within the Study Area and therefore will not be considered within the EIA.

8.3 Baseline Conditions

The Scheme includes an area of beach and the existing promenade and beach defences, which consist of hard engineered defence structures constructed from the c1950s onwards. These comprise a series of stepped revetments, recurve walls and vertical walls. There are also a number of groynes extending out from the defence structures.

[26] A bespoke buffer was adopted for the heritage desk-based assessment carried out by CPAT (2018). This extended to 1km at its maximum to take in the extent of the intertidal zone to the north and east of the Scheme. The buffer extended to a maximum of 300m to the south to take into account the built heritage.

8.3.1 Geology

The geology within the site boundary consists of a bedrock of Kinnerton Sandstone Formation – sandstone, with superficial geology of Marine Beach deposits[27].

8.3.2 Historic Mapping and Aerial Imagery

A search of available historic mapping[28] shows that within the Scheme boundary, the promenade was not developed until the mid-20th Century. Most development within the immediately vicinity was restricted to the south-eastern side of East and West Parades. Development on the north-west side was limited prior to the mid-20th Century, with the exception of an esplanade, the Grand Pavilion and the Promenade Pier. The construction of the sea defences in the 1950s, led to a number of developments between the beach and the East and West Parades.

Table 8.1: Historic Mapping Summary (within Scheme boundary)

Date	Map	Development
1878	Flintshire I	This map shows the original coastline along the northern side of Rhyl. The area north of East Parade mostly consisted of sand dunes. The esplanade and pier were constructed by this date.
1900	Flintshire I.SW	No change, although the Grand Pavilion/Amphitheatre at the southern end of the pier was constructed by this date.
1914	Denbighshire II.SW	Marine Parade, which lay to the north of Marine Drive, is laid out by this date and broadly follows the north extent of the current promenade just west of Splash Point. Other small developments within the beach area include the New Pavilion and a lifeboat station
1948	Denbighshire II.SW	No change
1953	Denbighshire II.SW	Marine Parade has been extended westwards as far as the Amphitheatre (formerly the Grand Pavilion). The promenade and sea defences are shown from the western end of Marine Parade and along West Parade.
Satellite imagery	**Google Earth**	**The timeline feature (between 2006 and 2015) shows that the sea defences have changed little, with the exception of a new slipway to the north-east of the lifeboat station**

Source: Historic Mapping[28]

8.3.3 Archaeology

Archaeological evidence recorded close to the Scheme boundary includes an area of exposed peat. This forms part of a wider area of former submerged land surfaces which were inundated due to rising sea levels after the last glaciation. Evidence for these surfaces have been recorded on the beach close to the eastern extreme of the Scheme and around Splash Point. Evidence recovered from these deposits include prehistoric artefacts, submerged trees, mammal remains and footprints[29].

[27] Geology of Britain viewer [Online] Available at: Geology of Britain viewer | British Geological Survey (BGS) Accessed November 2020

[28] National Library of Scotland Mapping resources [Online] Available at: https://maps.nls.uk/ Accessed November 2020

[29] CPAT 2018, Central Rhyl Coastal Defence Scheme, Denbighshire: Desk-based Assessment

Roman activity is limited to a few findspots of coins[30].

Post-medieval activity recorded within the Study Area includes a series of possible fish traps, or early sea defences, which have been recorded at Splash Point, to the east of the Scheme. A number of undesignated wrecks are also recorded within the Study Area, predominantly to the west of the Events Arena. The former Rhyl pier and Amphitheatre (or Gaiety Theatre) is also recorded[31].

8.3.4 Built Heritage and Designated Assets

Rhyl Central Conservation area sits to the south-east of the Scheme, beyond West Parade. The River Street Conservation area sits to the south-west of the Scheme, also beyond West Parade[32].

There are 27 listed buildings within the Study Area[33]. These buildings all lie to the south of the Scheme boundary and predominantly within the Rhyl Central Conservation area. They date from the post-medieval to the modern period.

Two designated aircraft crash sites have also been identified, approximately 600m to the north of the Scheme boundary[34].

8.4 Assumptions and Limitations

- The Scheme would have no detrimental effect on the setting of the Rhyl Central Conservation area or any assets;
- The Scheme would not have any significant effect on areas further along the coast which may affect the preservation of wreck sites;
- The available online resources and previous studies contain enough detail to make sound judgements;
- Designated data is up to date as of November 2018 and non-designated data supplied by Clywd-Powys Archaeological Trust is up to date as of November 2018 (as reported on in a previous DBA[35]). No surveys have yet been undertaken, but a visual inspection is proposed for a later stage. As part of the EIA, the designation and HER data will be updated. Where there is an absence of data, professional judgement will be used to reach informed decisions regarding the historic environment; and
- The current understanding of the extent and survival of archaeological remains within the Study Area is based on data relevant to the assessment which has been selected based on professional judgement. However, the specific nature, extent, date, degree of preservation and significance of known and unknown archaeological remains is difficult to predict without appropriate invasive investigation. The uncertainty in predicting impacts and effects upon such resources is inherent in all such studies and should be stressed.

[30] CPAT 2018, p8

[31] CPAT 2018, p8

[32] Archwilio [Online] Available at: https://archwilio.org.uk/her/chi1/arch.html?county=Denbighshire&lang=eng accessed November 2020

[33] A bespoke buffer was adopted for the heritage desk-based assessment carried out by CPAT (2018). This extended to 1km at its maximum to take in the extent of the intertidal zone to the north and east of the Scheme. The buffer extended to a maximum of 300m to the south to take into account the built heritage.

[34] CPAT 2018, p11

[35] CPAT (2018)

8.5 Key Guidance and Best Practice

The assessment would be carried out with due regard to the following key legislation and guidance:

- Ancient Monuments and Archaeological Areas Act 1979;
- Planning (Listed Buildings and Conservation Areas) Act 1990;
- Protection of Wrecks Act 1973;
- Protection of Military Remains Act 1986;
- Historic Environment (Wales) Act 2016;
- TAN 24: The Historic Environment;
- Cadw planning advice available at: https://cadw.gov.wales/advice-support/placemaking/legislation-and-guidance/policy-advice-and-guidance accessed November 2020;
- Cadw Heritage Impact Assessment in Wales, 2017;
- Cadw Setting of Historic Assets in Wales, 2017;
- Cadw Managing the Marine Historic Environment of Wales, 2020; and
- Highways England, Design Manual for Roads and Bridges: LA 106 Cultural heritage assessment 2019.

The HER and designation data used for this scoping chapter is correct as of 2018. In line with best practice, this will be updated for the EIA.

8.6 Potential Effects

The temporal scope of the assessment assumes a baseline with current conditions at the time of writing the ES. Both temporary and permanent effects from the Construction and Operation phases of the Scheme will be considered within the assessment.

Permanent effects are considered to be any physical impacts to designated and non-designated historic buildings and archaeological remains within the land required for the Scheme, alterations to the setting of listed buildings and visual and noise impacts caused by the operational phase of the Scheme.

Temporary effects are considered to be construction activity such as, increased noise or the visibility of heavy plant, which will be removed upon completion. It will equally include the construction of compounds which shall be removed after the completion of works.

The Scheme has the potential to impact upon non-designated archaeological remains, which are located within the Scheme area. Due to the proximity of heritage assets to the Scheme, there is potential for further archaeological remains to be present within the Scheme boundary.

There would be potential short term, temporary effects on any known built heritage sites, designated assets or listed buildings or their settings, depending on the location of site compounds and construction traffic routes. The design, nature and overall aim of the Scheme itself is unlikely to have any long-term visual effects.

The full extent of the potential environmental impacts of the Scheme is not currently known and further mitigation will be required in advance of the production of the EIA to fully understand the potential impacts (see Section 8.7).

Table 8.2: Potential Effects

Effects	Construction	Operation
Potential Non-Significant Effects	Potential for discovery of previously unidentified archaeological assets.	None
Potential Significant Effects	Potential for removal of archaeological remains.	None
Scoped In/Out	**In**	**Out**

The potential of removal of previously unidentified archaeological assets would constitute a significant effect. As there is potential of finding such features within the Scheme boundary, mitigation would be recommended.

A confirmatory scoping opinion is requested from all relevant statutory consultees.

8.7 Additional Information Required

DMRB LA106 requires mitigation measures to be identified where “remediation of a likely significant effect is necessary, as it cannot be avoided, prevented or reduced”. There are several mitigation measures that will need to be considered prior to the production of the ES. They include:

- Archaeological assessment of geotechnical logs. A programme of geotechnical ground investigation is scheduled to be completed in November 2020 (with the scope approved by an archaeologist prior to commencement) and the results will be used to develop an archaeological deposit model. This is intended to assess the extent and potential for submerged land surfaces within the Scheme boundary. This will feed into the ES and allow for appropriate mitigation measures to be proposed, in line with the recommendations developed after work at Borth, Ceredigion[36][37];
- Detailed design of the Scheme will be required in order to understand the potential impacts to known, and unknown, archaeological remains;
- Consultation with Cadw, Denbighshire Conservation Officer, CPAT Planning Archaeologist and the RCAHMW Maritime Officer to discuss the potential requirement for further mitigation.

8.8 Proposed Methodology

The proposed EIA methodology for the assessment of Archaeology and Cultural Heritage effects can be found in Appendix B.2.

[36] Meek, J. (2012) Borth Coastal Defence Scheme, Phase 1, Borth, Ceredigion: Archaeological Watching Brief. Unpublished Dyfed Archaeological Trust Report

[37] The recommendations are not formally published anywhere, but were agreed upon between the Archaeological Coastal Forum Group, which included representation from Cadw, the National Trust, RCAHMW, the four Welsh Archaeological Trusts and UWTSD. A list can be found in CPAT 2018, p16-17

9 Biodiversity

9.1 Introduction

This Biodiversity Chapter identifies the ecological features that can be significantly affected by the Scheme using ecological baseline data gathered from desktop records and field surveys.

The site itself comprises habitats of largely local value but there is significant ecological value in the habitats adjacent to the site, which form part of the Liverpool Bay Special Protection Area (SPA). There is potential for temporary construction effects on the SPA and the species it supports, which would require a Habitats Regulations Assessment (HRA).

9.1.1 Policy Context

9.1.2 Reporting/Assessment Completed to Date

The ecological reports produced for this Scheme to date include the:

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019;
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D);
- Central Rhyl OBC Preliminary Ecological Appraisal Report (PEAR), JBA Consulting, November 2018 (Appendix D);
- Central Rhyl OBC Habitats Regulations Screening Assessment, JBA Consulting, April 2019 (Appendix D); and
- Central Rhyl Coastal Defence Scheme – Field Report (Intertidal biotope survey), APEM, November 2020.

9.2 Study Area

The current guidance on ecological impact assessments (Chartered Institute of Ecology and Environmental Management; CIEEM, 2018) recommends that all ecological features that occur within a ‘Zone of Influence’ (ZoI) for a proposed development are investigated. The ZoI includes:

- Areas directly within the land take for the proposed development and access;
- Areas which would be temporarily affected during construction;
- Areas likely to be impacted by hydrological disruption; and
- Areas where there is a risk of pollution and noise disturbance during construction and/or operation.

The ZoI is variable depending on the nature of the construction activities and the ecological receptors affected. For this assessment zones have been defined as outlined in Table 9.1.

Table 9.1: Zone of Influence

Ecological Feature	Zone of influence
Statutory designated sites	5.0km
European designated sites	5.0km
Non-statutory designated sites	2.0km

Ecological Feature	Zone of influence
Protected species records	1.0km
Protected species evidence	Within the survey area

Source: Mott MacDonald Ltd, 2020

9.3 Baseline Conditions

This baseline condition is assessed through considering the statutory and non-statutory designated sites as well as the ecologically valuable or protected habitats and species within the ZoI. This has been informed by a desktop study, biotope survey and overwintering bird surveys.

9.3.1 Designations

A total of six statutory designated sites were identified within 5.0km of the Scheme. In addition there are nine non-statutory designated sites within 2.0km, comprising two Local Nature Reserves (LNRs) and seven Wildlife Sites (these are listed in the PEAR; Appendix D)[38].

All other statutory and non-statutory designations are considered sufficiently separated from the Scheme with no clear impact pathways. As such, these are considered unlikely to form a constraint to any proposals and are not considered further.

The statutory ecological designations considered likely to be affected by the Scheme are the Liverpool Bay SPA (located approximately 300m north of the Scheme at its closest point, designated at an international level for the wetland bird species and assemblages present; and the Dee Estuary SPA, SAC and Ramsar (located approximately 5.0km east). Given the proximity of these designations, they have been considered within a Habitats Regulations Assessment (HRA) and a Coastal Processes Assessment[39].

The following designated sites are not likely to be affected during construction, but could be adversely affected if the Scheme were to cause changes to the coastal processes in the area[40]:

- Dee Estuary SAC;
- Dee Estuary SPA;
- Dee Estuary Ramsar;
- Gronant Dunes SSSI;
- Gronant Dunes LNR; and
- Talacre Warren SSSI.

There is also the potential for adverse impacts on non-statutory LWSs, these are listed in the PEAR; Appendix D) and consultation with the relevant site managers is recommended[38].

9.3.2 Habitats

The majority of the site is characterised by intertidal habitats, consisting of coarse to fine sand with areas of mud and gravel present. A benthic invertebrate survey carried out in June 2018 identified low numbers of polychaete worms and amphipods[38] with large areas comprising the

[38] Preliminary Ecological Appraisal Report – Central Rhyl OBC, JBA Consulting, November 2018. Document reference: CR-JBA-02-00-RP-BD-0001-S2-P02-Central_Rhyl_OBC_Preliminary_Ecological_Appraisal

[39] Habitats Regulations Screening Assessment – Central Rhyl OBC. JBA Consulting, April 2019.

[40] Central Rhyl Coastal Defences – Preliminary Environmental Impact Report, JBA Consulting, April 2019. Document reference: 2018s1313 - Central Rhyl PEIR v0-7

biotope LS.LSa.MoS – Barren or amphipod-dominated mobile sand shore; and in more sheltered areas, LS.LSa.FiSa – Polychaete/amphipod-dominated fine sand shores.

An intertidal survey, consisting of a Phase I and II Habitat Survey was undertaken on the 11th and 12th November 2020[41] and results of this support the 2018 survey, the provisional biotopes recorded are listed as follows:

- Barren littoral coarse sand;
- Polychaete / amphipod dominated fine sand shores;
- *Lanice conchilega* in littoral sand;
- Polychaete / bivalve dominated mid estuarine mud shores;
- *Sabellaria alveolata* reefs on sand-abraded eulittoral rock;
- *Mytilus edulis* beds on littoral mixed substrata;
- Barnacles and *Littorina* spp. on unstable eulittoral mixed substrata; and
- *Mytilus edulis* and piddocks on eulittoral firm clay.

The southern areas of the site, beyond the revetment, comprise majority hardstanding (promenade, events arena and car parking), buildings (none were assessed as having more than a negligible ecological value or bat roost potential) and some well managed amenity grassland, mostly consisting of a monoculture of perennial rye grass (*Lolium perenne*). These are considered to be of negligible ecological value[38] and do not pose a constraint.

The following habitats are considered to be of elevated value in the context of the site and could qualify as Priority Habitats (as listed under Section 7 of the Environment (Wales) Act):

- Blue mussel (*Mytilus edulis*) beds are recorded as present on MagicMap[42]. This habitat was not identified during the 2018 survey. During the November 2020 biotope survey, *Mytilus edulis* were identified as present and formed the habitat '*Mytilus edulis* and piddocks on eulittoral firm clay' and '*Mytilus edulis* beds on littoral mixed substrata'. Both are features of interest;
- *Sabellaria alveolata* was recorded at the low-tide mark at various points. When this species forms reefs these are classed as a UK BAP priority habitat (Littoral Rock); the formations identified during the November field survey were determined to be of low quality reef habitat; and
- Potential for other protected habitats, pending results of the biotope survey.

A coastal processes assessment is recommended to assess the potential wider impacts to habitats and species[38].

9.3.3 Protected Species

A number of protected species were identified from records provided by North Wales Environmental Information Service (Cofnod), many of which have the potential to be present in the habitats within the survey area, with some confirmed on site. Based on the records returned and the Preliminary Environmental Impact Report (PEIR)[40], the species considered to be potential constraints for the Scheme are:

- Otter and other terrestrial mammals;

[41] APEM (2020). Central Rhyl Coastal Defence Scheme – Field Report. APEM Scientific Report P000005614FR. Mott MacDonald, November 2020, v1.1 Final, 8 pp

[42] MAGIC. Natural England 2020. [Online] Available at: https://magic.defra.gov.uk/MagicMap.aspx [Accessed November 2020]

- Nesting and wintering bird species;
- Fish;
- Marine mammals; and
- Marine invertebrates.

Overwintering bird surveys commenced in September 2020 and are currently ongoing. Field data to date confirms the presence of numerous species comprising the features of the Liverpool Bay SPA (e.g. common scoter and red throated diver)[43] and supports the findings of the 2016-2017 JBA surveys. An additional Schedule 1 (WCA) protected species, peregrine falcon, *Falco peregrinus*, comprising one adult female and one young has been identified utilising the Sky Tower; no historical data was available online indicating whether these are breeding close by.

Wintering bird surveys were carried out by JBA from October 2016 to April 2017[38] at the East Rhyl foreshore, directly adjacent to the Scheme. These identified the foreshore was utilised predominantly by waders and gulls comprising 36 species, a number of which formed part of the qualifying assemblage for the Liverpool Bay SPA. These also confirmed the presence of groups of common scoter (*Melanitta nigra*) within 500m of the coastline and red-throated diver *(Gavia stellata)* within 1.0km. Both species are protected under the Liverpool Bay SPA.

The overwintering bird surveys also identified the presence of a number of species protected under Section 7 of the Environment (Wales) Act (2016) within 500m of the coastline (see Appendix D).

The nursery and spawning grounds of numerous species of fish listed under Section 41 of the NERC Act were recorded within 10km of the Scheme along with records of Atlantic Salmon (*Salmo salar)*, Sea Trout (*Salmo trutta)*, European eel (*Anguilla anguilla)* and Sea and Brook Lamprey (*Petromyzon marinus and Lampetra planeri* respectively) from the Clwyd and Dee catchments[38].

Honeycomb worm (*Sabellaria alveolata*) was identified on intertidal surveys by both JBA (June 2018)[38] and APEM (November 2020)[41]. A marine biotope survey has been undertaken, with the results expected by January 2021, to inform the EIA.

9.4 Assumptions and Limitations

It is possible that certain species may have been overlooked or under-recorded during the assessment for reasons including the following:

- Biological records obtained from third parties and presented in the desk study do not represent a full and complete species list for the area;
- Ecological surveys are limited to factors which affect the presence of plants and animals, such as time of year, migration patterns and behaviour. The biotope survey was undertaken outside of the optimal tidal survey window although this is unlikely to have affected identification of the broad habitat types; and
- All information provided was correct at the time of writing this scoping assessment.

9.5 Key Guidance and Best Practice

This Chapter has been prepared with reference to the following legislation and policies of relevance to nature conservation and biodiversity:

[43] Central Rhyl GI HRA, Mott Macdonald Ltd, November 2020. Document reference: CR-MMD-00-ZZ-RP-EN-3002-P02

- The Environment (Wales) Act 2016)[44];
- Planning Policy Wales (PPW)[45];
- Denbighshire Local Development Plan[46] (adopted June 2013; Currently in the process of being updated however, delayed due to Covid-19) with three policies relevant to ecology:
  - Policy PSE1 – North Wales Coast Strategic Regeneration Area;
  - Policy VOE5 – Conservation of natural resources; and
  - Policy VOE6 – Water management.

Ecological assessments were undertaken in compliance with relevant guidance and best practice including:

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland –2nd edition;
- Joint Nature Conservation Committee (2010). Handbook for Phase 1 Habitat Survey – a technique for environmental audit;
- Relevant industry standard, best-practice guidance from Natural England (also adopted by Natural Resources Wales) or from relevant conservation groups (i.e. British Trust for Ornithology); and
- Relevant Industry standard, best practice guidance including:
  - The British Trust for Ornithology's Wetland Bird Survey, 'look-see' methodology (Bibby *et al*. 2000); and
  - The Marine Habitat Classification for Britain and Ireland (Connor *et al.* 2004).

9.6 Potential Effects

An initial assessment of the anticipated potential effects from the Scheme on biodiversity is presented in Table 9.2. This assessment has been undertaken on the assumption that best practice working measures and safeguards would be implemented as part of a Construction Environmental Management Plan (CEMP). In particular, it is assumed that this CEMP would include pollution control measures (hydrological, noise, dust and lighting), good biosecurity practices and sensitive working measures to safeguard protected species such as nesting birds. On this basis, effects from construction which would be mitigated by measures in the CEMP or other best practice safeguards are highlighted below as "potential non-significant".

There is also the potential for environmental enhancements to be incorporated into the Scheme as part of the target for an overall net biodiversity gain as required by the Environment (Wales) Act.

Ecological receptors that have been scoped out on the basis of the baseline assessment are described separately in Table 9.2. A confirmatory scoping opinion is requested from all relevant statutory consultees.

[44] The Environment (Wales) Act 2016 [Online] Available at: http://www.legislation.gov.uk/anaw/2016/3/contents/enacted Accessed November 2020

[45] 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 Accessed November 2020

[46] Denbighshire County Council Local Development Plan 2006 – 2021 [Online] Available at: Adopted Local Development Plan 2006-2021 (denbighshire.gov.uk) Accessed November 2020

Table 9.2: Potential Effects

Effects	Construction	Operation
Potential Non-Significant Effects	Adverse effects (mitigation already accounted for in CEMP or best practice): • Construction pollution (hydrological, dust and plastics) to adjacent habitats; • Loss or modification of nesting bird habitat (potential for damage or disturbance to nests); • Adverse effects on fish from localised increase in sedimentation or pollution, disruption to foraging behaviour and displacement of movements; • Adverse effects on foraging otter (known to be present in Clwyd Estuary); • Acoustic disturbance (during high tides) to marine mammals; and • Adverse effects on marine invertebrates from construction activities and water quality effects*. Beneficial effects (subject to enhancements): • There is potential for beneficial effects on habitats through appropriate design, both for intertidal and terrestrial habitats.	Anticipated effects: • Maintenance works, notably landscaping or habitat management, could affect nesting birds (subject to timing of works); • Potential of change of the available habitat for reptiles (targeting an overall enhancement) and maintenance works could risk killing or injury of reptiles (if present); and • Maintenance could result in localised impact expected to fish from operational use.
Potential Significant Effects	Adverse effects (requiring mitigation): • Disturbance to birds (designated interest features) of the Liverpool Bay SPA [requiring further assessment under HRA and EIA processes]; • Any significant works could alter the coastal processes which could impact the features of the Dee Estuary SAC, SPA and Ramsar [requiring further assessment under HRA and EIA processes]; • Adverse effects on marine invertebrates and submerged seaweed from construction activities and water quality effects; and • Any significant works could alter the coastal processes, which has the potential to change the sediment regime to the shingle spit at Gronant Dunes and Talacre Warren SSSI and have adverse effects on the Little tern population.	Adverse effects: • Any significant repair works could result in disturbance to birds in the SPA; • Any significant repair works could result in damage or degradation of habitats (notably intertidal habitats); and • Any significant repair works could alter the coastal processes which could impact the features of the Liverpool Bay SPA and Dee Estuary SAC, SPA and Ramsar.
Scoped In/Out	**Scoped in:** • Liverpool Bay SPA; • Dee Estuary SPA, SAC and Ramsar (including Gronant Dunes and Talacre Warren); • Benthic habitats (Mussel beds and honeycomb worm*);* • Other priority habitats;	**Scoped in:** • Liverpool Bay SPA; • Priority habitats; • Overwintering birds; and • Nesting birds. **Scoped out:**

Effects	Construction	Operation
	• Wintering birds; • Nesting birds; and • Invertebrates. **Scoped out:** • All other receptors.	• All other receptors.

Source: Mott MacDonald Ltd, 2020

*Subject to the results of the biotope report and feedback from marine specialists (notably their assessment of the importance of the honeycomb worm, mussel beds and any invertebrate communities present).

For potentially significant effects, mitigation and enhancement would be included within the ES Chapter and HRA.

9.7 Additional Information and Assessments/Reporting Required in Support of the ES

Potentially significant effects have been identified as being possible and consequently biodiversity has been scoped into the environmental statement. The following ecological surveys/reporting would be required to inform the assessment and mitigation in the biodiversity ES Chapter:

- Biotope Survey, completed on 11th – 12th November 2020 by APEM (full report anticipated January 4th, 2021); and
- Overwintering bird surveys, currently ongoing.

Based on the ecological baseline, it is anticipated that the following reports would be produced in order to inform a biodiversity ES Chapter:

- Report to inform a HRA;
- Biosecurity Risk Assessment;
- CEMP; and
- Coastal Processes Assessment.

9.8 Proposed Methodology

The proposed EIA methodology for the assessment of Biodiversity effects can be found in Appendix B.3.

10 Climate

10.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential effects of the Scheme on climate. Two aspects are considered for the climate assessment, these are the impact of the Scheme upon climate change and the resilience of the Scheme to climate change.

Impacts of the Scheme upon climate change considers greenhouse gas (GHG) emissions arising from the Scheme, as these contribute to climate change, covered under effects on climate. During the construction phase, embodied carbon emissions from the use of construction materials are considered to be the main contributor to climate change, with additional greenhouse gas emissions arising from the use of plant and transport of materials.

The resilience of the Scheme to climate change is also considered as part of this Chapter. The Scheme design would take into account climate change including predicted sea level increases when considering the design of the coastal defences and promenade height.

10.1.1 Reporting/Assessment Completed to Date

The reports produced for this Scheme to date include the:

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C); and
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D).

10.2 Study Area

The assessment of the effects on climate does not have a physical study area *per se* as the receptor (climate change) for GHG emissions is not spatially defined. Instead, the construction assessment would consider the embodied carbon within the materials, construction plant emissions and emissions from transport of materials to site. The operation assessment considers the emissions from repair and maintenance (where possible), and energy use through operation.

The resilience of the Scheme to climate change would be considered within a Climate Change Risk Assessment (CCRA) with a study area which would include all areas of land take and would consider all elements of the Scheme design.

The CCRA would consider the 2070s (2060-2079) as the timeline for analysis. This choice is informed by the long lifespan of the key structures within the Scheme, with the new coastal structures having a lifespan of 100 years (tidal inundation and wave overtopping standard of protection based on a 0.5% Annual Exceedance Probability event with a 100-year climate change allowance). The UK Climate Projections[47] would be used to set the future baseline, and the furthest projections available are for the 2080s time period. Where structures have a shorter lifespan (e.g. street lighting) this would be taken into account in the assessment.

[47] Met Office (2019) [Online] Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/high-res-projections Accessed November 2020.

10.3 Baseline Conditions

10.3.1 Existing Baseline

10.3.1.1 Effects on Climate

The construction industry is the largest consumer of natural resources in the UK and this accounts for approximately 10% of the total UK carbon emissions[48]. Therefore, assuming the UK proportion in lieu of a Wales specific proportion, it has been estimated that approximately 2.3MtCO_2 are attributed to the embodied carbon of construction materials in Wales as a whole based on 2018 emissions[49]. The Scheme falls within Denbighshire authority which reported 487ktCO_2 regional emissions for 2018[49].

10.3.1.2 Resilience of the Scheme to Climate Change

The Met Office holds historical regional climate information, in which Rhyl is included in the Wales region[50]. High-level climate observations for the Wales region over a 30-year averaging period between 1981-2010 are available (see Table 10.1). The climate variables used to describe current and future climate are temperature, precipitation and wind. These climate variables can also lead to changes in extreme climate events (for example, floods, droughts, soil moisture deficit, heatwaves, snow and ice). The information obtained on changes in the climate variables would be used to provide insight into future changes in extreme climate events.

Table 10.1: Climate Baseline Observations

Weather variables	Climate Observations
Temperature	Mean daily minimum temperatures in Wales can range from 0°C to 3°C in winter, with January being the coldest month, and in summer daily maximum temperatures are in the region of 18°C, with the hottest days being observed in July.
Heatwaves	Extreme maximum temperatures can occur in July or August. A temperature of 35.2°C was recorded in Hawarden Bridge, Flintshire on 2nd August 1990. When a hot airstream arrives from the east, maxima along the coasts can equal those inland, an example being the 31.8°C achieved at Aberporth, Ceredigion on 2nd August 1995.
Rainfall	Throughout Wales, the months from October to January are significantly wetter than those between February and September, unlike places in eastern England where July and August are the wettest months of the year. This seasonal pattern is a reflection of the high frequency of winter Atlantic depressions and the relatively low frequency of summer thunderstorms. The number of days with a rainfall total of 1mm or more ('wet days') tends to follow a pattern similar to the monthly rainfall totals. In the higher parts, over 50 days is the norm in winter (December-February) and over 35 days in summer (June-August).
Wind	Wales is one of the windier parts of the UK, with the windiest areas being over the highest ground and along the coasts, particularly those facing directions between north-west and south. Coastal areas average 15 days or more of gale each year with the number of days decreasing inland to 5 days or fewer. Wind gusts are the highest in November – February with the ability to reach 80 knots.

Source: Met Office[50]

[48] Institute of Civil Engineers (ICE) (2014): Energy Briefing Sheet: Embodied Energy and Carbon [Online] Available at: https://www.ice.org.uk/ICEDevelopmentWebPortal/media/Documents/Disciplines%20and%20Resources/Briefing%20Sheet/Embodied_Energy_and_Carbon.pdf Accessed November 2020.

[49] Department for Business, Energy and Industrial Strategy (2020) UK local authority and regional carbon dioxide emissions national statistics: 2005-2018.

[50] The Met Office (2016) Wales: Climate [Online] Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/wales_-climate---met-office.pdf Accessed November 2020.

10.3.2 Future Baseline

10.3.2.1 Effects on Climate

The Welsh government aim to reach net zero carbon by 2050 however it has been recommended by the Committee on Climate Change that wales aims for 95% reduction, amendments to regulations are anticipated to be completed in 2020[51]. Whereas, the UK government has committed to net zero GHG emissions by 2050, amending the Climate Change Act 2008[52].

The UK 2019 energy demand and greenhouse gas emissions projections[53] show that the third carbon budget (2018 to 2022) is very likely to be achieved with a headroom of around 26MtCO_2e. However, for the fourth carbon budget (2023 to 2027) and fifth carbon budget (2028 to 2032), the UK's emissions are currently projected to be greater than the cap set by the budget. The sixth carbon budget (2033 to 2037) is due to be published in December 2020 and will be the first to align with the UK's net zero commitments. Significant effort is required to ensure that all contributing emissions are reduced as far as possible through the design, construction and operation of the Scheme.

10.3.2.2 Resilience of the Scheme to Climate Change

The UK Climate Projections (UKCP) developed by the Met Office Hadley Centre include regional climate projection data, for which Rhyl is included in the Wales region. Wales is projected (under a range of emissions scenarios modelled in UKCP18) to experience hotter and drier summers, and warmer and wetter winters (See Table 10.2Table 10.2:). Key to the design of this Scheme is the projected sea level rise.

For the CCRA, climate projections data for the 2070s (2060-2079) under RCP 8.5[54] (the highest scenario available in UKCP18) have been selected. Projected changes in key climate variables and sea level under the RCP 8.5 emissions scenario, are summarised in Table 10.2.

Table 10.2: Future Climate Projections Over Land for the 2070s (RCP 8.5 scenario)

Climatic Conditions	Climate Projections
Temperature	The average summer temperature is projected to increase by 3.2°C under the central estimate, which represents "as likely as not" probability of change (50th percentile), and average winter temperature is estimated to increase by 2.4°C (50th percentile).
Rainfall	The average summer rainfall rate is estimated to decrease by 29%, whereas the average winter rainfall rate is estimated to increase by 16% (in the 50th percentile for both)
Sea Level Rise	Mean sea levels are expected to increase by 0.31m-0.64m by 2070 (in the 5th and 95th percentile respectively) for the most relevant location included in the UKCP18 which is Cardiff. The future impact of sea level rise would be

[51] Welsh Government, press release (2019) [Online] Available at: https://gov.wales/wales-accepts-committee-climate-change-95-emissions-reduction-target Accessed November 2020

[52] Gov.uk (2019) Climate Change Act 2008 [Online] Available at: https://www.legislation.gov.uk/ukpga/2008/27/section/1 Accessed November 2020

[53] Department for Business, Energy & Industrial Strategy (BEIS), Updated energy and emissions projections 2019 (October 2020) [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/931323/updated-energy-and-emissions-projections-2019.pdf Accessed November 2020

[54] RCP: Representative Concentration Pathways. RCPs are the new scenarios developed by the Intergovernmental Panel on Climate Change (IPCC) and used by the UKCP18 climate projections. RCPs are based on the projected concentration of greenhouse gases in the atmosphere in 2100, e.g. RCP 8.5 is a radiative forcing of 8.5 in 2100. These replace the previous Low, Medium and High scenarios. There are 4 RCPs in UKCP18 (2.6, 4.5, 6.0 and 8.5). These do not directly map onto the Low, Medium, High scenarios used previously.

	included as part of the Flood Risk Assessment (FRA) carried out for the Scheme.
Wind	Climate projections for wind are more uncertain than those for temperature and precipitation, due to inherent difficulty in modelling future wind conditions. However, overall an increase in extreme weather, including wind, is projected.

Source: UKCP18 Climate Projections[55]

10.4 Assumptions and Limitations

- Emissions associated with the end of the life stage (lifecycle stages C1-4), decommissioning, shall not be considered given the uncertainty of the length of operation of the Scheme;
- There would be assumptions made in estimating the GHG emissions from the construction and operation of the Scheme. Assumptions may include material quantities or type, or assumptions in determining the most appropriate emission factor. Specific assumptions would be included within the ES;
- Where possible maintenance and replacement over the lifetime of the Scheme would be included. However, this would depend on the level of information available. Any assumptions or exclusions would be detailed within the ES;
- Where Scheme specific data for the transport of material to site is not available assumptions provided by the Royal Institute of Chartered Surveyors[56] would be used;
- Information on the climate baseline and future projections are based on freely available information from third parties, including the historical meteorological variables recorded by the Met Office and the UK Climate Projections (UKCP18) developed by the Met Office. In addition, the assessment has been informed by a selected range of existing climate change research and literature, available at the time of writing this assessment; and
- Generally global projections are more certain than regional, and temperature projections more certain than those for precipitation. Further, the degree of uncertainty associated with all climate change projections increases for projections further into the future.

10.5 Key Guidance and Best Practice

Key legislation, policy and guidance relevant for climate includes:

- Climate Change Act, 2008 (2019 amendment sets a NetZero target by 2050 compared to 1990 baseline);
- The Environment (Wales) Act, 2016 (requires net 2050 emissions are at least 80% lower than baseline set in legislation);
- Prosperity for All: A Low Carbon Wales (2019);
- The Carbon Plan, 2011 (the plan sets out how the UK will achieve decarbonisation within the framework of the energy policy);
- EIA Guide to Climate Change Resilience and Adaptation (2020)[57]; sets out guidance on undertaking the vulnerability of the Scheme to climate change assessment;
- EIA Guide to Assessing Greenhouse Gas emissions and Evaluating their Significance (2017)[58]; sets out a guide to undertaking the effects on climate assessment

[55] Met Office (2018) UKCP18 Climate Projections: Key results [Online] Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Key-results.xlsx (last accessed June 2019)

[56] Royal Institute of Chartered Surveyors (2017) Whole life carbon assessment for the built environment.

[57] Institute of Environmental Management and Assessment (2020) EIA Guide to Climate Change Resilience and Adaptation

[58] Institute of Environmental Management and Assessment (2017) EIA Guide to Assessing Greenhouse Gas emissions and Evaluating their Significance

- Infrastructure Carbon Review, 2013 (sets out carbon reduction actions required by infrastructure organisations); and
- Publicly Available Specification 2080:2016 (sets out a common approach and understanding of whole life carbon management in the provision of economic infrastructure as a result of the Infrastructure Carbon Review).

10.6 Potential Effects

The potential effects of the Scheme are anticipated to be as detailed in Table 10.3. A confirmatory scoping opinion is requested from all relevant statutory consultees.

Table 10.3: Potential Effects

Effects	Construction	Operation
Effects on Climate		
Potential Non-Significant Effects	Transport emissions from site workers commuting to site.	Operational emissions from any energy required along the Scheme.
Potential Significant Effects	Embodied carbon emissions from the use of construction materials, plant emissions and emissions from transport of materials to site.	Emissions through maintenance, and repair.
Scoped In/Out	**Scoped In**	**Scoped In**
Resilience of the Scheme to Climate		
Potential Non-Significant Effects	Delays to construction programme and damage to construction materials if an extreme weather event occurs during the short construction period.	Melting or deformation to pavement surfacing due to increased temperatures. In-combination effects with other environmental disciplines e.g. landscape.
Potential Significant Effects	N/A	Promenade flooding due to large waves overtopping the revetment.
Scoped In/Out	**Scoped Out**	**Scoped Out**

Source: Mott MacDonald Ltd, 2020

The assessment for the Scheme's effect on climate change would consider the GHG emissions potential throughout the lifecycle of the Scheme for both construction and operation.

For the resilience of the Scheme to climate change, construction has been scoped out due to the short-term construction period in relation to climate change. The Scheme design would take climate change into account, including predicted sea level increases when considering the design of the coastal defences and promenade height. The design has utilised the Welsh Government Adapting to Climate Change guidance for sea level rise[59]. This assumes a rise of sea level of 0.43m by 2070 and 1.11m by 2100. Therefore, the potential significant effects have already been assessed and mitigation incorporated into the design and as such, operational effects have been scoped out of the assessment.

It is important that the design seeks to limit GHG emissions from the earliest stage possible to ensure the greatest reductions can occur. In line with the Welsh Government's carbon reduction plan, throughout the design the Scheme would seek to reduce GHG emissions as far as

[59] Welsh Government (2017) *Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales.*

practicable in all cases to contribute to the UK and Wales' net reduction in carbon emissions and maximise the potential for reducing GHG emissions. The following high-level approach would be applied and developed when seeking to reduce GHG emissions (as stipulated within PAS 2080):

- Build nothing: The design would evaluate the basic need for an asset and/or programme of works and shall explore alternative approaches to achieve outcomes set by the asset owner/manager;
- Build less: The design would evaluate the potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required;
- Build clever: The design would consider the use of low carbon solutions (including technologies materials and products) to minimise resource consumption during the construction, operation and user's use stages of the asset or programme of work; or
- Build efficiently: The design would use techniques (e.g. construction, operational) that reduce resource consumption during the construction and operation phases of an asset or programme of work.

10.7 Additional Information and Assessments/Reporting Required in Support of the ES

Potentially significant effects have been identified as being possible and consequently climate change has been scoped into the environmental statement. In order to complete the ES the following supplementary/supporting information is required for this discipline:

- CEMP;
- SWMP; and
- A Carbon Management Plan is recommended to ensure the greatest reduction in carbon emissions and smallest effect on climate change is achieved.

10.8 Proposed Methodology

An outline of the proposed EIA methodology for the assessment of effects on climate can be found in Appendix B.4.

11 Coastal Processes (Including Flood Risk and Coastal Water Quality)

11.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential effects of the Scheme on coastal processes, coastal flood risk and designated waterbodies.

The evolution and development of a shoreline is linked to the interaction between the natural processes applying both offshore and, more significantly, inshore and the geological/geomorphological form and profile of natural shoreline features and the form/profile of artificial coastal defence structures.

Once operational, the Scheme will provide additional protection for the Central Rhyl frontage where the defences are at risk of failure in the future and there is flood risk from overtopping. The Scheme will be designed to operate in conjunction with existing coastal processes.

Assessment of coastal and sediment processes would include:

- Direct effects on hydrodynamics and sediment dynamics;
- Indirect effects of these on other environmental aspects; and
- Effects upon coastal water quality.

Planning permission would be sought from DCC and a Marine Licence application would be made to NRW with consultation completed where necessary.

The coastal defences along the frontage are deteriorating and are currently predicted to fail by 2038 if no works are undertaken and the current maintenance regime is not continued. Along the central section of the frontage (Section E) (See Drawing CR-JBA-01-00-DR-C-3001 in Appendix A) wave overtopping occurs under a present day scenario, resulting in properties being at flood risk from a 20% AEP event or higher[60]. This risk of overtopping would increase with climate change.

Following the construction of the Scheme, the presence of the revetment would reduce wave energy and overtopping risk to the promenade and other adjacent infrastructure during future storm events. The rock toe would reduce the risk of failure of the existing seawall and reduce the wave energy impacting on the structure.

Overtopping events would also be reduced in frequency and severity due to the revetment and rock toe. A secondary flood wall is also proposed at the back of the promenade (Sections E-H only) to contain the flooding. The operational effects of the Scheme are therefore considered to be beneficial.

11.1.1 Reference Reports

The following relevant reporting/assessments have been undertaken to date:

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C);

[60] JBA (2019) Central Rhyl Coastal Defence Scheme, Outline Business Case

- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D);
- 2018s1313 / 2018s1347 - Central Rhyl and Central Prestatyn Coastal Processes Report, JBA Consulting, November 2018 (Appendix E);
- Central Rhyl and Central Prestatyn Inundation Modelling Report, JBA Consulting, May 2019; and
- Central Rhyl Coastal Defences – Coastal Water Framework Directive Screening Assessment, JBA Consulting, April 2019 (Appendix D).

11.2 Study Area

The study area for the coastal processes assessment is based on the area which the Scheme could be reasonably expected to have an effect on. For this Scheme this is anticipated to be the shoreline between the Clwyd Estuary, in the west, and the Dee Estuary to the east. The water quality assessment would consider impacts on all designated waterbodies that the Scheme may affect.

11.3 Baseline Conditions

Previous work has been carried out on behalf of DCC and BB to ascertain baseline conditions for the frontage. This has included the development of a coastal strategy and OBC[60].

During the development of the OBC, numerical models for waves and sediments were developed to understand the baseline conditions and the potential effects the new flood protection structures may have. These models are being updated by Mott MacDonald Ltd during the detailed design phase of the works and would be included in the future ES.

11.3.1 Hydrodynamics

11.3.1.1 Tides and Tidal Currents

The tidal range along this section of the frontage has an important influence on coastal processes. At Rhyl the mean spring tidal range is 7.47m and the neap tidal range is 3.87m.

Tidal currents in Liverpool Bay are generally in an easterly direction on the flood tide and westerly on the ebb tide with a residual net current from west to east. At Rhyl the tidal streams are generally in a west to east direction which dictates sediment transport.

The Rhyl frontage is impacted by the Clwyd Estuary ebb tidal delta which has been identified to extend over 1.0km offshore. This delta impacts on the wave climate and the coastal processes.

11.3.1.2 Wave Climate

The Rhyl frontage, owing to its location, is protected from long-period oceanic swell waves. The wave conditions at Rhyl are generally generated by local winds or as a result of waves from the north-west. These conditions result in a predominantly high wave angle[61] along the coastline.

11.3.2 Geology and Geomorphology

The bedrock geology at Rhyl is the Kinnerton Sandstone Formation on top of which lie Marine Beach deposits. A ground investigation by JBA in 2018 at East Rhyl found that the beach sands

[61] JBA (2018) 2018s1313 / 2018s1347 - Central Rhyl and Central Prestatyn OBC - Coastal Processes Report

were typically slightly gravelly to gravelly fine to coarse sand with shell fragments[61]. Beneath the beach material was:

- Tidal Flat Deposits of very soft to firm sandy silty clays with some peat and sand layers;
- Fluvial-glacial Deposits of loose to medium dense gravelly to very gravelly sands or sandy to very sandy gravels with a minor silt content; and
- Glacial Till Deposits of firm or firm to stiff, locally soft, slightly sandy and gravelly clays with occasional layers of sand that become stiff to very stiff at depth.

Cohesive (clay-rich) sediments have been observed in the intertidal area[62]. These sediments are exposed during the movement of the ridge and runnel system along the frontage.

A ground investigation is currently being undertaken for the Central Rhyl frontage and would be available during the detailed design and ES production for the Scheme.

11.3.3 Sediment Processes

The sediment transport direction along the frontage is in a west to east direction, from the Great Ormes Head towards the Point of Ayr spit and Dee Estuary. Over time, construction of hard defences and groyne fields has been undertaken which have had an influence on the coastal processes. Along the frontage beach lowering has been observed over time, along with narrowing of the intertidal zone between Rhyl and Prestatyn[63].

An assessment of littoral drift undertaken by HR Wallingford[64] indicated that approximately 217,500m^3/yr to 474,300m^3/yr sediment is transported along the West Rhyl to East Prestatyn. However, it is also noted that these rates are based on the Coastal Engineering Research Centre (CERC) formula which has its limitations and are inconsistent with observed behaviour. A review of the coastal profiles by CEUK 2015; HR Wallingford 2008 indicated that the variations in beach changes are cyclical and are related to nearshore movements of sand ridges and runnels. Although a pattern was not observed it was identified that net losses were inferred for East Rhyl[61]. The changes in the ridges and runnels is identified to be the result of cross shore sediment transport.

Analysis of the frontages ridge and runnel system was undertaken during the OBC development by analysing the beach profiles available. The results showed that the ridges and runnels are found between mean low water spring and mean high water neap. The profiles were shown to move landwards over time which was concluded to show sequential material supply rather than direct exchange of material between ridges.[61]

Within the SMP2 (2011) it was indicated that should the Walkaway scenario of not maintaining the condition and stability of the existing defences the coastline would be expected to erode by up to 32m over 100 years.

11.3.4 Hydrological Setting

11.3.4.1 Catchment Description

The natural drainage (hydrological) catchment immediately surrounding the Rhyl coastline is dominated by the large town of Rhyl. Rhyl is located next to the mouth of the River Clwyd, which

[62] CEUK (2015) North West Strategic Monitoring; Regional Sediment Analysis and Reporting 2015. Inter-tidal Report. Prepared for Sefton Council

[63] JBA Consulting (2010) East Rhyl EIA Scoping Report

[64] HR Wallingford (2008) Coastal Processes Study: Rhyl to Prestatyn. v4.0. Martin Wright Associates.

drains the Vale of Clwyd. Within the Vale, farming is of major economic importance and dominates the land use.

11.3.4.2 Surface Waterbodies (WFD)

The adjacent marine waters are part of the North Wales Coastal Waterbody (Western Wales River Basin District) Water Framework Directive (WFD) Waterbody ID GB641011650000[65] (heavily modified due to coastal defence). Its current overall status is Moderate (ecological: Moderate and chemical: Fail) with an overall objective of Good by 2021.

11.3.4.3 Transitional Waterbodies (WFD)

The Clwyd Transitional Waterbody is located to the immediate west of the Scheme WFD Waterbody ID GB541006608000 (heavily modified). Its current overall status is Moderate (ecological: Moderate and chemical: Good) with an overall objective of Good by 2027.

11.3.4.4 Groundwater Bodies (WFD)

The Clwyd Permo-Triassic Sandstone Groundwater Waterbody is located beneath the Scheme WFD Waterbody ID GB41001G202100. Its current overall status is Good (qualitative: Good and chemical: Good) with an overall objective of Good by 2015.

11.3.4.5 Other Surface Watercourses

The Rhyl Cut is an ordinary watercourse that is located 500m inland at its closest point and runs generally parallel to the coastline before discharging to the Clwyd.

11.3.5 Protected Areas

11.3.5.1 Natura 2000 Sites

The North Wales Coastal Waterbody is linked to the Liverpool Bay SPA (approximately 350m from the proposed Scheme) and the Dee Estuary SPA and SAC (around 5.0km east of the proposed Scheme).

The Clwyd Transitional Waterbody does not contain any Natura 2000 sites.

11.3.5.2 Bathing Water Quality

There are two Bathing Water Quality monitoring points in the Rhyl waterfront area:

- Rhyl East (approximate NGR 301065,382038) opposite the Travelodge on the Rhyl Promenade to the west of The Rhyl Sun Centre; and
- Rhyl (approximate NGR 00200,382600), opposite the SeaQuarium.

In 2020[56] the results of sampling and analysis of water quality at both points against the revised bathing water standards by NRW resulted in a Good classification[66] (up from Sufficient 2017-2019). Water quality at designated bathing water sites in Wales is assessed by NRW from May to September including testing the numbers of Intestinal enterococci and Escherichia coli present.

According to NRW "*this bathing water is subject to short term pollution. Short term pollution is caused when heavy rainfall washes faecal material into the sea from livestock, sewage and*

[65] Water Watch Wales [Online] Available at: https://waterwatchwales.naturalresourceswales.gov.uk/en/ Accessed November 2020

[66] NRW Bathing Water Quality Reporting [Online] Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/water-reports/bathing-water-quality/?lang=en Accessed November 2020

urban drainage via rivers and streams. At this site the risk of encountering reduced water quality increases after rainfall and typically returns to normal after 1-3 days."[75]

11.3.5.3 Shellfish Waters

There are no designated Shellfish Waters located within 2.0km of the Scheme.

11.3.5.4 Nitrate Vulnerable Zones

Nitrate Vulnerable Zone (NVZ) 135 lies within 100m of the North Wales Coastal Waterbody and is adjacent to the proposed scheme. NVZ 623 lies within 100m of the Clwyd Transitional Waterbody[67].

11.3.6 Other Considerations

11.3.6.1 Phytoplankton

Phytoplankton (microscopic algae) naturally increase in number at certain times of the year. This process is known as a phytoplankton bloom. Algal blooms can occur at any beach during the bathing season and are usually noticeable by a surface scum. This beach has no history of such blooms[66].

11.3.6.2 Drainage

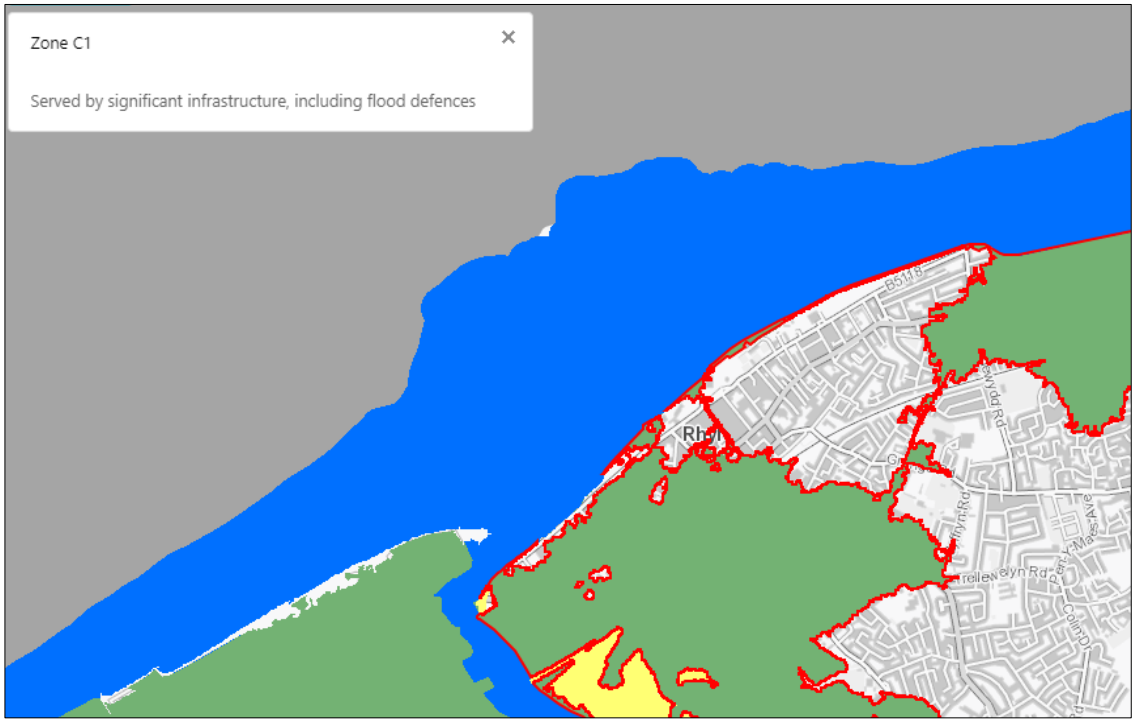
In general, current surface water runoff from the Promenade and highway area drains directly to the foreshore and into the sea.

11.3.7 Coastal Flood Risk

The area of interest lies within or close to 'TAN15: Development Advice Maps' Zone C1; this is described as an area "served by significant infrastructure, including flood defences" (shown in Figure 11.1). This zone is based on the extreme flood outline, which is greater than or equal to a 0.1% (river, tidal or coastal) Annual Exceedance Probability (AEP) even.

[67]Natural Resources Wales (undated) [Online] Available at: www.lle.gov.wales/ Accessed November 2020

Figure 11.1: Development Advice map for Central Rhyl



Source: Welsh Government Development Advice Maps, 2020[68]

In the past, overtopping of the defences has resulted in flooding of properties. In December 2013 flooding of the frontage occurred resulting in damage to properties and other assets.

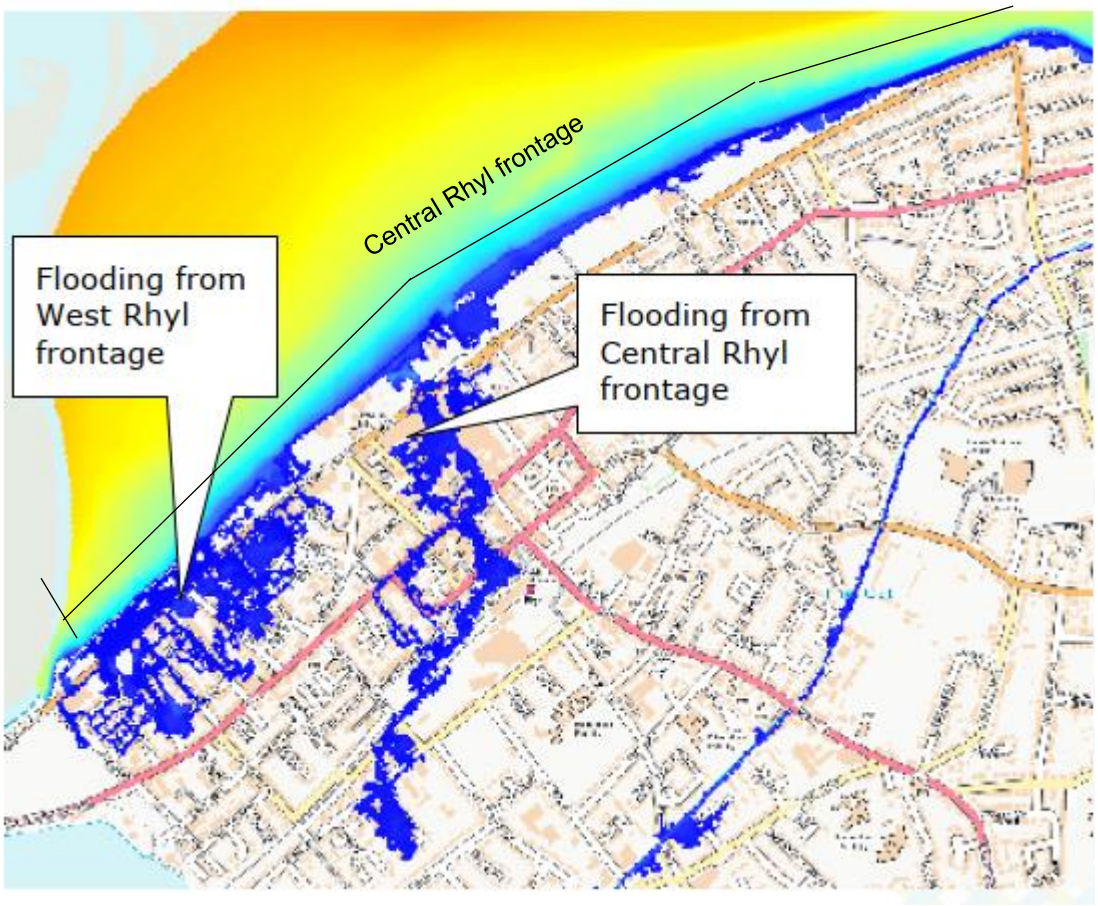
The baseline overtopping risk has, for this scoping report, been derived from an overtopping assessment[69] and inundation models[70]. The flood risk was determined using a SWAN model and emulator to translate the offshore waves to the nearshore and then the Neural Network tool to determine the overtopping rates along the frontage. The results of the overtopping were included in a Tuflow model which provided an understanding of the inundation along the frontage. An example flood map from the Walkaway scenario is presented in Figure 11.2.

[68] Natural Resources Wales (undated) Welsh Government Advice Maps [Online] Available at: https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme2 Accessed November 2020

[69] JBA Consulting (2019) Technical note – Wave Overtopping Report

[70] JBA Consulting (2019) Central Rhyl and Central Prestatyn Inundation Modelling Report.

Figure 11.2: Predicted Maximum Depth Grids – Central Rhyl, WA 0.5% AEP 2068 Scenario



Source: Central Rhyl and Central Prestatyn Inundation Modelling Report, JBA, 2019

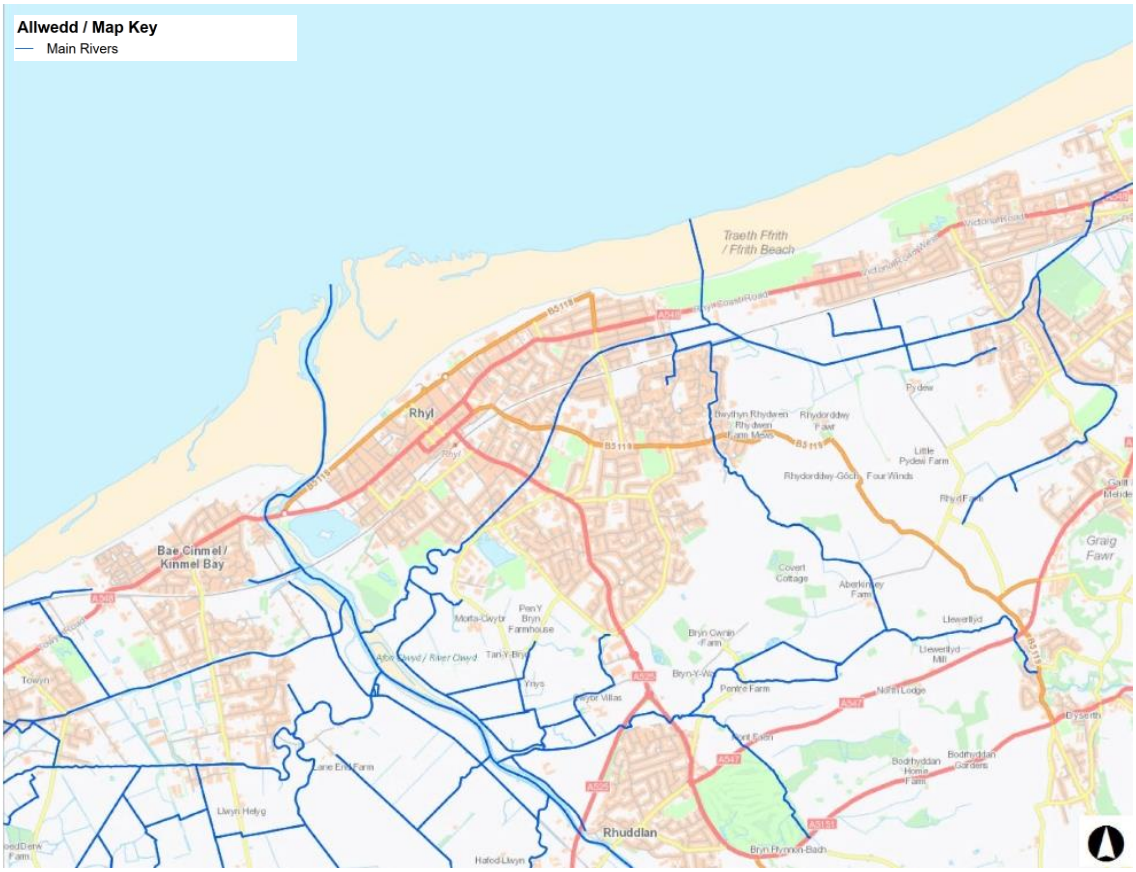
11.3.8 Fluvial Flood Risk

There are no fluvial watercourses within the site boundary however there are two in the vicinity of the Scheme (see Figure 11.3):

- The Rhyl Cut, (classified as a Main River by NRW flood mapping[71]) is present to the immediate east of the Scheme area; and
- The Clwyd, (classified as a Main River by NRW flood mapping[71]) is present to the immediate west of the Scheme area.

[71] Natural Resources Wales (undated) Welsh Government Advice Maps [Online] Available at: https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme=3 Accessed November 2020

Figure 11.3: Main Rivers Near Central Rhyl



Source: Natural Resources Wales, 2020[71]

These fluvial watercourses have been included in the inundation modelling previously undertaken by JBA for the Scheme to ensure that an understanding of the wider impacts were assessed. The Scheme is not considered to increase the fluvial flood risk to the area.

11.3.9 Surface Water Flood Risk

The NRW surface water flood risk maps show that there is some surface water flood risk in the area of interest (shown in Figure 11.4 below). These areas of surface water appear to be in low-lying areas of the town.

Figure 11.4: Central Rhyl Surface Water Flood Risk

Source: Natural Resources Wales, 2020[71]

11.4 Assumptions and Limitations

The impacts of coastal processes along this frontage have been reviewed using modelling from the OBC stage of the project. Owing to limitations of the modelling previously undertaken an updated model is being developed to provide revised overtopping and flood risk assessment for the Scheme.

A CEMP would be prepared by the appointed Contractor and implemented during the construction period. The CEMP would ensure that reasonable and practical steps are implemented to prevent the pollution of the coastal environment and protect local water quality.

It is also assumed that the Contractor would develop and implement a robust Construction Flood Management Plan during the construction phase.

11.5 Key Guidance and Best Practice

The following have specific relevance to the coastal processes impact of the Scheme (some are considered in more detail in Chapter 3):

- TAN14 (Coastal Planning): This policy provides guidance on protection of the coastal zone from inappropriate development. Consideration is given to visual amenity, physical processes and ground conditions; sensitivity and conservation of designated marine and

coastal sites; the requirement for remedial works and defence works; and recreational resource development;

- TAN15 (Development and Flood Risk), this TAN aims to prevent new development in areas of high flood risk and provides guidance on policy objectives for the management and reduction of flood risks;
- The Welsh National Marine Plan (November 2019);
- National Strategy for Flood and Coastal Erosion Risk Management (FCERM) in Wales (October 2020);
- The Denbighshire Local Development Plan 2018 – 2033, Draft preferred strategy:
  - Specifically, the draft policy relating to Natural & Built Environment;
- The North West England and North Wales Shoreline Management Plan (SMP22, sub-cell 11a) August 2016, within which the policy for the frontage is to Hold the Line: "*This policy includes those situations where work is carried out in front of the existing defences (such as beach recharge, rebuilding the toe of a structure, building offshore breakwaters and so on) to improve or maintain the standard of protection provided by the existing defence line. It also includes work behind existing defences (such as building secondary flood defences) where this work would form an essential part of maintaining the current coastal defence system"*[72];
- There is guidance in the EurOtop Manual[73,74] on wave overtopping criteria for the safety of people and vehicles;
- Water Framework Directive (England and Wales) Regulations 2017; and
- The Wildlife and Countryside Act 1981 (as amended).

11.6 Potential Effects

The potential effects the Scheme could have on both the direct impacts to hydrodynamics, sediment dynamics and coastal water quality and indirect impacts of these on other environmental aspects are presented in Table 11.1. A confirmatory scoping opinion is requested from all relevant statutory consultees.

Table 11.1: Potential Effects

Effects	Construction	Operation
Coastal Processes (Coastal Hydromorphology)		
Potential Insignificant Effects	Temporary changes to WFD water body hydromorphology – scour of stockpiles and toe of structures, potential material movement away from the Scheme.	Potential for changes to WFD water body hydromorphology – water body already heavily modified for the same purpose as the Scheme. In the longer term, there is potential for coastal processes such as cross shore and longshore drift to be impacted, although providing full consideration is given to coastal processes during design and all mitigation methods are adhered to, the long-term impacts on the natural environment of the bay should be minimal. No new groynes are proposed which would act to trap sediment and therefore reduce the longshore transport and sediment availability.

[72] Halcrow (2011) North West England and North Wales Shoreline Management Plan 2

[73] EurOtop Second Edition (2018) Manual on wave overtopping of sea defences and related structures: An overtopping manual largely based on European research, but for worldwide application

[74] EurOtop Second Edition (2007) Manual on wave overtopping of sea defences and related structures

Effects	Construction	Operation
Potential Significant Effects	N/A	The Scheme strongly complies with policy objectives for Central Rhyl to reduce the impact of coastal erosion and failure of the defences as a result of this. We predict a significantly beneficial effect which would be assessed in the ES.
Scoped In/Out	**Scoped Out**	**Scoped In**
Flood Risk		
Potential Insignificant Effects	Construction site and equipment could be at risk of getting inundated from overtopping. It is assumed the Contractor would have a flood risk management plan in place.	The Scheme would provide additional tidal flood protection for Central Rhyl. However, it should be noted that there is still a residual risk to the West Rhyl frontage which could flow into the Central Rhyl frontage and DCC would need to put in place a Flood Management Plan.
Potential Significant Effects	N/A	The installation of the new flood defences is in line with the local policy objectives. Overall, the impact of the Scheme is considered to be significantly beneficial as it would provide additional tidal flood protection for Rhyl and provide regeneration opportunities.
Scoped In/Out	**Scoped Out**	**Scoped In**
Coastal Water Quality (Including WFD Elements)		
Potential Insignificant Effects	Potential for local marine water quality to be adversely affected during construction due to the disturbance and mobilisation of sediment during excavations and potential pollution associated with construction activities*. There is potential for pollutants to be introduced in the revetment construction materials being placed at the site. Potential construction phase effects on Rhyl Bathing Waters.	Potential for effects relating to Moderate phytoplankton status of waterbody.
Potential Significant Effects	Potential for temporary effects on priority habitats and species relating to water quality. Potential for construction phase effects on Liverpool Bay SPA relating to water quality.	N/A
Scoped In/Out	**Scoped In**	**Scoped Out**

Source: Mott MacDonald Ltd, 2020

* However, construction effects would be managed through the implementation of the CEMP and would be temporary in nature. In addition, revetment and rock toe works would need to be completed at low tide (above the water line) which would minimise effects associated with sediment mobilisation and the creation of suspended solids. During construction, contamination risks to surface waters from, for example, spillages, accidents and direct runoff would also be managed through the CEMP.

A thorough review of findings of the previous modelling work[75] would be undertaken as part of the EIA process along with updated modelling being undertaken to support the coastal processes, considering the potential receptors that may be subject to change.

The construction methodology and CEMP would seek to minimise the suspension of sediment in the water column. During construction, there may be a need for monitoring of any sediments being re-suspended in the water column.

[75] Royal Haskoning (2010) Colwyn Bay Detailed Modelling Study for Coast Defence Scheme: Phase 1 Interim Modelling Technical Note

Particular consideration would be given in the CEMP to effects on water quality during the Bathing Season (May-September).

11.7 Additional Information and Assessments/Reporting Required in Support of the ES

Potentially significant effects have been identified as being possible and consequently coastal processes and water quality have been scoped into the environmental statement. The following studies/consents/licences are anticipated to be required for the final Scheme:

- Existing modelling review – determine if the identified baseline from previous modelling studies is affected by recently built coastal defence schemes;
- Updated wave and 1D sediment modelling to further develop the baseline;
- Coastal processes impacts – As a result of the Scheme; outline the prediction of the impacts on the baseline conditions, cumulative impacts, proposed mitigation and residual impacts post mitigation;
- Marine Licence application;
- WFD Compliance Assessment;
- Crown Estates Consent;
- Flood Management Plan – Defining the conditions requiring promenade/road closures during the operational phase; and
- Flood Consequence Assessment in accordance with TAN 15: Development and Flood Risk.

11.8 Proposed Methodology

The proposed EIA methodology for the assessment of Coastal Processes effects can be found in Appendix B.5.

12 Geology and Soils

12.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential effects of the Scheme on geological sites, soil as a valuable resource, hydrogeology and considers effects from contaminated land on the Scheme.

Effects in relation to minerals resources and waste are considered within Chapter 14.

12.1.1 Reference Reports

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C); and
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D).

In addition, the adjacent East Rhyl Coastal Defence Scheme (currently under construction) had a Ground Investigation (GI) Report produced by JBA Consulting (February 2018) which provides useful baseline data for the eastern area

12.2 Study Area

The study area for the assessment of geology and soils encompasses the area over which the Scheme could be reasonably expected to have an effect, which generally only relates to the areas anticipated to be directly disturbed by the proposed physical works and ground disturbance.

However, when considering the potential for contaminated land, sensitive off-site receptors which may feasibly be affected by the uncontrolled migration of contaminants off-site also need to be considered. In this instance, this is anticipated to comprise the adjacent marine waters. Off-site current and historic sources of contamination within 100m of the Scheme boundary have also been considered.

12.3 Baseline Conditions

12.3.1 Geological Setting

12.3.1.1 Underlying Geology

According to British Geological Survey (BGS) mapping[76], bedrock geology across the Scheme comprises the Kinnerton Sandstone Formation (sandstone, red-brown to yellow, generally pebble-free, fine- to medium-grained). Superficial deposits comprise Marine Beach Deposits (sand) with blown sand immediately to the south.

A ground investigation in 2018 in East Rhyl found that the beach sands were typically slightly gravelly to gravelly fine to coarse sand with shell fragments[61]. Beneath the beach material it was found to comprise:

- Tidal Flat Deposits of very soft to firm sandy silty clays with some peat and sand layers;

[76] British Geological Survey (BGS) [Online] Available at: https://mapapps.bgs.ac.uk/geologyofbritain/home.html Accessed November 2020

- Fluvial-glacial Deposits of loose to medium dense gravelly to very gravelly sands or sandy to very sandy gravels with a minor silt content; and
- Glacial Till Deposits of firm or firm to stiff, locally soft, slightly sandy and gravelly clays with occasional layers of sand that become stiff to very stiff at depth.

Cohesive sediments have been observed in the intertidal area[77]. These sediments are exposed during the movement of the ridge and runnel system along the frontage.

A ground investigation is currently being undertaken for the Central Rhyl frontage and would be available during the detailed design and ES production for the Scheme.

12.3.1.2 Designated Sites of Geological Interest

There are no Geological Conservation Review Sites, Regionally Important Geological Sites (RIGS) or geologically designated Sites of Special Scientific Interest present within the study area[78].

12.3.1.3 Mining

There are no formal records of any mining within, or in close proximity to, the Scheme area.

12.3.1.4 Hydrogeology

The underlying bedrock deposits are classed as a Principal Aquifer (these are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale)[79].

Groundwater beneath the Scheme area is part of the Water Framework Directive (WFD) Clwyd Permo-Triassic Sandstone Groundwater Body (Waterbody ID GB41001G202100) which has overall Good status (Quantitative: Good, Chemical: Good)[80].

Given that groundwater in the area would experience saline intrusion, it is not considered to be a sensitive resource.

12.3.2 Soils

12.3.2.1 Site Soil Resources

There is no agricultural land present within the main Scheme construction area. Low quality amenity grassland may be used in the proposed construction compound areas.

12.3.2.2 Land Use History

According to historic mapping[81], in 1871, the Scheme was located across the intertidal area approximately following the mean high-water mark to the north of the Rhyl coastline. A promenade had been developed in the central area however to the east and west the Scheme

[77] CEUK (2015) North West Strategic Monitoring; Regional Sediment Analysis and Reporting 2015. Inter-tidal Report. Prepared for Sefton Council

[78] Lle Geo portal for Wales [Online] Available at: http://lle.gov.wales/home Accessed November 2020

[79] Multi Agency Geographic Information for the Countryside website [Online] Available at: http://lle.gov.wales/home, Accessed November 2020

[80] Water Watch Wales website [Online] Available at: http://lle.gov.wales/home Accessed November 2020

[81] Old Maps [Online] Available at: https://www.old-maps.co.uk/#/ Accessed November 2020

was undeveloped coastline. The town of Rhyl was established to the south. A pier and toll house crossed the Scheme in the vicinity of the current SeaQuarium.

By 1899, additional development had taken place to the south and in the West Rhyl area, steps down to the beach are indicated. By 1914 Marine Parade (originally running along the northern edge of the promenade) had reclaimed the eastern most Scheme area from the intertidal zone and by 1959-60, the central and western promenade areas followed the approximately current location of the promenade's northern edge. At this time the promenade to the immediate south was almost fully developed including gardens and terraces, paddling/swimming pools, skating rink, bowling green, a theatre and car parks.

While the promenade developments have changed to the current day there has been no observable significant change in the northern promenade boundary since this time.

12.3.2.3 Contamination Potential

In general, there is considered to be a very low potential for there to be significant contamination present beneath the Scheme although Made Ground is assumed be present from the reclamation of the area from the intertidal zone and historic sea defence construction.

There are no landfills present within the study area.

12.4 Assumptions and Limitations

- The Scheme-specific GI is currently being completed, therefore the current understanding of the geology underlying the Scheme is from desk-based studies;
- The effects of material import and export along with waste generation would be considered in Chapter 14;
- It has been assumed that there would be no net loss of soils; and
- It has been assumed that an outline CEMP would be developed as part of the ES which would be used to inform a full CEMP to be produced by the appointed contractor. This CEMP would be in place for the construction period and would include the reasonable and practical measures required to prevent the pollution of underlying soils/groundwaters along with the erosion, deterioration and consolidation of adjacent soils in grassed/vegetated areas used during construction).

12.5 Key Guidance and Best Practice

Key legislation and guidance for geology and soils includes the following:

- The Wildlife and Countryside Act 1981 (as amended) and Countryside Rights of Way Act 2008 (For Geological Sites of Special Scientific Interest (SSSI));
- Planning Policy Wales, Edition 10 (December 2018), which specifically identifies the protection of soils as helping to meet the Well-Being of Future Generations (Wales) Act Goal 'A Resilient Wales';
- The Environmental Protection Act 1990 – contamination associated with land that is being redeveloped is managed through the planning system. Contaminated land must be considered in the context of the development proposals and remediated such that the land is suitable for its intended use. Once remediated, land should not be capable of being determined as "contaminated land" under the provisions of Part 2A of the Environmental Protection Act 1990;
- The Contaminated Land (Wales) Regulations 2006 (as amended); and

- The most current framework for the assessment of potential land contamination – the Environment Agency Land Contamination Risk Management Guidance (December 2020)[82].

12.6 Potential Effects

The potential effects of the Scheme on geology and soils are summarised within Table 12.1. The effects assume the application of best practice construction methods throughout the construction period. A confirmatory scoping opinion is requested from all relevant statutory consultees.

Table 12.1: Potential Effects (Assuming Standard Mitigation)

Effects	Construction	Operation
Potential Non-Significant Effects	There are no geologically designated sites within the Scheme area. Effects in relation to the underlying geology are anticipated to be negligible given the proposals are predominantly concerned with raising levels rather than lowering them (with the exception of anticipation of minor localised excavations in relation to services). There are no agricultural soils within the Scheme area. While grassed areas are likely to be used for construction compounds it is assumed that with best practice applied during the construction period for soil stripping and stockpiling to avoid soil deterioration and consolidation, effects are anticipated to be negligible. From the assessment of site history, the Scheme area does not include any potentially contaminative past land uses. Contaminated land is not anticipated to be encountered (although the presence of Made Ground is assumed as the area has been reclaimed from the intertidal zone over the last century) and therefore significant adverse effects associated with contaminated land are not anticipated. Effects on groundwater are anticipated to be negligible.	The completed and operational scheme is not expected to result in any impacts on geology or soils.
Potential Significant Effects	None	None
Scoped In/Out	**Scoped Out**	**Scoped Out**

Source: Mott MacDonald Ltd, 2020

The construction of the Scheme as well as its operation are not expected to result in any significant adverse effects on geology or soils, and this discipline is therefore proposed to be scoped out of the ES.

There are no opportunities for additional enhancement in relation to geology and soils for the Scheme given the nature of the development.

12.7 Additional Information and Assessments/Reporting Required in Support of the ES

While geology and soils have been scoped out of the EIA process, the following has been identified as being necessary to manage non-significant effects:

- The GI for the Scheme would include the collection of samples for laboratory analysis to enable full determination of risks from contamination to human, environmental and structural

[82] UK Government website for land contamination assessment advice: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm, accessed November 2020

/ utilities receptors along with waste classification. A Contaminated Land Risk Assessment (CLRA) would be prepared for the Scheme on completion of the ground investigation prior to the commencement of construction. This would inform the conceptual site model, identify any unacceptable contamination risks and enable the selection of appropriate mitigation measures to ensure the protection of human and environmental receptors (including controlled waters) during construction. Any mitigation measures required would be incorporated into the CEMP on completion of the CLRA. Following the completion of the CLRA, a Remediation Strategy would be prepared if deemed necessary. If areas of contamination are identified, the Remediation Strategy would manage all identified risks and ensure that the Scheme does not result in the creation of additional contamination transport pathways. To mitigate risks associated with potentially contaminated materials the producer would ensure that all material created on site undergoes basic characterisation prior to re-use / disposal and that it is managed in-line with best practice and the waste hierarchy.

13 Landscape and Visual

13.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential effects of the Scheme on landscape character and visual amenity. The landscape and visual impact assessment (LVIA) would address two separate but related issues:

- Effects on landscape as a resource in its own right; and
- Effects on people's views and visual amenity.

The assessment of landscape effects is also linked to the following environmental disciplines: historic environment, ecology, socio-economy, noise and traffic.

13.1.1 Reference Reports

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C);
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D); and
- Rhyl Outline Business Case – Landscape Appraisal, JBA Consulting (April 2019) (Appendix D).

13.2 Study Area

In the absence of a Zone of Theoretical Visibility (ZTV) for the Scheme, the study area has been defined from a desk-based study using online mapping, aerial imagery tools and a site walkover conducted by a landscape architect on the 5 November 2020. The visual envelope to the south is defined mainly by the built environment which is located along the B5118 (Marine Drive, East Parade and West Parade) which runs parallel to the proposed scheme extent. To the west of the proposed scheme is the estuary of the River Clwyd, here the visual envelope is defined by the landform within Horton Nose Nature Reserve and the infrastructure around Pont y Ddraig Harbour Bridge. To the east views are limited by the small headland adjacent to Marine Drive and Tynewydd Road and the works associated with the East Rhyl Coastal Defence Scheme.

The Scheme is located along approximately 2.15km of shoreline between the West Rhyl Coastal Defence Scheme and the East Rhyl Coastal Defence Scheme which is currently under construction. The western extent of the proposed scheme starts from the children's play area near River Street to Tynewydd Road in the east. The coastal defences to the west of the play area (where the Scheme joins with the West Rhyl Coastal Defence Scheme) are not currently proposed to be modified.

The study area for Central Rhyl consists of a mixture of tourist and visitor attractions along the beachfront in the form of fairgrounds, recreational areas (parks, play areas, amphitheatre and bowling greens etc.), cinemas, arcades, the SeaQuarium, hotels and areas of car parking associated with these facilities. There are also some residential properties, these are mainly within the eastern and western section of the study area (Marine Drive and Western Parade). Within the central area of the study area many of the properties along East and West Parade consist of tourist accommodation (hotels, apartments and bed & breakfasts) and commercial premises (retail and arcades).

13.3 Baseline Conditions

13.3.1 Landscape

13.3.1.1 National Character Areas Assessments

The study area lies within National Landscape Character Area 08 (NLCA08)[83]: North Wales Coast. The key characteristics of relevance to the study area are:

- Seaside resort towns – urban development and arterial road and railway routes along the coast, constricted in places by topography and rising hills. Much 19th Century development with more recent suburban development; and
- A generally man-made coastal edge – promenades, sea walls, groynes, rock armour protecting the coastal edge run along the majority of the coastline.

13.3.1.2 Local Character Areas Assessments

LANDMAP[84]: is a tool developed by NRW to help sustainable decision-making and natural resource planning at a range of levels from local to national. Included in LANDMAP are five national datasets; Geological Landscape, Landscape Habitats, Visual and Sensory, Historic Landscape and Cultural Landscape. The site is included within the following LANDMAP character areas:

Visual and Sensory

Coast West of Prestatyn (Lowland/Coastal/Intertidal - Level 3)

A stretch of coastline with a sea wall and promenade which gives a formal and managed character to the area. Less attractive views are mainly around the Rhyl seafront promenade, of neglected seafront buildings. The area is large and with a mixture of landcover types. It features an extensive coverage of shingle and sand beach that is a valuable resource with excellent public access, and basic amenities.

Prestatyn/Rhyl (Development/Built Land/Urban – Level 3)

An area of continuous urban coastal development that has resulted in the merging of Prestatyn and Rhyl through coastal fringe tourist accommodation development. Rhyl is the focus on the north Wales coastline for budget holiday travel and has undergone rapid over development in the last 30-40 years. Economic decline of the tourist industry has led to deprivation and neglect within the town which is beginning to be counteracted through new economic input and regeneration.

Clwyd Estuary (Water/Coastal Waters/Estuary – Level 3)

Consists of tidal mud banks, sand and remnant grazing marsh. It retains strong coastal features in spite of the proximity to urban development and provides some exceptional views. The tidal estuary gives the area an added value as the appearance changes throughout the day. It is a working coastal environment that is used by recreational vessels as well as working boats. The area includes the Fforyd Harbour at Rhyl and further downstream it is crossed by the Fforyd

[83] Natural Resources Wales (2015) [Online] Available at: https://cdn.naturalresources.wales/media/682560/nlca08-north-wales-coast-description.pdf?mode=pad&rnd=131550577050000000 Accessed November 2020

[84] Natural Resources Wales (2019) [Online] Available at: https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/evidence-to-inform-development-planning/landmap-the-welsh-landscape-baseline/?lang=en Accessed November 2020

Harbour bridge and fronted on both sides with the settlement edges of western Rhyl (Marine Lake) and more densely at Kinmel Bay on the Conwy CBC side of the estuary.

Historic Landscapes

Rhyl-Prestatyn (Urban Settlement – Level 4)

Rhyl is a mid-19th Century resort which has adapted in the 20th Century and which now faces challenges. The area is traditionally associated with Sunday School trips and seaside holidays. Chronological periods which are culturally dominant include; post 1950, Inter-War (1919-1939), Edwardian and Victorian. The area currently faces economic and cultural challenges and is vulnerable to further decline and sudden local social change.

13.3.1.3 Marine Character Areas

The study area lies within Marine Character Area 02 (MAC02)[85] Colwyn Bay and Rhyl Flats. The key characteristics of relevance to the study area are:

- Constantly shifting sandbanks with changing depths; hazards marked by numerous buoys, lights and fog horns;
- Developed coastline with many seaside resort towns, notably Llandudno (and pier), Colwyn Bay (and former pier location), Rhyl and Prestatyn, the latter having many caravan and chalet parks on their fringe. The coast serves as a traditional holiday destination;
- Recreational activity includes water sports such as jet skiing and speed boating;
- Wales Coast Path and a popular cycleway run the length of the coastline. Collectively the A55 Expressway, A548 and North Wales Coast Railway Line follow close to the coastline; and
- Both Colwyn Bay and Rhyl are popular shore and boat angling areas. Rhyl includes the main harbour along this stretch of coast.

13.3.1.4 Local Landscape Character

The waterfront within the study area is generally characterised by the long promenade, the associated leisure attractions typical of a coastal resort and the beach area which at low tide is wide, flat and sweeping. Along the promenade there are sections of existing coastal defences such as revetments, recurve walls and vertical walls, resulting in an overall engineered and developed character to the shoreline.

There are numerous other manmade landforms and features that characterise the central area of the promenade within Rhyl, creating a sense of separation between the promenade and the surrounding townscape. These include the Rhyl Events Arena which is a large amphitheatre type structure and the built form around the Children's Village Fairground, located on a podium with underground car parking and a pedestrian bridge connecting it to the surrounding area.

The eastern and western sections of the study area have a more residential character with sections of open space, mainly open grassed areas that separate the B5118 and the promenade. In the eastern section of the study area the East Rhyl Coastal Defence Scheme is currently under construction, affecting the character of this area with sections of the promenade closed for construction traffic and a large construction compound situated near the Pavilion Theatre.

[85] Natural Resources Wales (2015) [Online] Available at: https://cdn.naturalresources.wales/media/674480/mca-02-colwyn-bay-and-rhyl-flats-final.pdf?mode=pad&rnd=131502219930000000 Accessed November 2020

13.3.1.5 Landscape Designations

There are several designations within the vicinity to the Scheme or the local area which are of note. These are:

- Clwydian Range and Dee Valley AONB is located approximately 5km south-east of the site study area;
- Kinmel Dunes Local Nature Reserve;
- Horton Nose Nature Reserve;
- Liverpool Bay Special Protection Area;
- National Cycle Route 5 and 84;
- Wales Coast Path;
- Rhyl Central Conservation Area and Rhyl River Street; and
- Listed Buildings within Rhyl.

13.3.1.6 Landscape Quality

The overall quality of the existing landscape is mixed with the high quality of the wider setting of the site study area along the coastline undermined by the poor quality of the overall public realm along with the condition and array of styles of the visitor attractions along the promenade which in areas show signs of decline and detract from the wider landscape quality of Liverpool Bay.

13.3.2 Visual

Visual receptors potentially affected by the Scheme include:

- People in residential properties;
- Recreational users of Public Rights of Way (PRoW), national trails and paths;
- Visitors to local assets;
- Visitors within accommodation (hotels, holiday apartments and bed and breakfasts);
- Patients and visitors in a healthcare facility;
- People walking along footways in residential areas; and
- People travelling on roads.

The following visual receptors may experience views of the Scheme:

- Recreational users of the beach, promenade and the associated attractions along the promenade;
- Recreational users of the North Wales Coastal Path;
- Road users along the B5118 (West Parade, East Parade and Marine Drive);
- Visitors to Horton Nose Nature Reserve;
- Visitors to recreational and commercial premises along the B5118
- Guests within accommodation along the B5118 (Hotels, apartments and Bed and Breakfasts);
- Pedestrians and cyclists on Pont y Ddraig Harbour Bridge;
- Patients and visitors to Royal Alexandra Hospital;
- Residents in properties on Tynewydd Road; and
- Residents in properties along the B5118 (West Parade, East Parade and Marine Drive).

13.4 Assumptions and Limitations

- Where applicable receptors would be grouped for the purpose of the LVIA;
- In the absence of ZTV modelling for the Scheme the visual baseline was established as part of a desktop study and a site visit; and
- In the absence of details regarding the construction programme and construction logistics, it is assumed that construction traffic would access the Scheme using the existing roads (B5118) and the construction compounds and access points currently being used for the Eastern Rhyl Coastal Defence Scheme. It is also assumed that sections of the Promenade and sea front would be closed to users during the construction period.

13.5 Key Guidance and Best Practice

The assessment would be carried out with due regard to the following:

- Guidelines for Landscape and Visual Impact Assessment (GLVIA), 3rd Edition: (Landscape Institute and Institute of Environmental Management and Assessment, 2013);
- Natural Resources Wales; National Landscape Character Areas and Marine Character Areas; and
- JBA Consulting; Rhyl Outline Business Case – Landscape Appraisal (April 2019).

13.6 Potential Effects

The following have been considered in the determination of the potential landscape and visual amenity effects (as summarised in Table 13.1) associated with the Scheme:

- The likely nature, extent and scale of the Scheme to determine effects of change and development;
- The likely nature and scale of landscape effects (adverse, neutral or beneficial) during the construction and operation of the Scheme;
- The likelihood of the Scheme to affect aesthetic and perceptual aspects of the landscape, its distinctive character and its elements; and
- Issues likely to require further assessment together with the methods to be applied.

13.6.1 Construction

The most apparent change to the character of the landscape and the visual amenity of recreation users of the sea front, drivers and residents would result from the presence of construction plant and compounds during construction of the proposed scheme. The effects, however, would be temporary and it should be noted that the presence of such activities is already located within the study site through the ongoing construction of East Rhyl Coastal Defence Scheme.

The potential impacts on landscape character and visual amenity during construction would include:

- Presence of construction traffic, construction plant and equipment;
- Construction activity, generating noise and movement;
- Earthworks, changes in landform and storage of soils and rock revetment materials;
- Presence of construction compounds, temporary security fencing and hoardings;
- Vehicle movements including private vehicles belonging to site staff; and
- Use of lighting, if night-time works are required and security lighting.

13.6.2 Operation

The most apparent changes to landscape and views would result from the construction of rock armour scour protection, sections of new concrete stepped revetment and through section of raised promenade, a new rear seawall at the back of the promenade and associated new flood gates.

13.6.3 Summary of Potential Effects

A summary of the potential landscape and visual amenity effects for both construction and operation is provided within Table 13.1. A confirmatory scoping opinion is requested from all relevant statutory consultees.

Table 13.1: Potential Effects

Effects	Construction	Operation
LANDSCAPE EFFECTS		
Potential Non-Significant Effects	There is potential for there to be a direct effect on landscape character areas NLCA08 and MCA02 during construction. It is assumed that a section of the Promenade and North Wales Coastal Path would be diverted during construction resulting in reduced connectivity and therefore adverse landscape effects. Although the overall impact in construction stages would be tempered in areas by the existing presence of such activities associated with the East Rhyl Coastal Defence Scheme.	There is potential to be landscape effects for NCLA08 and MCA02, however the nature of the Scheme is in keeping with the existing character of the local area with numerous examples of coastal defence schemes along the sea front in the surrounding area.
Potential Significant Effects	There is potential for there to be a direct effect on landscape character areas NLCA08 and MCA02 during construction.	None identified.
Scoped In/Out	**Scoped In**	**Scoped Out**
VISUAL EFFECTS		
Potential Non-Significant Effects	For residents along the B5118 with properties facing the proposed scheme, elements of construction activity would be visible across a proportion of the view.	Elements of the proposed coastal defence scheme could be visible but would be viewed in context of the surrounding schemes to the west and east and the replacement of existing flood defence infrastructure, resulting in limited perceived change to the baseline visual amenity.
Potential Significant Effects	It is assumed that the Promenade and sections of the Wales Coast Path long distance footpath and Sustrans North Wales Coast Cycle Route would be inaccessible for walkers and cyclists during the construction phase of the Scheme. The effect of construction on the visual amenity of these receptors would depend upon the route of the diverted footpath/cycle route.	None Identified.

Effects	Construction	Operation
Scoped In/Out	**Scoped In**	**Scoped Out**

Source: Mott MacDonald Ltd, 2020

The Scheme is likely to result in significant landscape and visual effects during construction, affecting receptors that would be classed as highly sensitive (residents, recreational users of the sea front and associated facilities and recreational users of the PRoW and cycle network.

Landscape and visual effects during operation are likely to be minor adverse or minor beneficial and therefore non-significant, for the following reasons:

- The character of the landscape would remain comparable to the baseline with no significant changes to land use and slight benefits to visual amenity in a more holistic to the sea front; and
- For the majority of visual receptors, elements within the view including existing coastal defences, promenade, beach and the sea, would be comparable to the baseline. Although the rock revetment and increased height of the promenade would increase its prominence within views from the beach, there is examples of these features along the surrounding coastline and there is the opportunity for any adverse visual effects to be minimised through careful design and integration of the Scheme into the existing landscape and seascape.

13.7 Additional Information and Assessments/Reporting Required in Support of the ES

- Running a ZTV for the Scheme.

13.8 Proposed Methodology

The proposed EIA methodology for the assessment of Landscape and Visual effects can be found in Appendix B.6.

14 Materials and Waste

14.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential effects of the Scheme on materials and waste.

The materials, resources and waste assessment within the EIA would assess the potential impacts on material resources and waste management infrastructure which are likely to arise from the construction and operation of the Scheme. This Chapter provides a description of the baseline, identifies the potential impacts and sets out the proposed methodology for informing the EIA. For the purposes of this Scoping Report, the assessment scope comprises:

- The use of material resources; and
- The generation and management of waste.

14.1.1 Reference Reports

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C); and
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D).

A Design for Resource Efficiency (D4RE) workshop was carried out on 23rd November 2020 to record opportunities to reduce or reuse resources within this Scheme. The output can be used for a Resource Management Plan or other such plans to include resource efficiency at the early design stage.

14.2 Study Area

The assessment would use two geographically different study areas to examine the use of material resources and the generation and management of waste impacts. The first study area is based on the area of the completed works within the boundary of the Scheme, as this constitutes the area within which construction materials would be consumed (used, reused and recycled) and waste would be generated.

The second study area usually focuses on an area sufficient to identify the suitable waste infrastructure that could accept arisings or waste generated by the Scheme options, and feasible sources and availability of construction materials typically required for the works. For this Scheme this second study area would be the county of Denbighshire and the North Wales region.

14.3 Baseline Conditions

14.3.1 Use of Material Resources

Information on the demand for key construction materials, within the second study area has been used to provide the baseline for material resources. In addition, information for the UK has also been provided as a national comparison. This information has been determined through a desk-study using a number of readily available resources, in particular from the Minerals

Products Association, International Steel Statistics Bureau, British Geological Survey (BGS), NRW and DCC[86].

Table 14.1 outlines the UK demand, in terms of sales, of minerals and mineral products in 2016 (and 2018 for steel) and Table 14.2 outlines the production of minerals within Wales in 2018 and available mineral workings.

Table 14.1: UK Demand of Materials and Minerals / Mineral Products

Mineral	UK Demand (year)
Aggregates	247 million tonnes
Of which:	
Crushed rock	113.9 million tonnes
Sand and gravel – land won	48.6 million tonnes
Sand and gravel – marine won	14.1 million tonnes
Recycled and secondary	70.4 million tonnes
Cementitious (including imports)	15 million tonnes
Of which:	
Cement	12 million tonnes
Other cementitious materials (fly ash, ground clay bricks)	3 million tonnes
Ready-mixed concrete	56.1 million tonnes
Concrete products	25.8 million tonnes
Asphalt	25.2 million tonnes
Dimension stone	1 million tonnes
Steel	10.7 million tonnes

Source: Minerals Products Association (2016)[87] and International Steel Statistic Bureau (2018)[88]

Table 14.2: Wales Production of Minerals in 2018

Mineral	Wales Production in Tonnes	Number of Mineral Workings in Wales
Igneous rock Limestone and dolomite Sandstone	12,711,000 (excluding building stone)	50
Sand and gravel	1,517,000	18

Source: BGS[89]

At a regional level, Table 14.3 outlines the aggregate sales and reserves in Denbighshire and North Wales. It is outlined in the Welsh Government and North Wales and South Wales Regional Aggregate Working Parties[90] Regional Technical Statement that Flintshire's Carboniferous limestone quarries Supply the north-east of Wales market for crushed rock.

[86] Where information is not available for Wales, the UK has been used to provide the national comparison.

[87] Minerals Products Association (2018) Profile of the UK Mineral Products Industry: 2018 Edition [Online] Available at: https://mineralproducts.org/documents/Facts-at-a-Glance-2018.pdf Accessed November 2020

[88] International Steel Statistics Bureau (2018) Steel Demand [Online] Available at: http://issb.co.uk/news/news/uk.html Accessed November 2020

[89] British Geological Society (2019) United Kingdom Minerals Yearbook 2019 [Online] Available at: https://www.bgs.ac.uk/mineralsuk/statistics/UKStatistics.html Accessed November 2020

[90] Welsh Government and the North Wales and South Wales Regional Aggregate Working Parties (2014) *Regional Technical Statement for the North Wales and South Wales Regional Aggregate Working Parties - 1st Review* [online] available at: http://www.nwrawp-wales.org.uk/html/publications1/RTS%20First%20Review%20-%20Main%20Document%20-%20Final%20Edition%20(endorsed)%20(1).pdf Accessed November 2020

Denbighshire produced an average of 0.89 million tonnes per year of crushed rock in a 10-year period from 2001 to 2010 with 22.07 million tonnes in permitted reserves in 2010. Wrexham dominates the supply for natural sand and gravel from one major quarry, but a further two or three quarries in Flintshire produce these materials to meet demands[91].

Table 14.3: Aggregate Sales and Reserves in North Wales and Denbighshire

Aggregate	North Wales Sales (2014)	Denbighshire Sales (2014)	Denbighshire Reserve	Denbighshire Land-bank (years)
Sand and gravel	0.927 million tonnes	0 tonnes	0 tonnes	0
Crushed rock	4.17 million tonnes	0 tonnes	22.07 million tonnes	24.9

Source: British Geological Survey[92], Welsh Government and the North Wales and South Wales Regional Aggregate Working Parties[93]

The Regional Technical Statement[94] does not quantify the recycled aggregates from industrial and commercial development and redevelopment.

The Local Development Plan for Denbighshire[95], under Policy PSE 15, expresses that areas of hard rock and sand and gravel have been identified requiring protection (safeguarding) to ensure these resources remain available throughout 2006-2021. Safeguarded Sand and Gravel Reserves do not extend into the Scheme boundary. The nearest safeguarded areas are located to the south of the Scheme between Rhyl and Rhuddlan[96].

14.3.2 Generation and Management of Waste

The most recent information available relating to current waste generation and operational waste infrastructure in the North Wales region, and where available Denbighshire, has been gathered to provide the baseline for this assessment. Information on the current waste arisings and the capacity of waste management infrastructure has been determined through a desk-top study, using a number of readily available resources, in particular data from NRW, Welsh Government, and DCC.

[91] Welsh Government and the North Wales and South Wales Regional Aggregate Working Parties (2014) *Regional Technical Statement for the North Wales and South Wales Regional Aggregate Working Parties - 1st Review* [Online] Available at: http://www.nrwrawp-wales.org.uk/html/publications1/RTS%20First%20Review%20-%20Main%20Document%20-%20Final%20Edition%20(endorsed)%20(1).pdf Accessed November 2020

[92] British Geological Society (2014) Collation of the results of the 2014 Aggregate Minerals survey for England and Wales [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/563423/Aggregate_Minerals_Survey_England___Wales_2014.pdf Accessed November 2020

[93] Welsh Government and the North Wales and South Wales Regional Aggregate Working Parties (2014) *Regional Technical Statement for the North Wales and South Wales Regional Aggregate Working Parties - 1st Review* [Online] Available at: http://www.nrwrawp-wales.org.uk/html/publications1/RTS%20First%20Review%20-%20Main%20Document%20-%20Final%20Edition%20(endorsed)%20(1).pdf Accessed November 2020

[94] Welsh Government and the North Wales and South Wales Regional Aggregate Working Parties (2014) *Regional Technical Statement (1st Review) Appendix A (North Wales)* [Online] Available at: http://www.nrwrawp-wales.org.uk/html/publications1/RTS%20First%20Review%20-%20Appendix%20A%20(North%20Wales)%20-%20Final%20Edition%20(endorsed).pdf Accessed November 2020

[95] Denbighshire County Council (2013) Denbighshire Local Development Plan 2006-2021 Adopted June 2013 [Online] Available at: https://www.denbighshire.gov.uk/en/documents/planning-and-building-regulations/ldp/adopted-ldp/adopted-local-development-plan-2006-2021.pdf Accessed November 2020

[96] Denbighshire County Council (n.d.) Adopted Local Development Plan: [Online] Available at: https://www.denbighshire.gov.uk/en/planning-and-building-regulations/local-development-plan/adopted-local-development-plan-map.aspx Accessed November 2020

14.3.2.1 Waste Generation in North Wales and Wales

The latest published data from NRW indicates that Denbighshire produced over 0.185 million tonnes of waste in 2019. This equates to 1.98% of the waste generated in Wales in 2019[97]. The latest publicly available, information on waste received by site type in Wales and its regions is from 2013, shown in (Table 14.4).

Table 14.4: Waste Breakdown by Site Type (2013)

Site Type	North Wales (tonnes)	Wales (tonnes)
Landfill	449,000	2,138,000
Transfer	346,000	1,022,000
Treatment (excluding metal recycling sector)	577,000	2,667,000
Metal Recovery	78,000	829,000
Incinerated	35,000	48,000
Land Disposal	81,000	162,000
Total	1,566,000	7,910,000

Source: Natural Resource Wales[98]

Construction and Demolition Waste

With respect to construction and demolition (C&D) waste, NRW recorded that 0.74 million tonnes C&D waste was generated in 2012 in North Wales, with approximately 50,000 tonnes sent to landfill.

Data from The Wales Construction and Demolition Waste Generation Survey 2012[99], shows that approximately 0.68 million tonnes of C&D waste being recovered or recycled in 2012 (92% of the total generated). It did not clarify the quantities of inert, non-hazardous and hazardous C&D waste generated in North Wales.

Hazardous Waste

Regarding hazardous waste, Table 14.5 outlines the quantities managed and deposited in 2013 in Wales. An estimated 37,580 tonnes of hazardous waste were generated by the C&D sector, which made up 1% of the total waste generated by this sector in 2012.

North Wales does not have any hazardous waste landfill facilities. Therefore, any hazardous waste from the Scheme that requires landfilling would need to be moved to other Welsh regions or exported. In 2013, 65% of hazardous waste was exported to England and 30% transported to other regions in Wales[100].

[97] Natural Resources Wales (2020) Waste Permit Returns Data Interrogator [Online] Available at: https://data.gov.uk/dataset/71d7279f-a6aa-4a60-a9fa-51406b223277/waste-permit-returns-data-interrogator Accessed November 2020

[98] Natural Resources Wales (2013) Wales waste data information 2013 [Online] Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/waste-reports/wales-waste-data-information-2013/?lang=en Accessed November 2020

[99] Natural Resources Wales (2012) Construction and Demolition waste generated in Wales 2012 [Online] Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/waste-reports/construction-demolition-waste-survey/?lang=en Accessed November 2020

[100] Natural Resources Wales (2012) Survey of Construction & Demolition Waste Generated in Wales 2012 [Online] Available at: https://cdn.naturalresources.wales/media/1988/survey-of-construction-an-demolition-waste-wales-2012.pdf?mode=pad&rnd=131471843040000000 Accessed November 2020

Table 14.5: Hazardous Waste Managed and Deposited in 2013

Hazardous waste fate	North Wales (tonnes)	Wales (tonnes)
Incineration with energy recovery	3,897	3,897
Incineration without energy recovery	4,157	4,203
Landfill	-	64
Long term storage	-	-
Other Fate	-	-
Recovery	54,514	167,420
Rejected	-	87
Transfer (D)	476	44,037
Transfer (R)	1,914	36,286
Treatment	600	54,500
Total	**65,557**	**310,493**

Source: NRW (2013)[101]

14.3.2.2 Potential Sources of Hazardous Waste Arisings

To identify potential sources of contamination an initial review of the landfill sites, both authorised and historic, in the area was undertaken. Potential sources of contamination that are greater than 500m away from the study area have been identified but not considered further, as these are deemed unlikely to affect the Scheme.

There are no historic landfill sites located within the 500m buffer zone. There are, however, three historic landfill sites located within the 2.0km (all to the south of the 500m buffer zone:

- A large site covering Glan Y Morfa Industrial Estate, and the adjoining cycling area, skateboard park, and recycling site;
- A small site located at the intersection of Rhydwen Drive and Frederick Street; and
- A small site located between Pwll Brickfields Pond Landing Stage and Ffordd Derwen.

A further historic landfill site is located outside of the southern edge of the 2.0km buffer zone, to the south of Cwybr Fawr caravan site.

14.3.2.3 Waste Management Facilities

Landfills

Table 14.6 presents the remaining landfill capacity in North Wales[101].

[101] Natural Resources Wales (2013) *Wales waste data information 2013* [Online] Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/waste-reports/wales-waste-data-information-2013/?lang=en Accessed November 2020

Table 14.6: Landfill Capacity in 2013 in North Wales

Landfill Type	North Wales (m^3)	Wales (m^3)
Hazardous Restricted	0	191,000
Inert	1,715,000	3,176,000
Non-hazardous	4,074,000	17,751,000
Non-hazardous (SNRHW)*	0	3,126,000
Restricted user	66,000	5,926,000
Permitted, but not constructed	0	1,090,000
Total	5,855,000	31,261,000

Source: Natural Resources Wales (2013)[102] Note: *Some non-hazardous sites can accept some Stable Non-Reactive Hazardous Wastes (SNRHW) into a dedicated cell, but this is usually a small part of the overall capacity of the site.

North Wales region's total lifespan for landfill is less than the other regions in the country, with an estimated 8.3 years from 2013[102]. However, 30% of the total capacity of landfill in North Wales is for inert waste at 1,715,000m^3, in 2013. Denbighshire has no operational landfill facilities. However, Tŷ Mawr Farm Landfill in Conwy is less than 10km from the Scheme, as shown in Table 14.7.

Table 14.7: Landfills within 10.0km for Construction and Demolition Waste

Site Name	Waste Activity	Distance from Scheme	Permitted Tonnage and Remaining Capacity
Tŷ Mawr Farm Landfill	L05 - Inert Landfill	9.39km	99,000 (500,871 m^3 capacity remaining from July 2019)

Source: NRW[103,104]

Other Waste Management Facilities

A search on the public registers for permitted waste facilities shows that there are four waste facilities within Denbighshire, of which two may be able to treat or transfer C&D waste and are all within 10.0km of the Scheme at LL18 1SD, as shown in Table 14.8. Not all treatment facilities may be suitable for the project, but it demonstrates that there are treatment facilities available within the county which may be able to accommodate the waste that would be generated in this project.

Table 14.8: Permitted Sites Within 10km for C&D Waste Recycling and Recovery

Site Name	Waste Activity	Distance from Scheme (km)
Pilkington Asbestos Removal Services Ltd	S0809: Asbestos Waste Transfer Station	1.08
Rhyl Depot	A9: Special Waste Transfer Station	1.52
Dirtbusters	A11: Household, Commercial & Industrial Waste Transfer Stn	1.88

[102] Natural Resources Wales (2013) *Wales waste data information 2013* [Online] Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/waste-reports/wales-waste-data-information-2013/?lang=en Accessed November 2020

[105] Natural Resources Wales (2020) Environmental Permitting Regulations – Waste Sites [Online] Available at: https://naturalresourceswales.sharefile.eu/share/view/s1102605d41b4dc38/fo93b078-77cc-4568-a39d-20ecfac8707a Accessed November 2020

[105] Natural Resources Wales (2020) Environmental Permitting Regulations – Waste Sites [Online] Available at: https://naturalresourceswales.sharefile.eu/share/view/s1102605d41b4dc38/fo93b078-77cc-4568-a39d-20ecfac8707a Accessed November 2020

Site Name	Waste Activity	Distance from Scheme (km)
Gofer Bulking Station	A11: Household, Commercial & Industrial Waste Transfer Stn	5.34
Riverside Skips Transfer Station	A11: Household, Commercial & Industrial Waste Transfer Stn	7.38
K M Environmental Ltd	A14: Transfer Station taking Non-Biodegradable Wastes	7.87

Source: NRW (2020)[105,106]

In addition to permitted C&D waste management sites, inert material is also managed on sites that have an NRW environmental permit exemption. These exempt sites generally comprise land restoration activities such as restoring mineral voids, engineering/landscaping schemes and for agricultural improvements on farmland.

Although small tonnages of waste from other waste streams (e.g. biodegradable waste) may be managed at locations with an exemption, the largest tonnage of exempt activities is likely to involve C&D material. In September 2020, 69 exemptions were held in Denbighshire, with 10 specifically for activities identified as possibly being suitable to receive wastes from construction and demolition activities (U1)[107]. However, these exempt sites are often short-lived and can only except limited tonnages of waste in any year, and therefore, should be identified upon commencement of construction.

Reuse, recycling and recovery of wastes, on- or off-site, would be prioritised. However, if these options are not available or feasible the last resort option is to adopt the Proximity Principle for disposal to land. Tŷ Mawr Farm Landfill being within the 10km radius may be suitable for inert construction and demolition waste and should be considered first as means of disposal before arranging for waste to be transported greater distances.

14.4 Assumptions and Limitations

Given the early stages of design, estimates relating to the quantity of materials required are not available nor are there estimates available relating to the quantity of waste arisings anticipated. As such, a qualitative assessment has been carried out at this stage, limited to identifying activities that are likely to require significant quantities of materials, or are likely to produce significant quantities of waste. The following assumptions are made:

- This assessment would not consider the environmental effects associated with the extraction of raw materials used for the manufacture of products (which may occur outside of the UK). These stages of the products' or materials' lifecycles are outside of the scope of the assessment, due to the range of unknown variables associated with the processes involved;
- Adverse environmental effects through transportation (both to and from site) and contaminated land is more logically to be dealt with in other relevant discipline Chapters; and
- The procurement of the materials required for the construction of the Scheme is unknown at this stage. It has been assumed that not all materials would be available to be sourced

[105] Natural Resources Wales (2020) Environmental Permitting Regulations – Waste Sites [Online] Available at: https://naturalresourceswales.sharefile.eu/share/view/s1102605d41b4dc38/fo93b078-77cc-4568-a39d-20ecfac8707a Accessed November 2020

[106] Natural Resources Wales (2020) Environmental Permitting Regulations - Industrial Sites [Online] Available at: https://naturalresourceswales.sharefile.eu/share/view/seb795ca50d44b06b/fo6ab1a9-8133-4174-b4c7-922719737806 Accessed November 2020

[107] Natural Resources Wales (2020) Waste Management License Current Exemptions [Online] Available at: http://lle.gov.wales/catalogue/item/WasteManagementLicenseCurrentExemptions/?lang=en Accessed November 2020

regionally, and that the majority would be sourced nationally or elsewhere in the UK, which represents the (environmentally) worst case scenario.

14.5 Key Guidance and Best Practice

The following legislation would underpin the assessment and would be described in detail in the assessment:

- The Environmental Protection Act (1990)[108];
- The Hazardous Waste (England and Wales) Regulations (2005)[109] as amended;
- The Waste (England and Wales) Regulations (2011)[110] as amended;
- The Landfill (England and Wales) Regulations (2002) as amended[111]; and
- The Environmental Permitting (England and Wales) Regulations (2016)[112].

The following guidance would underpin the assessment and would be described in detail in the assessment:

- Interim Advice Note (IAN) 125/09(W) Supplementary Guidance for Users of DMRB Volume 11 'Environmental Assessment'[113];
- DMRB Vol 11, Sec 3, Part 13 LA110[114];
- Minerals Technical Advice Note (MTAN) Wales 1: Aggregates[115];
- Technical Advice Note (TAN) 21: Waste[116];
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites [117]; and
- CL:AIRE Definition of Waste: Development Industry Code of Practice[118].

[108] Her Majesty Government (UK) (1990) Environmental Protection Act 1990 [Online] Available at: http://www.legislation.gov.uk/ukpga/1990/43/contents Accessed November 2020

[109]Her Majesty Government (UK) (2005) Hazardous Waste (England and Wales) Regulations 2005 [Online] Available at: http://www.legislation.gov.uk/uksi/2005/894/contents/made Accessed November 2020

[110] Her Majesty Government (UK) (2011) Waste (England and Wales) Regulations (2011) [Online] Available at: http://www.legislation.gov.uk/uksi/2011/988/contents Accessed November 2020

[111] Her Majesty Government (UK) (2002) Landfill (England and Wales) Regulations (as amended) [Online] Available at: https://www.legislation.gov.uk/uksi/2002/1559/contents/made Accessed November 2002

[112] Her Majesty Government (UK) (2016) Environmental Permitting (England and Wales) Regulations [Online] Available at: http://www.legislation.gov.uk/uksi/2016/1154/contents Accessed November 2020

[113] Welsh Government (2010) INTERIM ADVICE NOTE 125 /09(W) Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment' [Online] Available at: https://gov.wales/sites/default/files/publications/2017-10/interim-advice-note-12509w-supplementary-guidance-for-users-of-design-manual-for-roads-and-bridges-dmrb-volume-11-environmental-assessment.pdf Accessed November 2020

[114] Highways England (2019) DMRB Volume 11 Section 3 Part 13 LA 110 Sustainability and environment. Appraisal. Material assets and waste (formerly IAN 153/11) [Online] Available at: https://www.standardsforhighways.co.uk/dmrb/search/6a19a7d4-2596-490d-b17b-4c9e570339e9 Accessed November 2020

[115] Welsh Government (2004) Minerals technical advice note (MTAN) Wales 1: aggregates [Online] Available at: https://gov.wales/minerals-technical-advice-note-mtan-wales-1-aggregates Accessed November 2020

[116] Welsh Government (2017) Technical advice note (TAN) 21: waste [Online] Available at: https://gov.wales/technical-advice-note-tan-21-waste Accessed November 2020

[117] Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites [Online] Available at: https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites Accessed November 2020

[118] CL:AIRE (2011) Definition of waste: Development Industry Code of practice CoP Main Document [Online] Available at: https://www.claire.co.uk/projects-and-initiatives/dow-cop/28-framework-and-guidance/111-dow-cop-main-document Accessed November 2020

14.6 Potential Effects

14.6.1 Use of Materials

The Scheme is likely to require large quantities of material resources for the construction of the coastal defence and associated structures. This would, therefore, have permanent direct adverse effects on the environment, specifically through the depletion of non-renewable resources, and the subsequent impact on the national demand for materials. Specific quantities of materials have not been quantified at this stage, however the types of material resources likely to be required, for the construction of the Scheme, are as follows:

- Concrete;
- Cement;
- Aggregate;
- Large natural rock; and
- Bitumen.

Materials required for the operation and maintenance of the Scheme mostly include aggregates and other materials for coastal defence repairs and other maintenance activities.

Judgement of aspects scoped in or out is taken from the baseline information and the understanding of the known and estimated demand for materials resources. Table 14.9 describes the potential effects of the use of materials from this Scheme during construction and operation It summarises which aspects of the Scheme would be scoped in for a subsequent ES.

A confirmatory scoping opinion is requested from all relevant statutory consultees.

Table 14.9: Potential Effects on Materials

Effects	Construction	Operation
Potential Not-Significant Effects	None identified.	The receptors likely to be subject to impacts as a result of the use of material resources include quarries and other sources of minerals, and other finite raw material resources. Maintenance activities would be infrequent with associated materials volumes expected to be in small quantities.
Potential Significant Effects	The receptors likely to be subject to impacts as a result of the use of material resources include quarries and other sources of minerals, and other finite raw material resources. The potential impacts associated with the use of material resources on these receptors include: • The depletion of non-renewable resources; and • The impact on the national demand for materials. The Scheme is likely to require large quantities of material resources for the	None identified.

Effects	Construction	Operation
	construction of the coastal defence and associated structures.	
Scoped In/Out	**Scoped In**	**Scoped Out**

Source: Mott MacDonald Ltd, 2020

It is likely that any significant effects due to the quantity of material resources required could be appropriately mitigated through the implementation of mitigation measures such as the outcomes of the D4RE workshop to identify measures to minimise the requirement for imported materials and reuse wastes generated.

However, without accurate material quantification at this stage, this assumption cannot be confirmed. Where possible, recycled aggregates would be used within the Scheme and utilise locally derived material resources, for example sand along the coast where permitted.

14.6.2 Generation and Management of Waste

Waste would predominantly arise from excavations of hard surfaces and sand, and from materials brought to site, not used for their intended purposes, damaged items, cut offs and surplus materials. Some types of waste, generated from construction projects, may be harmful to human health, or to the environment, either immediately or over an extended period of time (defined as hazardous wastes). However, these are not anticipated to be generated from the Scheme, the majority of wastes would be non-hazardous.

Exact quantities of waste likely to be generated by the construction of the Scheme have not been quantified at this stage. However, waste may result from the following:

- Surplus excavated materials (soils or substrata);
- Waste from the demolition of existing structures; and
- Surplus construction materials (e.g. concrete, aggregates, asphalt).

During the operation of the Scheme waste would be likely to arise from the following activities:

- Promenade/beach access cleaning;
- Replacement signage and lighting;
- Hard surface repair and resurfacing; and
- Coastal defence maintenance.

Judgement of aspects scoped in or out is taken from the baseline information and an understanding of the typical wastes generated. Table 14.10 describes the potential effects of the generation of waste from the Scheme during construction and operation. It summarises which aspects of the Scheme would be scoped in for a subsequent ES.

A confirmatory scoping opinion is requested from all relevant statutory consultees.

Table 14.10: Potential Effects from the Generation of Waste

Effects	Construction	Operation
Potential Not Significant Effects	The receptors likely to be subject to impacts as a result of waste generation and management are landfills and other waste management infrastructure. The potential impacts assessment from the generation and management of waste	The receptors likely to be subject to impacts as a result of waste generation and management are landfills and other waste management infrastructure. The potential impacts assessment from the generation and management of waste

Effects	Construction	Operation
	arise from depletion of the remaining local landfill capacity. No significant effects are anticipated, relating to the construction of the Scheme, as waste generated would be unlikely to generate large volumes requiring treatment or disposal and would be limited to inert or non-hazardous wastes. There is an understanding that there is sufficient capacity within the existing waste infrastructure within Denbighshire and North Wales to deal with any wastes arising from the construction of the Scheme. Mitigation measures would be put in place to adequately deal with waste that may be generated during construction.	arise from depletion of the remaining local landfill capacity. No significant effects anticipated relating to the operation of the Scheme as waste generated through maintenance activities would be unlikely to generate large volumes of waste requiring treatment or disposal. There is an understanding that there is sufficient capacity within the existing waste infrastructure within Denbighshire and North Wales to deal with any wastes arising from the operation of the Scheme.
Potential Significant Effects	None identified.	None identified.
Scoped In/Out	**Scoped Out**	**Scoped Out**

Source: Mott MacDonald Ltd, 2020

The Scheme would aim to minimise the generation of waste as much as possible, through the outcomes of the D4RE workshop, and development of a Site Waste Management Plan (SWMP). Additionally, it is assumed at this stage that any surplus materials would be suitable to be re-used either within the Scheme or elsewhere.. As long as waste is managed appropriately, implementing the mitigation measures, it is unlikely that the generation and management of waste would result in significant effects.

Completion of a D4RE workshop and SWMP would minimise the requirement for imported materials and waste generation. Materials requirements and waste arisings associated with the annual maintenance regime are expected to be minimal and likely to be less than maintenance for the existing defences. By applying the waste hierarchy to C&D waste the Scheme would contribute to the Welsh target to recycle this waste at a rate increasing by at least 1.4% each year to 2050, using 2006/2007 as a baseline. In addition, the Mineral Technical Advice Note: Aggregates[119] sets objectives to encourage the production of aggregates from secondary and recycled resources including an overall target for 40% of C&D waste recycled as aggregates by 2025.

A confirmatory scoping opinion for this discipline is requested from DCC and any relevant statutory consultees.

14.7 Additional Information and Assessments/Reporting Required in Support of the ES

The following would be required:

- Further assessment is required of the use of materials during construction:
  - Accurate material quantification;

[119] Welsh Government (2004) Minerals technical advice note (MTAN) Wales 1: aggregates [Online] Available at https://gov.wales/minerals-technical-advice-note-mtan-wales-1-aggregates Accessed November 2020

  - Further design information; and
  - Scheme schedule and the availability of and access to material from quarries (especially within Denbighshire) and other such sources of material throughout the phases of construction.
- A SWMP:
  - To be produced prior to the commencement of construction;
  - Detail how waste would be managed and disposed of during the construction of the Scheme;
  - Define the use of the waste hierarchy to manage waste and implementing mitigation measures to minimise and reduce the amount of waste needing treatment and disposal; and
  - Taking account of any changes in design as the project progresses.

14.8 Proposed Methodology

The proposed EIA methodology for the assessment of Materials effects can be found in Appendix B.7.

15 Noise and Vibration

15.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential noise and vibration impacts and associated effects of the Scheme on nearby noise and vibration sensitive receptors (NSRs). This analysis aims to gain an understanding of the need to undertake further assessment should any of the following apply:

- Does construction or operational noise and vibration generated by the project have the potential to generate adverse effects at any noise and vibration sensitive receptors?; and
- Are there any receptors where there would be a reasonable stakeholder expectation that a construction or operational noise and vibration assessment would be undertaken?

The description of the baseline utilises desk study information only, no quantitative testing or monitoring has been undertaken to inform it.

15.1.1 Reporting/Assessment Completed to Date

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C); and
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D).

In addition, the adjacent East Rhyl Coastal Defence Scheme (currently under construction) had a Noise and Air Quality Assessment completed by Hawkins Environmental (October 2018) which contains useful noise baseline data for the area.

15.2 Study Area

The study area of this Chapter predominantly focuses on the closest sensitive receptors within 200m of the Scheme, however consideration has been given to receptors up to 300m from the Scheme that could be affected by traffic generated at the construction stage. This approach is consistent with BS5228[120] guidance for the prediction and assessment of potential construction noise and vibration impacts.

15.3 Baseline Conditions

15.3.1 Potential Sensitive Receptors

There are several sensitive receptors in the vicinity of the site, including, residences, pre-school nurseries, a theatre and cinema, the SeaQuarium and residential care homes. The closest of these includes the theatre, cinema and SeaQuarium which at the closest point are within 20m of proposed construction work areas. There are also several potentially sensitive listed buildings within the study area.

The closest residential areas are located opposite the Scheme bounding the B5118. The closest of these are located 40m from the eastern end of the Scheme on Marine Drive. Residential properties are located along the full length of the Scheme.

[120] British Standards Institution (BSI) (2014). BS 5228-1&2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise & Part 2: Vibration.

Marine mammals, fish and birds have the potential to be affected by construction noise including any piling activities. The Preliminary Environmental Impact Report and Preliminary Ecological Appraisal Report did not identify marine mammals from a desk study however these are noted to likely be present within the coastal waters adjacent to works area.

15.3.2 Existing Noise Sources

The existing noise environment at nearby noise sensitive receptors within Rhyl comprises a combination of sources including:

- Road traffic noise from the B5118 (East Parade, West Parade and Marine Drive) which run parallel with the Scheme;
- Road traffic from the surrounding road network with Rhyl;
- Commercial and leisure activities including parks and facilities located along the seafront; and
- Environmental sources (e.g. gull calls, breaking waves).

Road traffic noise from the B5118 (East Parade, West Parade and Marine Drive) is understood to be the dominant ambient noise source for majority of residential dwellings closest to the Scheme works areas.

15.3.3 Baseline Noise Levels

At the time of this scoping exercise, the effects of Covid-19 are considered to have resulted in atypical ambient and background noise levels in surrounding areas to the Scheme due to changes in usage of primary modes of transport in addition to changes in commercial, residential and leisure activities. Baseline noise levels for the Scheme have not been measured, however a desktop study has been undertaken to review the baseline noise environment at relevant sensitive receptors.

Strategic noise maps of Wales[121] indicate that noise from main trunk roads and rail sources do not significantly contribute to ambient noise levels at receptors adjacent to the Scheme. Noise levels are shown to be less than 55dB $L_{Aeq,16hr}$ for receptors within 200m of the Scheme. Road traffic from minor and local roads (not included within noise mapping) would however contribute to existing noise levels at relevant receptors.

Strategic noise mapping also identifies a single noise Priority Area within Rhyl located on the A525 (ID: 1299). This Priority Area is not within 200m of the Scheme extents but is located on one of the main road links into Rhyl.

Baseline noise measurements were undertaken by Hawkins Environmental in 2018 to inform the East Rhyl Defence Scheme ES. These surveys include locations relevant to the Central Rhyl Coastal Defences scheme. Measurement results are considered to be representative of conditions prior to effects of Covid-19 measures and provide an indication of baseline noise levels for reference within this assessment.

Noise measurements undertaken in 2018 indicate that daytime noise levels at noise sensitive receptors located on Marine Drive are between approximately 50 dB $L_{Aeq,16hr}$ and 60dB $L_{Aeq,16hr}$. Results for receptors located on East and West Parade are shown to be between 60dB $L_{Aeq,16hr}$ and 65dB $L_{Aeq,16hr}$.

[121] Extrium Ltd (2015) Wales Noise and Air Quality Viewer [Online] Available at: http://extrium.co.uk/walesnoiseviewer.html Accessed November 2020

Where practical it is recommended that baseline surveys are undertaken at representative NSRs to establish the baseline pre-construction noise levels for consideration within the construction noise assessment. The surveys should be undertaken for a suitable duration representative of periods when construction would be undertaken at the nearest NSR during representative noise conditions (i.e. outside of school holidays).

At the time of this scoping exercise, due to uncertainty over the implications of any future changes in ambient noise levels due to effects of Covid-19, it is recommended that agreement with DCC is sought to establish baseline noise levels through the use of representative existing data for assessment at EIA. Where it is not practical to undertake measurements, results from East Rhyl EIA report (undertaken in 2018) could be used to inform baseline noise levels which are considered to be representative of conditions prior to effects of Covid-19 measures and can provide an indication of baseline noise levels.

15.4 Assumptions and Limitations

- Baseline noise levels have been reviewed from previously measured data associated with the East Rhyl scheme. Uncertainty due to Covid-19 means baseline noise levels at the time of EIA may vary. Representative baseline noise levels should be measured or selected and agreed with DCC at the time of EIA;
- A detailed construction method statement is not available at this time. It is assumed construction traffic to the site from A55 would avoid routes through central Rhyl to access the site area;
- Traffic movements and traffic management measures required during the construction and operational phases are currently unknown. It is assumed that existing traffic volumes and travel patterns would not change significantly on completion of the works; and
- It is assumed that rock breaking would not be undertaken within the Scheme area and would be completed at the area the rocks are to be sourced.

15.5 Guidance and Best Practice

Key legislation, policy and guidance relevant to noise and vibration in Wales include:

- The Environmental Noise (Wales) Regulations 2006[122];
- Land Compensation Act 1973[123];
- Noise Insulation Regulations 1975 (as amended 1988)[124];
- Well-being of Future Generations (Wales) Act 2015[125];
- Control of Pollution Act 1974[126];
- Planning Policy Wales, 2018[127];
- TAN 11 (Noise), 1997[128];

[122] Environmental Protection Wales: The Environmental Noise (Wales) Regulations 2006. SI 2006/2629 (W.255). UK: The Stationery Office Limited.

[123] Land Compensation Act 1973. (ch. 26). England: C. H. Baylis, CB.

[124] The Noise Insulation (Amendment) Regulations 1988. SI 1988/2000. UK: The Stationery Office Limited.

[125] Well-being of Future Generations (Wales) Act 2015. (anaw 2). UK: The Stationery Office Limited.

[126] Control of Pollution Act 1974. (ch. 40). London: Her Majesty's Stationery Office.

[127] Welsh Government (2018). Planning Policy Wales - Edition 10.

[128] Welsh Government (1997). Planning Policy Wales Technical Advice Note (TAN) 11: Noise.

- BS5228-1:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites – Part 1: Noise’[129];
- BS5228-2:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration’[130]; and
- BS7385-2:1993’ Evaluation and Measurement for Vibration in Buildings. Guide to Damage Levels from Ground-borne Vibration’[131].

15.6 Potential Effects

15.6.1 Construction Noise

There are potential adverse effects from noise impacts arising from the construction of the Scheme including scour protection, stepped revetments, sheet piling, extension of outfalls, promenade raising, retaining structures, access routes and ramps, improvement works, site compounds and from construction traffic.

It is understood sheet piling would be necessary at the toe of the stepped revetment. The total duration that piling would occur for is not known at this time. However, should high noise level activities including piling occur for extended durations the construction phase could cause a significant adverse effect at nearby noise sensitive receptors if left unmitigated. Construction noise and vibration impacts would be mitigated by the implementation of Best Practicable Means as defined in Section 72 of the Control of Pollution Act 1974. These measures would include selection of the most appropriate construction techniques, use of soft starts for piling and limiting working hours of relevant high noise level activities.

Increases in road traffic noise due to construction vehicles and associated traffic to and from the site has the potential to result in adverse noise impacts at noise sensitive receptors. This is dependent on the number of people needed to carry out the works and the number of deliveries required.

There are potential adverse effects on marine mammals due to construction noise particularly from proposed piling works. The extent of this is subject to multiple factors including construction methodology. An underwater noise assessment should be undertaken to determine the extent of potential effects.

There are potential noise impacts on birds. Potential effects are dependent on multiple factors including location of construction works with respect to sensitive species, construction methodology and character of noise generated, timing of the works, etc. Construction noise impacts on birds has therefore been scoped in for assessment subject to review of detailed construction methodology.

15.6.2 Construction Vibration

The assessment of the potential impacts of vibration from construction is generally limited to sensitive and occupied properties at which perceptible vibration is predicted and any building where vibration may affect its structural integrity. This includes the adjacent SeaQuarium which would be particularly sensitive to vibration.

[129] British Standards Institution (BSI) (2014). BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.

[130] British Standards Institution (BSI) (2014). BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.

[131] British Standards Institution (BSI) (1993). BS7385-2:1993’ Evaluation and Measurement for Vibration in Buildings. Guide to Damage Levels from Ground-borne Vibration’.

Vibration from construction activities has the potential to generate adverse effects at vibration sensitive receptors and is scoped into the proposed EIA.

15.6.3 Operational Noise and Vibration

The proposals do not introduce permanent changes to the highway network, no noise and vibration impacts and effects are anticipated due to operation of the Scheme. Assessment of operational noise and vibration is therefore scoped out of the proposed EIA.

15.6.4 Potential Effects Summary

Table 15.1 summarises that in conclusion, operational noise and vibration are considered to be insignificant and are therefore scoped out. It is recommended that a quantitative assessment for construction noise and vibration is scoped in.

Table 15.1: Potential Effects

Effects	Construction	Operation
Potential Non-Significant Effects	Construction traffic could cause temporary adverse effects at NSRs. Construction activities could cause temporary adverse impacts for marine mammals and fish. Construction activities could cause temporary adverse impacts on birds.	No operational noise and vibration effects or impacts are identified.
Potential Significant Effects	Construction activities may produce significant adverse noise and vibration effects at sensitive receptors depending on several factors including the methodology, time of operation and duration of works. The CNMP and CEMP would be produced to minimise adverse noise and vibration effects.	No operational noise and vibration effects or impacts are identified.
Scoped In/Out	**Scoped In (construction noise)** **Scoped In (construction vibration)**	**Scoped out (operational noise and vibration)**

Source: Mott MacDonald Ltd, 2020

Construction noise and vibration has been scoped in at the current time, however a scoping opinion for this discipline is requested from any statutory consultees to determine whether the mitigation proposed would sufficiently mitigate effects such that they would no longer be considered as significant.

15.7 Additional Information and Assessments/Reporting Required in Support of the ES

To inform the ES Chapter the following information would be required:

- Construction traffic data and details of selected routes. If no quantitative traffic data is available, an assumption of proposed requirements for construction traffic would be applied;
- Baseline noise survey data to inform the construction assessment (subject to noted assumptions and limitations due to any ongoing Covid-19 measures);
- Construction programme;
- Confirmation of likely plant inventories, working areas and usage;

- Details of piling methodology including pile sizes, depths etc.; and,
- Location and operation of construction compounds;

15.8 Proposed Methodology

The proposed EIA methodology for the assessment of Noise and Vibration effects can be found in Appendix B.8.

16 Population and Health

16.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential effects of the Scheme on population and health. An overview of the population and health baseline within the study area and details of the likely significant population and human health effects are provided. The proposed methodology for assessing the impact of the Scheme on population and health is set out, identifying those effects which can be scoped out of the EIA.

16.1.1 Reference Reports

The following reports have been considered:

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C); and
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D).

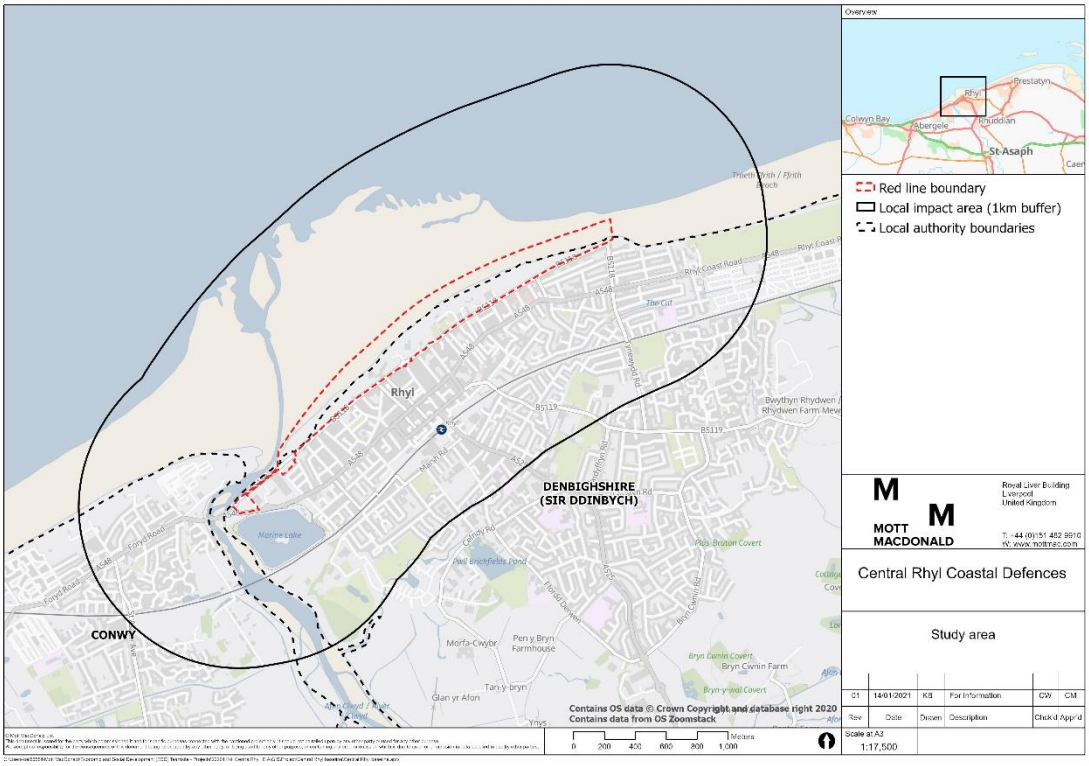
16.2 Study Area

Baseline data has been calculated for a Local Impact Area (LIA), which includes a portion of both Denbighshire County and Conwy County Borough, the Wider Impact Area (WIA), and Wales. The LIA and WIA have been created based on guidance and professional judgement and are defined as follows:

- LIA – The area within 1.0km of the Scheme would be referred to as the LIA. This is the primary study area for this discipline and is designed to capture most potential population and health effects of the Scheme. The Scheme is approximately 2.4km in length, from the western end of the Brownfield Development Priority Area (site of Quay Street Car Park) in the west to Tynewydd Road in the east (Figure 16.1); and
- WIA – The county of Denbighshire, which includes the town of Rhyl, and the Conwy County Borough, which includes the seaside village of Kinmel Bay (part of it included in the LIA), are referred to as the WIA. This area would be used to assess potential active travel and tourism effects, as well as wider economy effects where they arise, as impacts would be on receptors which are greater than 1.0km from the Scheme.

Note: The RLB for the Scheme has not yet been finalised. The boundary used is an indicative conservative boundary including all potential areas for access, construction compounds and working areas. It therefore represents a worst-case scenario.

Figure 16.1: Map of the Study Area showing the LIA



Source: Mott MacDonald Ltd, 2021

16.3 Baseline Conditions

16.3.1 Population

Rhyl is a seaside town in the county of Denbighshire in north east Wales, fronted by a promenade and wide sandy beach. With a population of more than 26,000[133], Rhyl is one of the biggest towns in North Wales.

Table 16.1 Shows the population and age structure of the LIA, WIA and Wales.

Table 16.1: Population Baseline Data

Area	Total population	Under 16	Age 16-64	65+
LIA	17,113	21%	58%	21%
WIA	212,899	17%	57%	26%
Wales	3,152,879	18%	61%	21%

Source: ONS 2019 mid-year population estimates

The proportion of children in the LIA (21%) is slightly higher than the proportion in the WIA (17%) and in Wales (18%). The proportion of people aged 65 and older in the LIA (21%) is lower than in the WIA (26%), and consistent with the proportion in Wales (21%), People aged

[133] Office for National Statistics (ONS) (2019) Mid-year Population Estimates [Online] Available at: Population and migration - Office for National Statistics (ons.gov.uk) Accessed: November 2020

between 16 and 64 make up the majority of the population in the LIA and WIA (58% and 57% respectively), although these represent slightly lower averages that that for Wales (61%).

16.3.2 Deprivation

The Welsh Index of Multiple Deprivation (WIMD) is used for the measurement and comparison of relative level of deprivation (poverty). Table 16.2 shows the income deprivation quintiles across the LIA, WIA and Wales.

Table 16.2: Population by Deprivation Quintiles

Location	Most deprived	Second most deprived	Third most deprived	Fourth most deprived	Least deprived
LIA	62%	15%	18%	5%	0%
WIA	13%	20%	22%	25%	20%
Wales	20%	20%	21%	20%	20%

Source: Welsh Indices of Multiple Deprivation, 2019

Most of the residents in the LIA live in the most deprived (62%) neighbourhoods in the country. This proportion is considerably higher than for the WIA and Wales (13% and 20% respectively). The population in the LIA is therefore more deprived in comparison to WIA and Wales populations.

16.3.3 Employment and Economic Activity

Table 16.3 shows the economic activity rate, employment rate and unemployment rate for the working age population (16-64) for each of the study areas. Data at LIA level is available only for the proportion of working age population.

Table 16.3: Economic Activity Baseline Data

Area	Working Age Population (16-64)	Economic Activity Rate	Employment Rate	Unemployment Rate
LIA	58%	-	-	-
WIA	57%	77%	74%	4.8%
Wales	61%	77%	74%	3.7%

Source: ONS 2019 mid-year population estimates and Annual Population Survey, June 2020

The proportion of working age individuals aged 16-64 in the LIA and WIA is 58% and 57% respectively. The proportion of working age population in the LIA and WIA is slightly lower than Wales statistics (61%).

The Business Register and Employment Survey (BRES) provides data on employment estimates by industry.[134] The largest industries of employment in the WIA are 'health', 'accommodation and food services', 'retail' and 'education' (21%, 15%, 11% and 8% respectively). The proportion of employees within the health sector in the LIA is 22% which is in line with the WIA (21%) but higher than Wales proportion (16%) as there are a number of community hospitals, asylums, cancer treatment centres and a number of General Practitioner clinics within the LIA.

[134] The Business Register and Employment Survey (BRES) publishes employee and employment estimates at detailed geographical and industrial levels and is regarded as the official source of employee and employment estimates by detailed geography and industry.

16.3.4 Businesses

There are approximately 827 businesses within the LIA, located along B5118 (West and East Parade), A548 (Wellington Road) and in the city centre of Rhyl, south of A525 (High Street, Vale Rd Bridge). Also, there are a number of businesses in the Kinmel Bay Village, especially adjacent to intersection of Foryd Road with St Asaph Avenue.

The businesses on the promenade are located on the B5118 which is known as the West Parade, East Parade and Marine Drive depending on the location along the road. From west to east, notable businesses along the promenade, to the immediate south of the Scheme, include Sun Centre 2 Rhyl Waterpark, Sky Tower, Vue Cinema, Children's Village and Rhyl Central car park, SeaQuarium, Rhyl Events Arena, Travelodge and Pavilion Theatre.

To the south of the B5118 there is mix of commercial properties in Rhyl town centre including hotels, shops, restaurants and cafes.

16.3.5 Tourism

North Wales attracts 3% of domestic tourism nights and accounts for around a third of tourism in Wales, which is more than any other region in Wales.[135] Tourism (accommodation & food services) also accounts for 15% of employment in the WIA.[137]

The main beach at Rhyl is a vast expanse of sand stretching for around 2.6km, from the mouth of the River Clwyd to approximately Tynewydd Road. Rhyl is a traditional seaside resort town with wide range of activities available on the seafront which is called the promenade. These include seafront amusement arcades, the SeaQuarium and the Sun Centre 2 Rhyl Waterpark.

16.3.6 Health

Table 16.4 presents key health indicators within the LIA, WIA and Wales. At LIA level data is only available for 'long-term health problem or disability' (LTHD). The proportion of people with a LTHD is higher within the LIA compared to the WIA and in Wales.

The WIA performs consistently with national statistics in relation to life expectancy. The mortality rate for people under 75 years of age suffering cardiovascular diseases (per 100,000) is higher in the LIA compared to CCBC and Wales.

Table 16.4: Public Health Baseline Data

Measure	LIA	WIA	Wales
Long-term health problem or disability (2011) (%)	28%	24%	23%
Life expectancy at birth (male 2016-18) (years)	-	78	78
Life expectancy at birth (female 2016-18) (years)	-	82	82
Under-75 mortality rate, cardiovascular diseases (per 100,000, 2017)	-	86	85

Source: NHS Wales, Public Health Indicators

[135] Mott MacDonald (2013) Colwyn Bay Waterfront Project: Environmental Statement Addendum for Phase 1b

[137] Office for National Statistics (ONS) Business Register and Employment Survey [Online] Available at: Business - Office for National Statistics (ons.gov.uk) Accessed: November 2020

16.3.7 Residential Properties

There are 9022 residential properties within the LIA. Within the RLB there is a self-contained flat at The Sun Verge pub. A considerable number of residential properties are located on the southern side of the B5118 (West, East Parade and Marine Drive). The B5118 provides a buffer between the properties and the majority of the Scheme.

16.3.8 Community Resources

There are multiple community resources located within the LIA. Amongst these are a number of hospitals (2), health care services (8), care/nursing homes (22), sports facilities (32), churches (8), community facilities (16), schools (3) and open public spaces (1 inside the RLB).

The closest community resources to the Scheme are seven sports/recreational facilities inside the RLB and one open space at the north eastern end of the RLB[138]. Also, adjacent to the RLB of the Scheme, there are a number of community resources, including Royal Alexandra Hospital, Denbighshire Community Mental Health Team, Beach House Day nursery and a few care homes (3 – including Plas Y Mor Care Home, St David's Residential Care Home, and Abbeyfield Rhyl sheltered housing). All of these are located to the south of the Scheme and are accessed from the B5118.

16.3.9 Open Space and Recreation Including Active Travel Routes

National Cycle Route 5, the Wales Coast Path (from Holyhead to Chester) passes through the LIA along the promenade in Rhyl. National Cycle Route 84, which connects Rhyl to St Asaph starts at the Children's Village (an outdoor play area) located on the promenade and heads west towards Kinmel Bay, passing by Marine Lake.

There are Public Rights of Way (PRoW) in the LIA which provide pedestrians and cyclists access to the Promenade. Beach access is currently provided through slipways and steps located at regular intervals.

Children's Village and other outdoor play areas, a skate park, Green Bowls Centre, Sun Centre 2 Rhyl Waterpark, and East Parade Wild meadow are located along the promenade in the LIA. There are also a number of sports facilities (32) within the LIA, including tennis courts, play areas, sports fields and an indoor leisure centre.

16.3.10 Development Land

The Denbighshire County Council Adopted Local Development Plan[139] shows the location and extent of allocated developments in Rhyl. Within the LIA there are three conservation areas (one to the east of Marine Lake adjacent to Seabank Road, one around River Street and the biggest one broadly following the town centre boundary). To the north of the Marine Lake, to the west of the Scheme, there is Brownfield Development Priority Area.

There are several housing allocations within the LIA:

- One at the intersection of Westbourne Avenue with Wood Road;
- Two on Sandringham Avenue;
- Two on Russell Road (one close to Churton Road and one close to Fairfield Avenue); and

[138] Facilities mentioned in the next sub-heading 16.3.9

[139] Denbighshire County Council, Local Development Plan 2006 – 2021: Map [Online] Available at: https://www.denbighshire.gov.uk/en/planning-and-building-regulations/local-development-plan/adopted-local-development-plan-map.aspx Accessed November 2020

- One on East Parade close to Fairfield Avenue).

16.4 Assumptions and Limitations

- The assessment of the potential for significant effects has been carried out against a benchmark of current baseline conditions within the LIA and WIA. As with any dataset, these may be subject to change over time, which may influence the findings of the assessment and could lead to the assessment being subject to statistical time lag;
- No formal consultation or primary research has been undertaken in the production of this Chapter;
- It is assumed that the construction process would not render local properties unusable and there would be no displacement of local residents; and
- It is assumed that the construction compounds will require temporary land take, but the land will be reinstated ready for future uses.

16.5 Key Guidance and Best Practice

The population and human health assessment is guided by the EIA Regulations[140] as well as national and local planning policy including:

- Countryside Rights of Way Act, 2000;[141]
- Well Being of Future Generations (Wales) Act (2015)[142];
- Planning Policy Wales 2018;[143]
- TAN 16: Sport, Recreation and Open Space;
- TAN 20: Planning and the Welsh Language;
- TAN 23: Economic Development; and
- Denbighshire County Council LDP 2006-2021.

The assessment is also guided by Public Health Wales' 'Health Impact Assessment: A practical guide' which outlines human health assessment methods for Wales[144]. This is considered the most up-to-date and relevant piece of guidance for human health assessments within Wales. However, professional judgement is also used to guide the assessment, particularly in relation to population impacts.

16.6 Potential Effects

Table 16.5 shows the potential effects identified in construction and operation of the Scheme.

A confirmatory scoping opinion is requested from all relevant statutory consultees.

[140] Her Majesty Government (UK) The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations (2017) [Online] Available at: The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (legislation.gov.uk) Accessed November 2020

[141] Her Majesty Government (UK) Countryside and Rights of Way Act (2000) [Online] Available at: Countryside and Rights of Way Act 2000 (legislation.gov.uk) Accessed November 2020

[142] Her Majesty Government (UK) Well-being of Future Generations (Wales) Act (2015) [Online] Available at: https://www.legislation.gov.uk/anaw/2015/2/contents/enacted Accessed November 2020

[143] 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, Accessed November 2020

[144] Public Health Wales (undated), 'Health Impact Assessment: A practical guide' [Online] Available at: https://whiasu.publichealthnetwork.cymru/files/1415/0710/5107/HIA_Tool_Kit_V2_WEB.pdf Accessed November 2020

Table 16.5: Potential Effects

Effects	Construction	Operation
Potential Insignificant Effects	There is not expected to be any permanent loss of residential or commercial land or property as a result of the construction of the Scheme. The only temporary loss of land is associated with the construction compounds and working areas. Effects are likely to be not significant as land will be returned to its former use after the construction period. There may be temporary disruption to access for the small number of properties located in close proximity to the Scheme. However, these effects would be temporary, and access would be maintained to all affected properties. The effects on residents, in relation to access to their properties, are not likely to be significant. Access to the beach is likely to be temporarily impacted as a result of construction with some access points being required to be temporarily closed. However, as there are multiple access points, residents and visitors would still be able to access other beach areas and as such these effects on recreational receptors are not likely to be significant. The potential effects on development land are not likely to be significant as the Scheme is separated from allocated sites by the B5118, which is unlikely to be closed during the construction of the Scheme. The construction of the Scheme would therefore not impact on the ability for these sites to be developed. The possible use of two construction compound sites at the western end of the RLB, one on a Brownfield Development Priority Area (site of Quay Street Car Park, currently closed until spring 2021 while a temporary COVID-19 testing centre is set-up) and the other one on development land situated on the right side of West Parade, between Sydenham Avenue and Sandringham Avenue, has the potential to delay any plans to utilise them, but only temporarily, and this will not impact on the ability for these sites to be developed in the future.	There is not expected to be any loss of residential land or property, or disruption to access as a result of the operation of the Scheme. Therefore, effects are not likely to be significant. Effects on community receptors are not likely to be significant as the operation of the Scheme would not impact the ability for people to access and use community resources within the LIA. The potential effect on development land from operation of the Scheme is not likely to be significant, as the Scheme is separated from allocated sites by the B5118. The operation of the Scheme would therefore not impact on the ability for these sites to be developed. There will be beneficial impacts from the improved defences.
Potential Significant Effects	There are a considerable number of businesses within the LIA which could be impacted due to changes to access, and other environmental impacts such as noise and air quality, during construction of the Scheme. This has the potential to disrupt local business activity, particularly footfall, which has the potential to be significant. Those businesses located	The Scheme is proposed to manage flood risk to 548 residential and 44 non-residential properties over 100 years and manage erosion to key tourism infrastructure. Improved coastal protection as a result of operation of the Scheme would safeguard existing businesses and may attract new businesses to the promenade

Effects	Construction	Operation
	between Rhyl Promenade and B5118 (especially West Parade) are most likely to be affected. Here are located a number of amusement arcades, restaurants, bars and cafeterias, as well as shops. Effects on community receptors are likely to be significant, as a number of community receptors are located within the RLB, close to proposed construction works. Appropriate construction management processes need to be implemented, in relation to potential traffic, noise and air quality impacts, in order to mitigate the potential negative effects. There are anticipated to be positive effects on the local economy and employment in relation to job creation, the supply chain, and employment opportunities during construction of the Scheme. There may be temporary disruption for cyclists and pedestrians in the LIA. This would temporarily impact on people's use and enjoyment of the national cycling trail and the Promenade, which is part of the Wales Coast Path. One of the main tourist attractions in Rhyl is the beach. The construction area would be predominantly on Rhyl Beach close to the centre of the town. As the construction could result in the closure of a large area of Rhyl Beach to the public, this could impact upon the physical and mental health of residents and could deter tourists from wanting to visit the area. Therefore, impacts on tourism have the potential to be significant. Construction of the Scheme could potentially have human health effects and reduce amenity for nearby residents during construction through environmental impacts such as noise or air quality impacts. Therefore, combined effects on residents from a temporary reduction in amenity, and human health effects have the potential to be significant.	and increase opportunities for employment. There are likely to be benefits for NMUs, due to improvements to the promenade. The detailed design of the Scheme and therefore the extent of these potential improvements have not yet been finalised. There may be benefits to health as a result of improvements to NMU facilities from the Scheme, increasing people's use and enjoyment of the national cycling trail and the Promenade, which is part of the Wales Coast Path. Improved access to the beach is likely to have a beneficial effect on recreational opportunities for residents in Rhyl. There is the potential for beneficial effects on tourism as a result of the Scheme as the enhanced protection makes the promenade more attractive for cyclists and pedestrians.
Scoped In/Out	**Scoped In**	**Scoped In**

Source: Mott MacDonald Ltd, 2020

Population and human health effects are scoped in for both construction and operation of the Scheme.

Potential additional mitigation measures include:

- Working with local businesses along the promenade to mitigate potential adverse construction effects. Potential mitigation could include understanding access requirements to maintain footfall and undertaking construction during months when patronage is reduced. This may enable businesses to stay open during the construction period;
- Configuration of alternative cycling and pedestrian routes to minimise disruption to both visitors and local population during construction; and
- Implementation of best practice construction management procedures to mitigate air quality, noise and traffic effects.

16.7 Additional Information and Assessments/Reporting Required in Support of the ES

- Outline CEMP; and
- Air quality, noise and traffic EIA Chapter review, to determine human health effects.

16.8 Proposed Methodology

The proposed EIA methodology for the assessment of Population and Health effects can be found in B.9.

17 Traffic, Transport and Access

17.1 Introduction

This Chapter sets out the proposed scope for the assessment of the potential effects of the Scheme on traffic, transport and access. The ES Chapter would be supported by a Transport Statement (TS) as a requirement to undertake traffic modelling such as junction capacity assessments is not anticipated to be necessary.

17.1.1 Reference Reports

- Central Rhyl Coastal Defences Outline Business Case, Denbighshire County Council, October 2019 (Appendix C); and
- Central Rhyl Coastal Defences, Preliminary Environmental Impact Report, JBA Consulting, April 2019 (Appendix D).

In addition, the adjacent East Rhyl Coastal Defence Scheme (currently under construction) had a Transport Assessment completed by Fore (October 2018) which contains useful baseline data for the area. DCC have also provided baseline traffic data for Rhyl and the proposed construction traffic route.

17.2 Study Area

The study area would be defined in the TS and would consider the likely impact of the construction traffic upon the road network. IEMA guidance recommends the following when considering the impact of traffic on a highway:

- Highway links where traffic flows would increase by more than 30% (or the number of heavy goods vehicles would increase by more than 30%); and
- Any other specifically sensitive areas where total traffic flows would increase by 10% or more.

The exact study area and scope of the TS would be agreed with the Local Highway Authority, when construction routes and traffic management proposals are known in more detail. Possible traffic routes are described in Chapter 2.

17.3 Baseline Conditions

17.3.1 Existing Infrastructure and Access

The main access points to areas of construction are likely to be from the B5118 (West Parade, East Parade and Marine Drive). The B5118 is formed of a single carriageway road with wide pavements on both sides, as well as street lighting. Pavements narrow for a short section between Abbey Street and High Street.

National Cycle Network (NCN) Route 5 runs off-road to the north along the adjacent promenade within the Scheme area.

There are several vehicular accesses to the Promenade. During scoping of the TS with DCC and the main contractor, the most appropriate routes for construction vehicles to take would be discussed, aiming to minimise disruption to the town centre and residential areas.

17.3.2 Public Transport

Rhyl railway station is located a short 5 to 10 minute walk from the beach, being located to the immediate south of the town centre. The North Wales Coast Railway Line, connecting Rhyl to Holyhead, Colwyn Bay, Chester and Crewe, runs north-east to south-west inland of the coast road. Rhyl railway station is served by both local and national train services, and the town is also connected to local and national bus routes.

17.3.3 Rhyl Beach Usage

Discussions with DCC would be required to determine which areas of the Promenade would be protected and which areas, such as key tourism attractions, would remain operational during construction. Temporary parking facilities may need to be provided for tourists to minimise impact on local businesses.

17.4 Assumptions and Limitations

- For the construction phase, the number of Light Duty Vehicle (LDV) and Heavy Duty Vehicle (HDV) movements required on the B5118 along with the necessary traffic management measures are currently unknown. These would be confirmed and considered in the TS in consultation with the main contractor when these are known;
- The transport of rock revetment would be via road;
- More information on the distribution of traffic across the local road network during the construction period would be detailed in the TS. Road closures are not anticipated however temporary traffic management may be necessary at certain stages of the Scheme;
- It is also assumed that temporary diversions would be required to the NCN 5, PROWs and bus routes, which would be agreed during scoping of the TS with DCC and the main site contractor; and
- Existing recent DCC traffic survey data would be utilised. Due to the effects of Covid-19 and non-normal conditions, additional traffic survey counts are not anticipated to be representative.

17.5 Key Guidance and Best Practice

The assessment would be carried out with due regard to the following:

- DMRB Volume 11: Environmental Assessment;
- IEMA (2004) Guidelines for Environmental Impact Assessment;
- IEMA (2003) Guidelines for the Assessment of Road Traffic;
- Planning Policy Wales;
- TAN 18: Transport;
- Manual for Streets (2007);
- Denbighshire Local Development Plan, 2006 – 2021 (Adopted 2013); and
- Active Travel (Wales) Act, 2013.

17.6 Potential Effects

17.6.1 Construction Phase

It is expected that during the construction phase, anticipated to last approximately 24 months, there would be a temporary short-term increase in traffic flows due to the delivery of plant, rock

armour, construction materials and construction vehicles as well as construction employee vehicles. Appropriate traffic management and construction routes would be agreed with DCC (along with CCBC for any construction route sections passing through Conwy County land) during scoping of the TS and would be reviewed as appropriate during the construction period.

The estimated impact of construction traffic would be detailed within the TS, however this is expected to be relatively minimal due to the low numbers of daily construction vehicle movements expected.

17.6.2 Operational Phase

It is not anticipated that there would be any significant alteration to the existing transport network once the Scheme is complete.

17.6.3 Effect Summary

It is not anticipated that existing traffic volumes and travel patterns would change significantly on completion of the works.

The principal construction stage effects are anticipated to be largely minimal, however there may be some requirement for temporary traffic management. This would be agreed with DCC during the scoping of the TS.

The TS would focus on the construction phase and the impact this could have on the local highway network. It would include a Construction Traffic Management Plan produced by the main contractor to inform construction and minimise adverse effects.

Assumptions about site access and traffic management would be discussed with DCC with the aim of minimising any construction related impact.

The scoping assessment for the TS would be agreed with DCC and any relevant statutory consultees.

Table 17.1 details the anticipated construction and operational effects of implementing the Scheme. A confirmatory scoping opinion is requested from all relevant statutory consultees.

Table 17.1: Potential Effects

Effects	Construction	Operation
Potential Non-Significant Effects	Construction traffic could temporarily impact on the quality of life of residents. The transportation of construction material may have a short-term environmental impact. The temporary closure of pedestrian and cycle routes would have a small impact on users, but alternative and suitable diversion routes would be made available. Occasional changes to traffic patterns on the local road network due to lorries delivering construction material (depending on construction traffic routes from different locations).	Minimal traffic impacts expected post-construction.

Effects	Construction	Operation
	Temporary traffic management is likely to be required during the construction period.	
Potential Significant Effects	None identified, assuming the measures identified in the TS are implemented during construction.	None identified.
Scoped In/Out	**Scoped Out***	**Scoped Out**

Source: Mott MacDonald Ltd, 2020

*However a TS is to be produced.

A confirmatory scoping opinion for this discipline is requested.

17.7 Transport Statement

A TS would be prepared and developed based on the following principal activities:

- Review of existing transport conditions to identify the characteristics of the local road network, which would assist in determining the sensitivity of potential nearby receptors;
- Review of highway safety – where the proposed construction works are expected to produce a change in the character of the traffic on the local road network;
- Review of construction vehicle routing and quantification of volumes during the construction period;
- Review of existing pedestrian and cycle amenity and their respective facilities during construction;
- Review of locations of construction compounds and parking arrangements for construction staff; and
- Review of temporary diversion routes for the local highway network and active travel routes including the NCN 5 route.

To support the production of the TS:

- Existing DCC traffic survey data would be utilised. Due to the effects of Covid-19 and non-normal conditions, additional traffic survey counts are not anticipated to be required; and
- Road Traffic Collison data would be obtained and reviewed in the TS.

A Construction Traffic Management Plan would be developed by the main contractor to provide additional clarity on the vehicle movements and temporary traffic management arrangements during construction. This would enable a revised scoping to be undertaken and, if necessary, further assessment.

17.8 Proposed Methodology

The proposed EIA methodology for the assessment of Transport, Traffic and Access effects can be found in B.10.

18 Proposed ES Scope and Methodology

18.1 Potential Alternative Approach to ES

Due to current funding deadlines, the design process for the scheme is extremely compressed. While the outline design for the Scheme will be complete at the time of ES production, detailed design may still be ongoing which may result in small changes to, for example, the exact height of structures, minor changes to the intertidal land take and specific finishing.

In the event where it is not possible to fully define all details of the Scheme at the time of ES production, it is possible to ensure that the process of EIA is not compromised in its objective of providing the decision-maker and stakeholders with full information on likely significant effects by using a “Rochdale Envelope” approach. This means identifying the realistic maximum/worst-case effects of the options for the description of the Scheme and ensuring each effect is reported and mitigated accordingly. Each technical assessment would be undertaken using the Scheme design that gives rise to the greatest predicted likely significant effects for that particular assessment topic. The ES would clearly set out the parameters that have been identified as giving rise to such effects, how the parameters will be defined so as to ensure that they can be secured in the planning permission and, in the case of each of the technical assessments, which parameters are being used in undertaking the assessment of the likely significant effects of the proposed development.

This approach would ensure that DCC, NRW and other stakeholders can have confidence that the Scheme will not give rise to any greater level of environmental effects than those which were assessed in the decision-making process and also have the knowledge that the Scheme would most likely result in a lower level of environmental effects to those assessed.

We would welcome the opportunity to discuss the potential suitability and application of this approach.

18.2 Technical Scope

The ES must include a description of the aspects of the environment, which are likely to be significantly affected by the Scheme. Table 18.1 therefore sets out those disciplines that are proposed to be scoped into and out of the ES based on the scoping assessments completed within Chapters 7 to 17 of this report.

A confirmatory scoping opinion for each discipline is requested from all relevant statutory consultees.

Table 18.1: Disciplines to be Scoped In/Out of the EIA

Topic	Construction	Operation
Air Quality	OUT*	OUT
Archaeology and Cultural Heritage	IN	OUT
Biodiversity	IN	IN
Climate: Climate Change	IN	IN
Climate: Resilience	OUT	OUT
Coastal Processes: Coastal Hydromorphology	OUT	IN
Coastal Processes: Flood Risk	OUT	IN

Topic	Construction	Operation
Coastal Processes: Water Quality	IN	OUT
Geology and Soils	OUT	OUT
Landscape and Visual: Landscape	IN	OUT
Landscape and Visual: Visual	IN	OUT
Materials and Waste: Materials	IN	OUT
Materials and Waste: Waste	OUT	OUT
Noise and Vibration: Noise	IN	OUT
Noise and Vibration: Vibration	IN	OUT
Population and Health	IN	IN
Traffic, Transport and Access	OUT**	OUT
Cumulative Impacts	IN	IN
Risk of Major Accidents and Disasters	OUT***	OUT***

Source: Mott MacDonald Ltd, 2020

*Construction Dust Risk Assessment required.

**Transport Statement required.

*** Given that the principal aim of the Scheme is to provide coastal defence and reduce the risk of damage to key infrastructure in the Rhyl area and that construction best practice would be utilised, the risk of major accidents and disasters is not considered to be significant and has been scoped out of the EIA.

18.3 Temporal Scope

18.3.1 Environmental Baseline

As a general principle, environmental effects would be assessed by comparing the predicted state of the environment without the Scheme and with the state of the environment with the Scheme for a particular year. This would include an outline of the likely evolution of the site environment without implementation of the development as far as changes from the baseline scenario can be predicted. This baseline evolution may include future trends such as air quality and traffic growth.

18.3.2 Duration of Effects

Environmental effects would be classified as either permanent or temporary, as appropriate. Permanent changes are those which are irreversible or would last for the foreseeable future.

The duration of temporary environmental effects would be defined as short, medium or long term based on the likely durations of the construction and operational phases of the development. These definitions would be considered within the assessment of the likely significant effects and would be set out in the ES.

Where environmental effects would be infrequent or intermittent this would be noted in the ES and the frequency considered in the assessment.

18.3.3 Phases of the Scheme

18.3.3.1 Construction

Certain environmental effects would only occur during construction of the Scheme and would cease once construction activities have ceased. These would typically be the temporary effects

of the Scheme and would be described as “short-term” or “medium-term”, as appropriate, using the definitions determined to be appropriate and set out in the ES.

18.3.3.2 Operation

Environmental effects that occur during the operation of the project would typically be permanent or “long-term”.

18.3.3.3 Decommissioning

The Scheme is anticipated to be operational in perpetuity, therefore it is not proposed that the ES would address decommissioning.

18.4 Spatial Scope

The spatial extent of each of the technical assessments would vary from one to another in accordance with the relevant policy and guidance for the assessment of that discipline as detailed in Chapters 7 to 17. Typically, the study area would comprise the site and those areas that surround the site but are excluded from it.

For some disciplines it would extend further from the site boundary where there is the potential for effects to be significant over a wider area (e.g. as a result of traffic generated by the development).

The study area for each technical assessment would be identified and described as appropriate in each of the discipline Chapters of the ES.

18.5 Assessment of Effects

18.5.1 Types of Effects

The EIA would report on the likely significant effects for the construction and operational phases of the Scheme.

Account would be taken as appropriate as to whether effects are:

- Direct Effects – effects that are caused by activities which are an integral part of the Scheme;
- Indirect Effects – effects arising indirectly from the construction or use of a development;
- Secondary Effects – arising in consequence of indirect effects;
- Cumulative Effects – effects that result from different sources, but which affect a common receptor resulting in a greater combined effect;
- Transboundary Effects – effects caused by a Scheme that are experienced across a boundary;
- Temporary Effects – Environmental effects that occur during the construction of a project would typically be temporary;
- Permanent Effects – Permanent effects are those which are irreversible, would last for the foreseeable future or are effects considered to last greater than ten years;
- Beneficial Effects – Effects that have a positive influence on the environment; and
- Adverse Effects – Effects that have an adverse influence on the environment.

18.5.2 Methodology for Assessing Significance

The method for assessing significance of effects varies between environmental disciplines and a proposed outline for each discipline is provided in Appendix B.

In principle, as this is a linear scheme, the overarching Environmental Assessment Methodology to be followed would be the one outlined in DMRB LA104[145]. For many Chapters, the assessment methodology would be based on the environmental sensitivity (or value/importance) of a receptor and the magnitude of change from the baseline conditions as represented by the significance of effect matrix in Table 18.2.

It should be noted that the assignment of significance would be based on professional judgement and the matrix below is only a tool to assist with the process.

Table 18.2: Significance of Effect

		Value/Sensitivity of Effect				
		Very High	**High**	**Medium**	**Low**	**Negligible**
Magnitude of Effect	**Major**	Very Large	Large to Very Large	Moderate to Large	Slight to Moderate	Slight
	Moderate	Large to Very Large	Moderate to Large	Moderate	Slight	Neutral to Slight
	Minor	Moderate to Large	Slight to Moderate	Slight	Neutral to Slight	Neutral to Slight
	Negligible	Slight	Slight	Neutral to Slight	Neutral to Slight	Neutral
	No change	Neutral	Neutral	Neutral	Neutral	Neutral

Where the significance of effect can be summarised as follows:

- **Very Large:** Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
- **Large:** These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
- **Moderate:** These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
- **Slight:** These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
- **Neutral:** No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

[145] Highways England (2019) Design Manual for Roads and Bridges (DMRB) LA 104 Environmental Assessment and Monitoring Revision 1

For some specific discipline assessments, guidance or the nature of the effect requires that differing criteria or scales for determining significance are to be used, however, wherever possible there would be consistency of terminology and conclusions would tie in with the above.

Effects that are described as ‘very large’, ‘large’ or ‘moderate’ are determined to be significant; and effects that are described as ‘minor’ or ‘negligible’ are determined to be not significant.

18.5.3 Impact Interactions (Cumulative Impacts)

The EIA Regulations require the consideration of the potential impacts of:

- Inter-relationships of different environmental disciplines; and
- Cumulative effects of other existing and/or approved development.

The EIA would consider as appropriate the potential for impact interactions leading to a cumulative environmental effect on a receptor being greater than each of the individual effects that have been identified.

Cumulative impacts would be assessed within a specific Chapter of the ES.

18.6 Mitigation

One of the most important functions of the EIA process is to identify ways to mitigate adverse environmental effects and identify opportunities that the Scheme may have for environmental enhancements. For mitigating significant adverse effects, in order of preference the following hierarchy would be followed:

- Enhancement – Opportunities that the Scheme may provide to enhance the local and wider environment;
- Avoidance – Designing a Scheme in such a way that avoids adverse effects on the environment;
- Reduction – Design the development or employ construction methodologies such that significant adverse effects identified are reduced; and
- Compensation – Providing off-site enhancement to compensate for where onsite mitigation has not been possible.

18.6.1 Primary, Secondary and Tertiary Mitigation

EIA mitigation can be characterised depending on the stage of the assessment when it is considered[146]:

- Primary mitigation measures (impact avoidance measures embedded in design);
- Secondary mitigation (identified during the EIA assessment process, iterative design process to reduce or eliminate effects); and
- Tertiary mitigation measures in relation to residual effects (follow up measures, where necessary).

[146] 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 Accessed November 2020

18.6.2 Residual Effects

Environmental effects remaining after mitigation measures have been incorporated are termed residual effects and these would be fully described in the ES.

18.7 Monitoring

The EIA Regulations require "*the monitoring of any significant adverse effects on the environment of proposed development*". It is important to note that the Regulations only require the monitoring of effects that are both significant and adverse. The ES would therefore ensure that it is clear to the reader which, if any, effects are both adverse and significant and may therefore require monitoring and provide a schedule of proposed monitoring to clearly identify the monitoring that is proposed in relation to any significant adverse effects that have been identified.

18.8 Environmental Statement Summary

Following the submission of this Scoping report to, and receipt of a scoping opinion from, DCC and taking into account comments from all other statutory and non-statutory consultees, the ES would be prepared in compliance with the EIA Regulations. Reference would also be made to current and emerging best practice.

The ES would document the EIA process, describing the Scheme and setting out the policy context; giving full detail of the EIA methodology and any technical methodologies and data used in support of the assessment; present the assessment of likely significant environmental effects; detail any mitigation and enhancement measures that have been employed; and provide a schedule of proposed monitoring arrangements.

The ES would present the residual effects, and an assessment of the cumulative effects and impact interactions.

The ES would comprise of three volumes:

- Volume 1 – Main Text and Figures;
- Volume 2 – Technical Appendices; and
- Volume 3 – Non-Technical Summary.

18.9 Consideration of Alternatives

The EIA process provides an opportunity to influence the design of a development taking potential environmental constraints and opportunities into consideration before a final decision is taken on design. Early consideration of potential alternatives to the Scheme would ensure minimisation of risks and could also help to avoid likely environmental effects.

In accordance with the EIA Regulations, the ES would consider the reasonable alternatives to the preferred Scheme and compare the environmental effects with other alternatives qualitatively at high level using professional judgment. The alternatives would include the 'do nothing' scenario.

18.10 EIA Team Competence

EIA Regulations require that, to ensure the completeness and quality of Environmental Statements, *"the developer must ensure that the environmental statement is prepared by competent experts*".

In line with the EIA Regulations, all contributors to the EIA are competent experts in EIA and this would be demonstrated in the ES with an overview of each key expert's qualifications, professional accreditations and experience.

19 Abbreviations

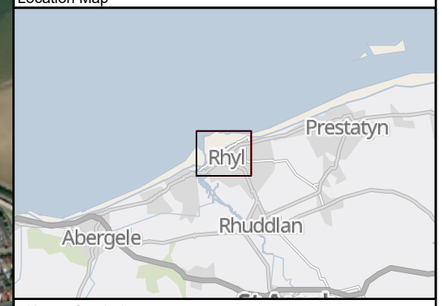
Table 19.1: Abbreviations

Abbreviation	Details
AADT	Annual Average Daily Traffic
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
BB	Balfour Beatty
BGS	British Geological Survey
CAS	Clean Air Strategy
C&D	Construction and Demolition
CCBC	Conwy County Borough Council
CCRA	Climate Change Risk Assessment
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CL:AIRE	Contaminated Land: Applications in Real Environments
CLRA	Contaminated Land Risk Assessment
CNMP	Construction Noise Management Plan
D4RE	Design for Resource Efficiency
DCC	Denbighshire County Council
DEFRA	Department for Environment, Food & Rural Affairs
DMRB	Design Manual for Roads and Bridges
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EPUK	Environmental Protection UK
ES	Environmental Statement
GCN	Great Crested Newt (*Triturus cristatus*)
GHG	Greenhouse Gases
GI	Ground Investigation
HDV	Heavy Duty Vehicles
HGV	Heavy Goods Vehicles
HRA	Habitats Regulations Assessment
IAN	Interim Advice Note
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment (IEMA)
LDP	Local Development Plan
LDV	Light Duty Vehicles
LIA	Local Impact Area
LNR	Local Nature Reserve
LVIA	Landscape and Visual Impact Assessment

Abbreviation	Details
LWS	Local Wildlife Site
MTAN	Minerals technical advice note
NCN	National Cycle Network
NO_2	Nitrogen dioxide
NMU	Non-Motorised User
NRW	Natural Resources Wales
NSR	Noise Sensitive Receptor
NWC	North Wales Coast
OEMP	Outline Environmental Management Plan
PAS 2080	Publicly Available Standard 2080
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 microns
PRoW	Public Rights of Way
RIGS	Regionally Important Geological Site
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SWMP	Site Waste Management Plan
TAN	Technical Advice Note
TS	Transport Statement
UKCP18	United Kingdom Climate Projections 2018
WFD	Water Framework Directive
WG	Welsh Government
WIA	Wider Impact Area
ZOI	Zone of Influence
ZTV	Zone of theoretical Visibility

A. Supporting Drawings

Location Map



Key to Symbols

Red line boundary

Notes

1. For information only, not for construction.
2. Contains OS data © Crown Copyright and database right 2020
Contains data from OS Zoomstack, Maxar, Microsoft

Rev	Date	Drawn	Description	Ch'k'd	App'd
P02	18/01/21	SA	Secondary issue	NS	NP
P01	27/11/20	SA	Preliminary issue	CL	NMP

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Client

sir ddinbych denbighshire County Council / Cyngor

Balfour Beatty

Title
Central Rhyl Coastal Defences
Red Line Boundary

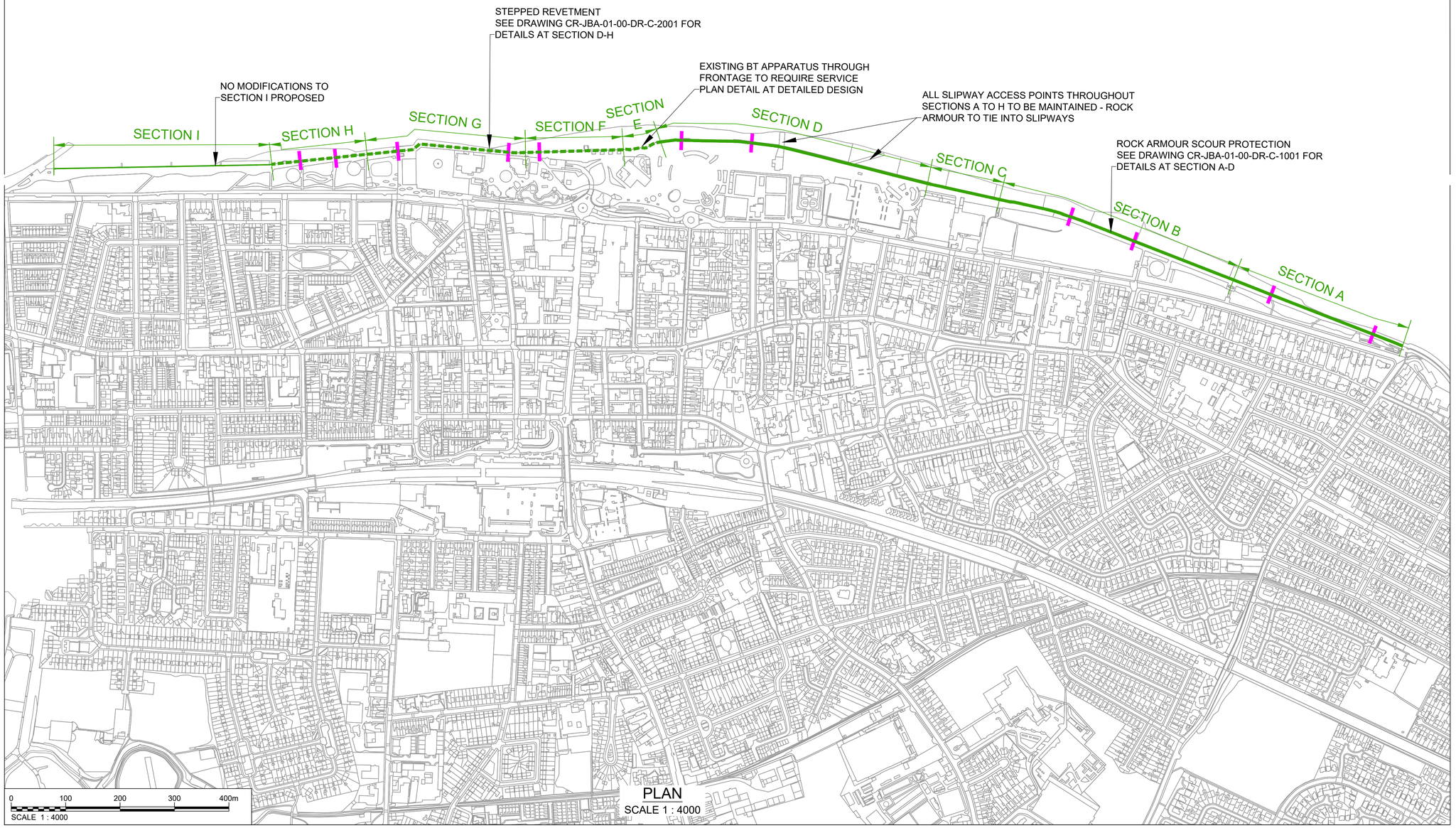
Designed	N Spofforth	NS	Eng. Check	N Spofforth	NS
Drawn	S Anstice	SA	Coordination	N Spofforth	NS
GIS Check	K Bell	KB	Approved	N Price	NP

Scale at A3	Status	Rev	Security
1:8,000	S4	P02	STD

Drawing Number
CR-MMD-00-00-DR-EN-3006

0 100 200 300 400 500 Meters

C:\Users\ANS90589\Mott MacDonald\420823 Central Rhyl Coastal Defence - GIS\MXD\Central Rhyl Costal Defence - RLB\Central Rhyl Costal Defence - RLB.aprx



PLAN
SCALE 1 : 4000

- Medium UXO risk
- Unknown ground conditions
- Working in tidal conditions
- Working at height
- Lifting operations
- Excavations in soft beach material

Construction Risks

- Plant movement on beach and promenade
- Disturbance to public by plant noise

Public Risks

- Debris and dust from construction work
- Plant working in tidal area
- Pollution hazards

Environmental Risks

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.
It is assumed that all works detailed on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

General Notes

1. All dimensions shown are in millimetres unless otherwise stated and levels are in metres to Ordnance Datum.
2. Do not scale from this drawing. All dimensions must be checked/verified at detailed design and on site.
3. All levels quoted have been taken from beach profiles surveyed in October 2009, as supplied by Denbighshire County Council
4. All works on the coast will be carried out with care to minimise the risk of pollution adhering to Pollution Prevention Guidelines.
5. All works affecting flood defences, main watercourses and/or ordinary watercourses will be subject to Consent for Permanent and Temporary Works under the Land Drainage Act 1991.
6. Provision of additional lifesaving equipment may be required.
7. Setback flood gates may be required at sections D-H.
8. Landward access to the promenade to be maintained at sections D-H.
9. Options S1 and S2 drawings should be consulted for full details for this option.

Key

- Rock armour scour protection (length: 1200m)
- Stepped revetment (length: 955m)
- Stepped extension to maintain access between promenade and beach

Rev.:	Comments	Date	Drawn	Designed	Checked	Approved

Client Approval

- A - Approved
- B - Approved with Revisions
- C - Do Not Use

Purpose of Issue	Status
For information	S0

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CENTRAL RHYL OUTLINE BUSINESS CASE

SHORTLIST OPTION 3 - CONCEPT DESIGN
COMBINED OPTION (S1 & S2)
GENERAL ARRANGEMENT AND TYPICAL SECTIONS

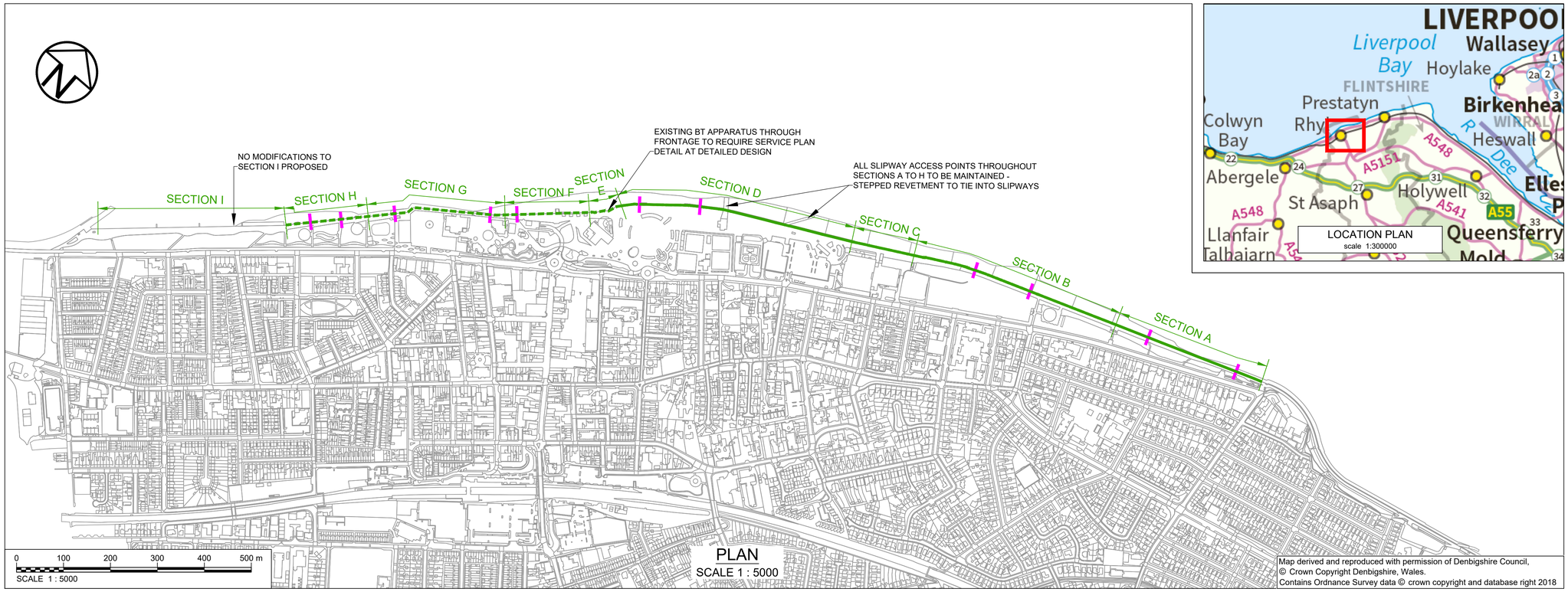
for

Cyngor sir ddinbych denbighshire County Council
Balfour Beatty

Scale:			
As shown @ A1	Drawn:	R.Groves	16/04/19
	Designed:	A. Wright	16/04/19
	Checked:	A. Dane	16/04/19
	Approved:	G. Kenn	16/04/19

Digital File Name: CR-JBA-01-00-DR-C-3001-S3_GA

Drawing Number:	Revision
CR-JBA-01-00-DR-C-3001	P01

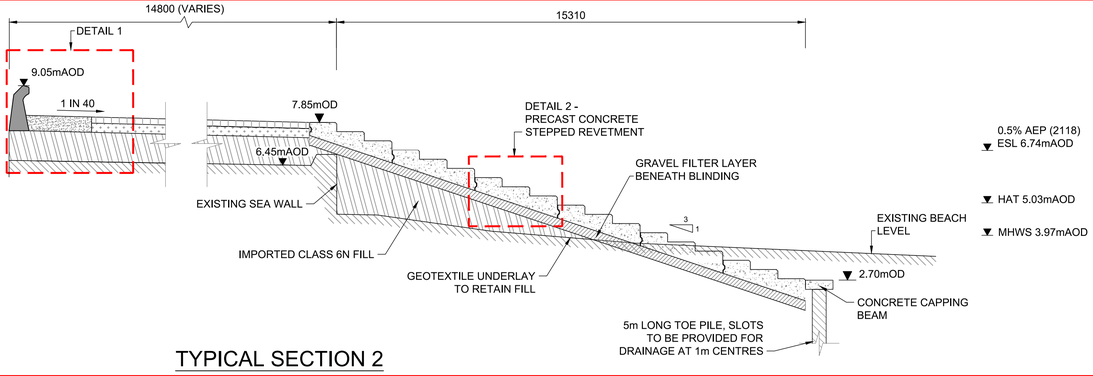


PLAN
SCALE 1 : 5000

Map derived and reproduced with permission of Denbighshire Council, © Crown Copyright Denbigshire, Wales. Contains Ordnance Survey data © crown copyright and database right 2018

Section 1 blocked out as it does not form part of the Preferred Option for the Scheme

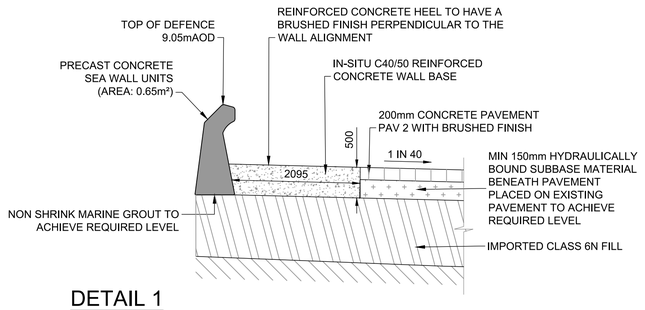
(Annotation box added by Mott MacDonald Ltd, 2021 for clarity as part of the EIA Screening and Scoping Report)



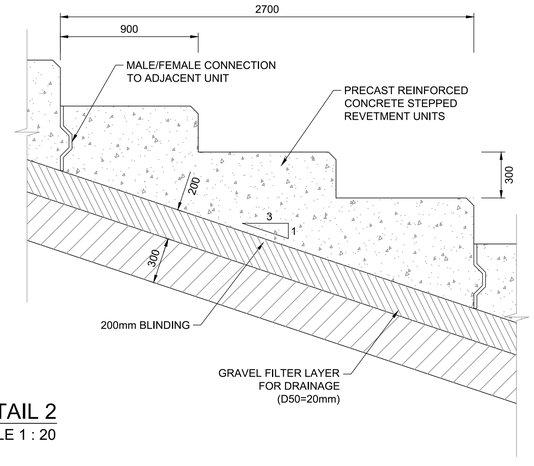
TYPICAL SECTION 2

Typical Section 2 - For the Preferred Option this applies only to Section E to H

(Annotation box added by Mott MacDonald Ltd, 2021 for clarity as part of the EIA Screening and Scoping Report)



DETAIL 1
SCALE 1 : 50



DETAIL 2
SCALE 1 : 20

- Medium UXO risk
- Unknown ground conditions
- Working in tidal conditions
- Working at height
- Lifting operations
- Excavations in soft beach material

Construction Risks

- Plant movement on beach and promenade
- Disturbance to public by plant noise

Public Risks

- Debris and dust from construction work
- Plant working in tidal area
- Pollution hazards

Environmental Risks

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.
It is assumed that all works detailed on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

General Notes

1. All dimensions shown are in millimetres unless otherwise stated and levels are in metres to Ordnance Datum.
2. Do not scale from this drawing. All dimensions must be checked/verified at detailed design and on site.
3. All levels quoted have been taken from beach profiles surveyed in October 2009, as supplied by Denbighshire County Council
4. All works on the coast will be carried out with care to minimise the risk of pollution adhering to Pollution Prevention Guidelines.
5. All works affecting flood defences, main watercourses and/or ordinary watercourses will be subject to Consent for Permanent and Temporary Works under the Land Drainage Act 1991.
6. Provision of additional lifesaving equipment may be required.
7. Setback flood gates may be required.
8. Landward access to the promenade to be maintained.
9. Levels presented in the typical sections account for settlement and consolidation.

Key

- Proposed frontage modifications (Typical section 1)
- Proposed frontage modifications (Typical section 2)
- Stepped extension to maintain access between promenade and beach

Rev.:	Comments	Date	Drawn	Designed	Checked	Approved
P02	Updated to reflect Balfour Beatty comments	26/03/19	RG	AW	AD	GK

Client Approval

- A - Approved
- B - Approved with Revisions
- C - Do Not Use

Purpose of Issue	Status
For information	S0

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CENTRAL RHYL OUTLINE BUSINESS CASE

SHORTLIST OPTION 2 - CONCEPT DESIGN
STEPPED REVETMENT
GENERAL ARRANGEMENT AND TYPICAL SECTIONS

for

Cyngor sir ddinbych denbighshire County Council

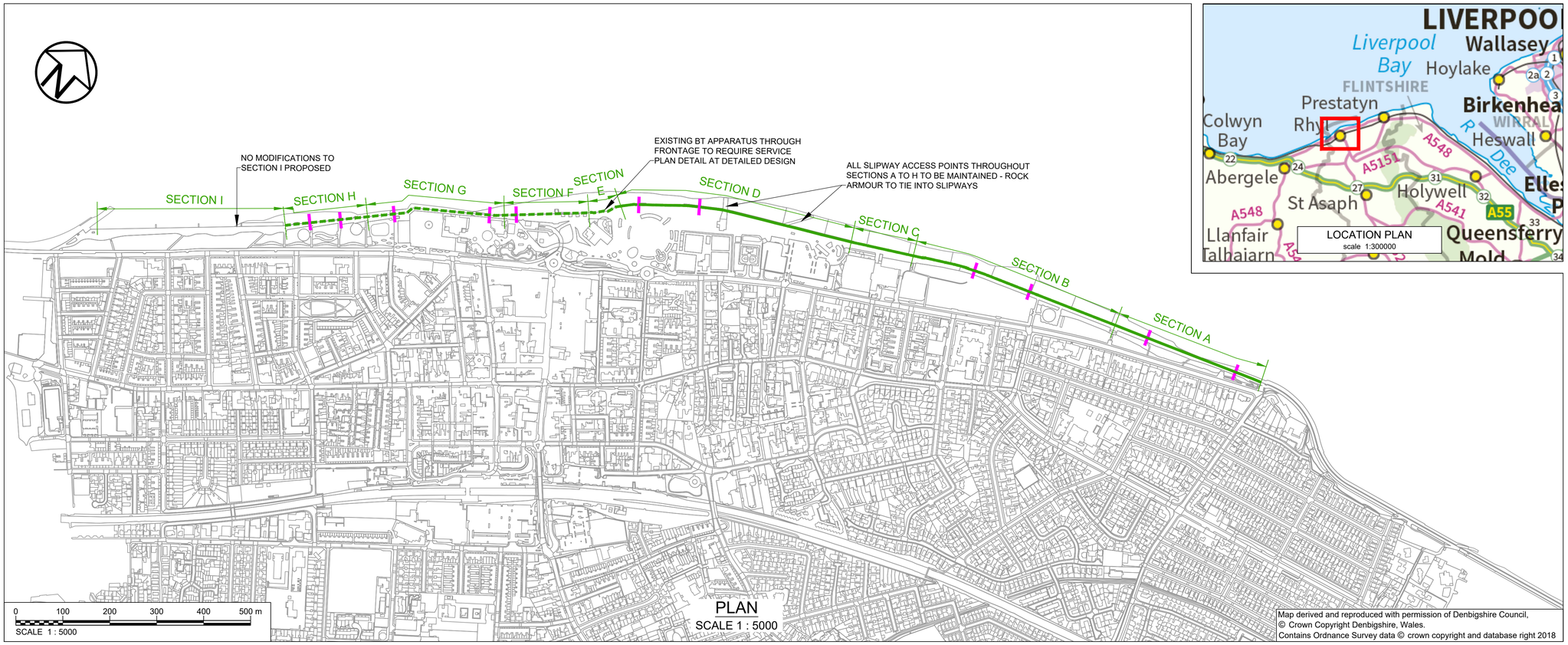
Balfour Beatty

Scale:			
As shown @ A1	Drawn:	R.Groves	20/02/19
	Designed:	A. Wright	20/02/19
	Checked:	A. Dane	27/02/19
	Approved:	G. Kenn	27/02/19

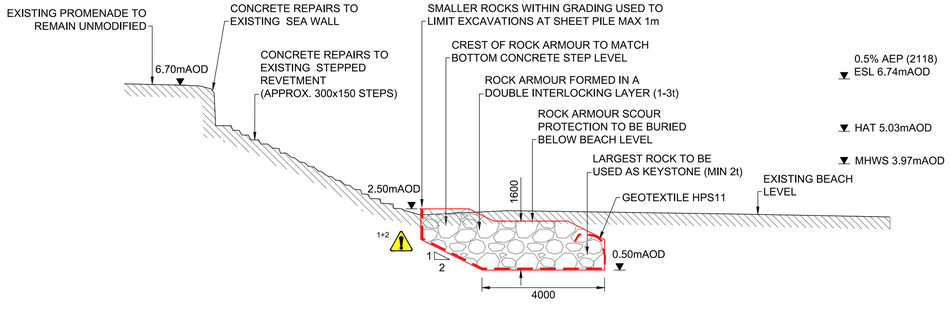
Digital File Name: CR-JBA-01-00-DR-C-2001-S2_GA_and_Sections

Drawing Number: CR-JBA-01-00-DR-C-2001

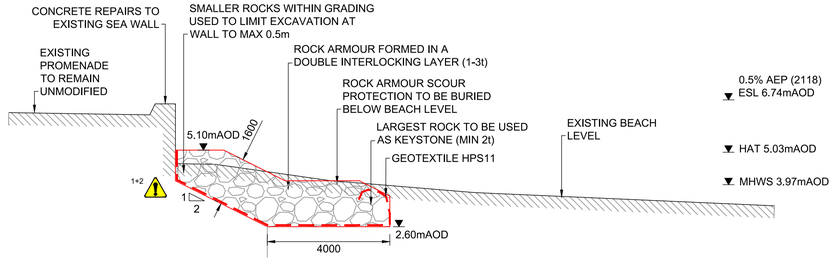
Revision: P02



PLAN
SCALE 1 : 5000



TYPICAL SECTION 1
(APPLICABLE TO SECTIONS A AND D; TOTAL LENGTH: 840m)
SCALE 1 : 100



TYPICAL SECTION 2

Typical Section 2 - For the Preferred Option this applies only to Sections B and C

(Annotation box added by Mott MacDonald Ltd, 2021 for clarity as part of the EIA Screening and Scoping Report)

Construction Risks	Public Risks	Environmental Risks
• Medium UXO risk • Unknown foundation depth of existing structures • Unknown ground conditions • Working in tidal conditions • Working at height • Lifting operations • Excavations in soft beach material	• Plant movement on beach and promenade • Disturbance to public by plant noise	• Debris and dust from construction work • Pollution hazards

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.
It is assumed that all works detailed on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

General Notes

1. All dimensions shown are in millimetres unless otherwise stated and levels are in metres to Ordnance Datum.
2. Do not scale from this drawing. All dimensions must be checked/verified at detailed design and on site.
3. All levels quoted on drawings were taken from beach profiles surveyed in October 2009, as supplied by Denbighshire County Council.
4. All works on the coast will be carried out with care to minimise the risk of pollution adhering to Pollution Prevention Guidelines.
5. All works affecting flood defences, main watercourses and/or ordinary watercourses will be subject to Consent for Permanent and Temporary Works under the Land Drainage Act 1991.
6. Provision of additional lifesaving equipment may be required.

Key

- Proposed frontage modifications (Typical section 1)
- Proposed frontage modifications (Typical section 2)
- Allowance for stepped access between promenade and beach as extension through proposed rock armour
- 1 Foundation depth unknown
- 2 Destabilisation of existing structure

Rev.:	Date		Drawn		Designed		Checked		Approved	
	Comments									
Rev.:	Date		Drawn		Designed		Checked		Approved	
	Comments									
Rev.:	Date		Drawn		Designed		Checked		Approved	
	Comments									
Rev.:	Date		Drawn		Designed		Checked		Approved	
	Comments									
P02	Updated to reflect Balfour Beatty comments									
Rev.:	Date	26/03/19	Drawn	RG	Designed	AW	Checked	AD	Approved	GK

Client Approval

- A - Approved
- B - Approved with Revisions
- C - Do Not Use

Purpose of Issue	Status
For information	S0

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CENTRAL RHYL OUTLINE BUSINESS CASE

SHORTLIST OPTION 1 - CONCEPT DESIGN
ROCK ARMOUR SCOUR PROTECTION
AND CONCRETE REPAIRS
GENERAL ARRANGEMENT AND TYPICAL SECTIONS
for

Cyngor sir ddinbych denbighshire County Council
Balfour Beatty

Scale:		
As shown @ A1	Drawn: R.Groves	26/02/19
	Designed: A. Wright	26/02/19
	Checked: A. Dane	27/02/19
	Approved: G. Kenn	27/02/19

Digital File Name: CR-JBA-01-00-DR-C-1001-S1_GA_and_Sections

Drawing Number:	Revision
CR-JBA-01-00-DR-C-1001	P02

B. Environmental Discipline EIA Methodologies

B.1 Air Quality

Air Quality has been scoped out of the ES, however a Construction Dust Risk Assessment is required. The methodology for this is detailed below.

B.1.1 Establishing Baseline

No air quality surveys are required for this Scheme, as sufficient local authority monitoring data is available to provide a robust baseline.

B.1.2 Construction Dust Risk Assessment

The dust risk assessment would be carried out in accordance with the Institute of Air Quality Management (IAQM) guidance[5].

The IAQM guidance recommends splitting the construction activities into four separate source categories and determining the dust risk associated with each of these individually. This assessment has determined the risk of each of the following source categories:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (the transport of dust and dirt onto the public road network).

The risk of each source for dust effects is described as 'negligible', 'low risk', 'medium risk' or 'high risk' depending on the nature and scale of the construction activities and the proximity of sensitive receptors to the construction activities or site boundary. The assessment is used to identify appropriate mitigation measures proportional to the level of risk, to reduce the effects such that they are not significant.

The assessment considers three separate effects from dust:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to an increase in exposure to PM_{10}.

Step 1 of the assessment applies screening criteria to the Scheme which states that an assessment would normally be required where there is:

- A ’human receptor’ within:
  - 350m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- An ‘ecological receptor’ within:
  - 50m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

No further assessment is required if there are no receptors within the defined boundaries.

B.1.3 Residual Effects

It is assumed that construction activities would be mitigated through a CEMP. Mitigation would minimise potential adverse impacts and are expected to result an effect that is ‘not significant’.

B.2 Archaeology and Cultural Heritage

B.2.1 Methodology Overview

The methodology for assessing the archaeology and cultural heritage would be undertaken in line with DMRB, LA106 Cultural heritage assessment guidance (published January 2020). According to DMRB, significance of effect upon the historic environment resource is assessed according to the value of the heritage asset and the magnitude of change. The effects may be either adverse or beneficial. The proposed assessment criteria are set out in Table B.1, Table B.2 and Table B.3.

B.2.2 Methodology Overview

B.2.3 Establishing Baseline

The baseline scenario shall define the existing designated and undesignated cultural heritage resource Chartered Institute for Archaeologists (CIfA) desk-based assessment[147]. Where desk-based studies suggest that available information is inadequate for the purpose of the assessment, field surveys shall be undertaken to enhance the data, in accordance with CIfA standards and guidance[148]. In order to enhance the baseline, an archaeological deposit model will be developed utilising the geotechnical investigation results.

In addition to national registers and local cultural heritage records, historical maps and aerial photographs, relevant books, journals, previous reports, LiDAR and geotechnical data may be consulted.

B.2.4 Assessment of Significance of Effects

B.2.4.1 Criteria for Determining Value/Sensitivity

Assigning value (sensitivity), magnitude of impact and significance of effect and reporting the significant effects of a project on cultural heritage resource and its settings shall follow the requirements in LA 104 Environmental assessment and monitoring[149].

The value and sensitivity of historic environment receptors would be based on Table B.1 below. Assessment of importance is based on a combination of designated status and professional judgement. It takes into account the Secretary of State's non-statutory criteria for the scheduling of ancient monuments; assessment criteria adopted by English Heritage as part of its Monuments Protection Programme and the Secretary of State's Principles of Selection Criteria for Listed Buildings.

It is also recognised that occasionally sites can have a lower or higher than normal sensitivity within a local context. The assessment of sensitivity therefore needs to take into account the component of the site that is being affected and the ability of the site to absorb change without compromising the understanding or appreciation of the resource.

[147] See CPAT (2018) which was produced in line with CIfA 2017, Standard and guidance for historic environment desk-based assessment [Online] Available at: https://www.archaeologists.net/sites/default/files/CIfAS%26GDBA_4.pdf Accessed November 2020

[148] Chartered institute for Archaeologists [Online] Available at: https://www.archaeologists.net/codes/cifa Accessed November 2020

[149] Highways England (2020) Design Manual for Roads and Bridges (DMRB), LA 104 Environmental Assessment and Monitoring, Revision 1

Table B.1: Value of Historic Environment Asset

Value	Asset
Very High	World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.
High	Assets that can contribute significantly to national research objectives. Scheduled monuments, undesignated assets of schedulable quality, Grade I or II* listed building, other listed buildings that can be shown to have exceptional qualities, Conservation Areas containing very important buildings, and undesignated structures of clear national importance. Designated or undesignated landscapes of outstanding interest, high quality and importance of demonstrable national value, exhibiting considerable coherence, time-depth or other critical factors
Medium	Designated or undesignated assets that contribute to regional research objectives. Grade II Listed Buildings, undesignated historic buildings of exceptional qualities in their fabric or historical associations, Conservation areas containing buildings that contribute significantly to its historic character, historic townscapes or built-up areas with important historic integrity in their buildings or built setting. Designated special historic landscapes, undesignated historic landscapes that could justify special historic landscape designation. Landscapes of regional value, averagely well preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s).
Low	Designated and undesignated assets important to local interest groups, limited by poor preservation or poor contextual association. Assets of limited value but with the potential to contribute to local research agendas. Locally listed buildings, unlisted historic buildings of modest quality in their fabric or historical association, historic townscapes of limited historic integrity in their buildings, or built settings.
Negligible	The importance of the resource has not been ascertained. Buildings with some hidden potential for historic significance.

Source: DMRB Volume 11, Section 3, Part 2 (HA 208/07) 'Cultural Heritage' and LA 104 Environmental Assessment and monitoring (2020)

B.2.4.2 Criteria for Determining Magnitude of Effect

The degree of impact to the asset from the introduction of the project would be assessed in accordance with Table B.2.

Table B.2: Magnitude of Impact

Magnitude of Impact (Change)	Description of Change
Major	Change to most or all key archaeological materials, or historic building elements, such that resource is totally altered. Comprehensive changes to setting. Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.
Moderate	Changes to many key archaeological materials, or historic building elements, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset. Changes to the setting of an historic building, such that it is significantly modified. Changes to many key historic landscape elements, parcels or components; visual change to many key aspects of the historic

Magnitude of Impact (Change)	Description of Change
	landscape, noticeable differences in noise or sound quality; considerable changes to use or access; resulting in moderate change to historic landscape character unit.
Minor	Changes to key archaeological materials, or historic building elements, such that the asset is slightly altered. Slight changes to setting. Changes to the setting of an historic building, such that it is noticeably changed. Changes to few key historic landscape elements, parcels or components; slight visual changes to few key aspects of the historic landscape; limited change of noise levels or sound quality; slight changes to use or access; resulting in limited changes to historic landscape character unit.
Negligible	Very minor changes to archaeological materials or setting. Slight changes to historic building elements or setting that hardly affect it. Very minor changes to key historic landscape elements, parcels or components; virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character unit.
No change	No change to the heritage asset.

Source: DMRB Volume 11, Section 3, Part 2 (HA 208/07) 'Cultural Heritage' and LA 104 Environmental Assessment and monitoring (2020)

B.2.4.3 Significance of Effect Matrix

Effects would be evaluated by combining the assessment of magnitude and sensitivity in Table B.1 and Table B.2 to predict the significance of effect. These effects can be beneficial or adverse and temporary or permanent.

Table B.3: Significance of Effect Matrix

		Magnitude of Change				
		No Change	Negligible	Minor	Moderate	Major
Heritage Value	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Source: DMRB Volume 11, Section 3, Part 2 (HA 208/07) 'Cultural Heritage' and LA 104 Environmental Assessment and monitoring (2020)

Effects would be identified as neutral, slight, moderate, large or very large; adverse or beneficial.

For the purposes of this assessment, effects of Moderate (Adverse or Beneficial) and above would be considered to be significant.

B.3 Biodiversity

B.3.1 Methodology Overview

The biodiversity Chapter and supporting assessment would be undertaken in line with industry guidance set out within the Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland – 2nd edition.

B.3.2 Establishing Baseline

The baseline data would be gathered from a series of desktop studies and field surveys as follows:

- Desktop study (including sourcing records from North Wales Environmental Information Service; Cofnod) (2019);
- Phase 1 Habitat Survey (June 2018, JBA);
- Intertidal and Biotope Survey (November 2020, Apem);
- Bat Assessment of Buildings and structures (JBA, November 2018); and
- Overwintering bird surveys (December 2019 – February 2020 and September 2020 – April 2021).

In addition, the information outlined in Chapter 9.7 would also be required.

B.3.3 Assessment of Significance of Effects

B.3.3.1 Criteria for Determining Value/Sensitivity

The criteria for determining the value and sensitivity of ecological receptors would be undertaken in line with DMRB guidance (2019) LA108150 (as this is a linear scheme with highway elements) and with reference to CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland–2nd edition[151] as set out within Table B.4.

Table B.4: Criteria for Determining Value/Sensitivity of Receptor

Biodiversity Resource Importance	Description
International	Very high importance and rarity, international scale and very limited potential for substitution. Examples of this include: • Internationally designated sites (SACs, SPAs, Ramsar sites, etc); • Sites proposed for international designation (cSACs or pSACs); • Biogenetic Reserves, World Heritage Sites (where recognised specifically for their biodiversity value) and Biosphere Reserves; • Undesignated sites which meet the published selection criteria for international designation; • Resident or regularly occurring populations of species which can be considered at an international level where: (i) the loss of these populations would adversely affect the conservation status or distribution of the species at an international scale; (ii) the population forms a critical part of a wider population at this scale; or

[150] Highways England (2020) DMRB. LA108 Biodiversity Revision 1 (Formerly Volume 11 Section 3 Part 4)

[151] Chartered Institute of Ecology and Environmental Management (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland–2nd edition [Online] Available at: Guidelines for Ecological Impact Assessment (EcIA) | CIEEM Accessed November 2020

Biodiversity Resource Importance	Description
	(iii) the species is at a critical phase of its life cycle at an international scale.
UK or National	High importance and rarity, national scale, and limited potential for substitution. Examples of this include: • National designated sites (SSSIs, NNRs, National Parks, Marine Protection Areas (MPAs) or Marine Conservation Zones (MCZs); • Undesignated sites which meet the published selection criteria for national designation; • UK BAP priority habitats or those listed in the relevant statutory list of priority species and habitats (i.e. Section 7 of the Environment (Wales) Act 2016); • Areas of irreplaceable habitats (including ancient woodland, ancient or veteran trees, blanket bog, limestone pavement, sand dunes, salt marsh and lowland fen); • Undesignated habitats which meet the definition of the above habitats; • Resident or regularly occurring populations of species which can be considered at an international, UK or national level where: (i) the loss of these populations would adversely affect the conservation status or distribution of the species at a national scale; (ii) the population forms a critical part of a wider population at this scale; or (iii) the species is at a critical phase of its life cycle at a national scale.
Regional	High or medium importance and rarity, regional scale, limited potential for substitution. Examples of this include: • Regionally important non-statutory designated sites (including heritage coasts); • Areas of habitats identified (including for restoration) in regional plans or strategies; • Resident or regularly occurring populations of species which can be considered at an international, UK or national level where: (i) the loss of these populations would adversely affect the conservation status or distribution of the species at a regional scale; (ii) the population forms a critical part of a wider population at this scale; or (iii) the species is at a critical phase of its life cycle at a regional scale. • Species identified in regional plans or strategies.
County	Low or medium importance and rarity, county or other unitary authority (i.e. borough or district) scale. Examples of this include: • Statutory and non-statutory wildlife or nature conservation sites designated at a county (or equivalent) level (including Local Wildlife Sites (LWSs), Local Nature Conservation Sites (LNCSs), Local Nature Reserves (LNRs), Sites of Importance for Nature Conservation (SINCs), Sites of Nature Conservation Importance (SNCIs) and County Wildlife Sites (CWSs)); • Areas of habitats identified in county or equivalent authority plans or strategies (such as local Biodiversity Action Plans); • Resident or regularly occurring populations of species which can be considered at an international, UK or national level where: (i) the loss of these populations would adversely affect the conservation status or distribution of the species at a county (or equivalent) scale; (ii) the population forms a critical part of a wider population at this scale; or (iii) the species is at a critical phase of its life cycle at a county (or equivalent) scale.
Local	Low importance and rarity, local scale. Examples of this include: • Local level designated sites (including all of those listed above for county level);

Biodiversity Resource Importance	Description
	• Areas of habitat considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal or genetic exchange; or • Populations / communities of species considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal or genetic exchange.
Less than local	This level of importance is not specifically included in the DMRB guidance but represents common and/or widespread habitats or species considered of value at the site level only. Loss of these features is unlikely to affect the local population status or conservation significance.

Source: Summarised and adapted from DMRB (2019) LA108 Table 3.9

B.3.3.2 Criteria for Determining Magnitude of Effect

The magnitude of impact is determined by the predicted deviation from the baseline conditions and the scale of the effect. In line with CIEEM (2018) guidance, this takes into account: extent; magnitude; duration; frequency and timing; and reversibility of effects. A distinction is also recognised between:

- Habitats – where effects on extent, structure and function of the habitat, as well as distribution and species composition, need to be considered; and
- Species – where effects on abundance and distribution of that species need to be considered.

Taking the above into consideration, the criteria for determining magnitude of impact (or level of effect) would be undertaken in line with DMRB (2019) LA108 and is summarised in Table B.5.

Table B.5: Criteria for Determining Magnitude of Effect

Magnitude (or Level) of Impact	Typical Description
Major	• Permanent / irreversible damage or improvement to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact negatively / positively affects the integrity or key characteristics of the resource.
Moderate	• Temporary / reversible damage or improvement to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact negatively / positively affects the integrity or key characteristics of the resource.
Minor	• Permanent / irreversible damage or improvement to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
Negligible	• Temporary / reversible damage or improvement to a biodiversity resource; and • The extent, magnitude, frequency, and / or timing of an impact does not affect the integrity or key characteristics of the resource.
No change	• No observable impact, either positive or negative

Source: Adapted from DMRB (2019) LA108

B.3.3.3 Significance of Effect Matrix

Based on Table B.4 and Table B.5, using the combination of conservation value of the receptor and the magnitude of change along with professional judgment, the significance of the effect

upon nature conservation features as a result of the Scheme would be identified and assessed using the matrix in Table B.6 along with professional judgment.

Table B.6: Significance of Effect Matrix

Resource Importance	Level of Impact				
	No Change	**Negligible**	**Minor**	**Moderate**	**Major**
International Importance	Neutral	Slight	Moderate or large	Large or very large	Very large
UK or National Importance	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
Regional Importance	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
County or equivalent authority Importance	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
Local Importance	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight
Less than Local Importance	Scoped out of assessment (neutral for all levels)				

Source: Adapted from DMRB (2019) LA108

Effects would be identified as neutral, slight, moderate, large or very large; adverse or beneficial.

For the purposes of this assessment, effects of Moderate (Adverse or Beneficial) and above would be considered to be significant.

B.4 Climate

B.4.1 Methodology Overview

B.4.1.1 Effects on Climate Change

The assessment of the effects of the Scheme on climate would include an assessment of the greenhouse gases (GHGs)[152] emitted during construction (embodied carbon of construction materials, plant emissions, and emissions from transport of materials to site), and operational (energy required for operation, and maintenance and repair emissions) over the lifecycle of the Scheme.

B.4.1.2 Resilience of the Scheme to Climate Change

The resilience of the Scheme to climate change has been scoped out of the assessment due to the short construction period and as the potential significant risks through operation have been mitigated against within the design of the Scheme. This includes the construction stage, operation stage and any in-combination climate resilience effects.

B.4.2 Establishing Baseline

A GHG assessment at the earliest stage of design where suitable information is available would be undertaken informing the baseline. It is expected that the GHG footprint calculated for the ES would form the baseline for the future design stages. Any quantifiable reductions identified through design would then be used to inform further footprints in the absence of complete materials information.

B.4.3 Assessment of Significance of Effects

B.4.3.1 Criteria for Determining Value/Sensitivity

Effects on climate do not have specified receptors and therefore there are no criteria for determining the value or sensitivity of the receptor.

B.4.3.2 Criteria for Determining Magnitude of Effect

There is at present no single accepted criteria for determining magnitude of effect of GHGs on climate change.

B.4.3.3 Significance of Effect Matrix

There is at present no single accepted criteria for determining the significance of GHGs on climate change. It is deemed that any emissions should be considered significant[153], especially due to the UK's Net Zero targets, and reduced wherever possible. An assessment of project GHG emissions against Welsh government carbon budgets, sector carbon emissions and regional carbon emissions would be undertaken to contextualise the significance of the Scheme's emissions.

[152] A greenhouse gas is a gas that absorbs and emits radiant energy within the thermal infrared range. Greenhouse gases cause the greenhouse effect. The primary greenhouse gases in Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide and ozone.

[153] IEMA (2017) Environmental Impact Assessment Guide to : Assessing Greenhouse Gas Emissions and Evaluating their Significance [online] available at: https://www.iema.net/assets/uploads/EIA%20Guide_GHG%20Assessment%20and%20Significance_IEMA_16May17.pdf accessed November 2020

B.5 Coastal Processes (including Flood Risk and WFD Elements)

B.5.1 Methodology Overview

The assessment approach for this linear Scheme would be adapted from the guidance presented within DMRB LA104[154] and LA113[155] using professional judgment.

The assessment would also utilise NRW guidance notes for Marine Physical Processes Guidance to inform EIA[156] and the guidance for assessing activities and projects for compliance with the Water Framework Directive[157]. These guidance documents have been considered when reviewing the available data for the baseline and any impacts the Scheme may have.

B.5.2 Establishing Baseline

Modelling that has been undertaken to date would be utilised to support the EIA baseline development. In addition, a new MIKE21 SW model has been developed to review the wave conditions along the frontage along with a 1D sediment transport model. The sediment transport model would be used to support the baseline and also assess the impact of the Scheme on the local coastal processes.

The water quality baseline would be established through a detailed review of online data sources including WFD Water Body status information and Bathing Water quality data.

B.5.3 Assessment of Significance of Effects

B.5.3.1 Criteria for Determining Value/Sensitivity

The criteria for determining the sensitivity (value) of receptors that could be impacted by changes to coastal processes and flood risk is presented in Table B.7.

Table B.7: Scale for Evaluating the Sensitivity (Value) of Receptors

Receptor Value (Sensitivity)	Coastal Processes and WFD Quality Elements Typical Examples	Description: Flood Risk Receptors Typical Examples
Very High (very high importance and rarity, international scale and very limited potential for substitution).	• Site protected/designated under UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by UK legislation. • Watercourse having a WFD classification shown in a RBMP and Q95 $\geq$ 1.0 m^3/s. • Large scale wider than the SMP cell changes to coastal processes	• Essential infrastructure or highly vulnerable development: – Essential transport infrastructure which has to cross the area at risk and utility infrastructure which has to be located within the flood risk area for operational reasons. – Police, ambulance and fire stations required to operate during flooding.
High (high importance and rarity, national scale,	• Species protected under UK legislation. • UK Bathing Waters. • UK Shellfish Waters.	• More vulnerable development including: – Hospitals.

[154] Highways England (2019) Design Manual for Roads and Bridges (DMRB) Volume 11 Section 2 Part 4 LA 104, Environmental Assessment and Monitoring (Formerly HD 45/09)

[155] Highways England (2020) Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 11 LA 113, Road Drainage and the Water Environment (Formerly HD 45/09)

[156] Natural Resources Wales (2020) GN041, Marine Physical Processes Guidance to inform Environmental Impact Assessment (EIA)

[157] Natural Resources Wales (2018) OGN72, Guidance for assessing activities and projects for compliance with the Water Framework Directive

Receptor Value (Sensitivity)	Coastal Processes and WFD Quality Elements Typical Examples	Description: Flood Risk Receptors Typical Examples
and limited potential for substitution)	• Watercourse having a WFD classification shown in a RBMP and Q95<1.0m^3/s. • Large scale SMP cell changes to coastal processes.	– Residential institutions such as care homes. – Non-residential uses for health services and nurseries.
Medium (medium or high importance and rarity, regional scale, limited potential for substitution).	• Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001m^3/s. • Changes to the coastal processes in the sub cell.	Less vulnerable development including: – Buildings for shops, financial and other services. – Land and buildings used for agriculture and forestry.
Low (low or medium importance and rarity, local scale).	• Watercourses not having a WFD classification shown in a RBMP and Q95 ≤ 0.001m^3/s. • Localised changes to the coastal processes.	Water compatible development including: – Flood control infrastructure. – Sand and gravel working. – Docks, marinas and wharves.
Negligible	Very low importance and rarity, local scale.	

Source: Adapted from DMRB Volume 11 Guidance

B.5.3.2 Criteria for Determining Magnitude of Effect

The magnitude of impact would be determined by the predicted deviation from the baseline conditions and the scale of the effect. The qualitative magnitude of each impact (in the absence of quantitative data) would be determined according to the descriptions provided within Table B.8.

Table B.8: Scale for Evaluating the Magnitude with respect to Effects on Coastal Processes and Flood Risk

Magnitude of Impact	Typical Description	Coastal Processes/WFD Quality Element Typical Examples	Flood Risk Typical Examples
Major	Adverse: Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.	• Loss or extensive permanent change to a designated nature conservation site. • Long term (>2 years) changes to beach erosion/sediment dispersion patterns. • Loss or extensive change to a fishery. • Reduction in water body WFD classification.	• Increase flood levels by >100mm. • Increase of overtopping rates to cause structural failure to sea wall and assets behind.
	Beneficial: Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.	• Improvement in water body WFD classification.	• Decrease in flood levels >100mm. • Decrease of overtopping rates to result in significant improvement to structural resilience and improvement in utility.

Magnitude of Impact	Typical Description	Coastal Processes/WFD Quality Element Typical Examples	Flood Risk Typical Examples
Moderate	Adverse: Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.	• Permanent change to a designated nature conservation site. • Medium term (6 months to 2 years) changes to beach erosion/sediment dispersion patterns. • Partial loss in productivity of a fishery. • Contribution to reduction in water body WFD classification.	• Increase flood levels by >50mm. • Increase of overtopping rates to cause damage to pavements but no collapse of the structure (sea wall) – controlled and repairable damage.
	Beneficial: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.	• Contribution to improvement in water body WFD classification.	• Decrease in flood levels >50mm • Decrease of overtopping rates to reduce damage to pavements but no collapse of the structure (sea wall) – controlled and repairable damage.
Minor	Adverse: Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.	• Non-permanent change to a designated nature conservation site. • Short term (3 – 6 months) changes to beach erosion / baseline sediment dispersion. • Decrease in quality of non-WFD water body.	• Increase flood levels by >10mm. • Increasing overtopping rates to result in loss of utility.
	Beneficial: Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.	• Contribution to improvement in non WFD water body classification.	• Decrease in flood levels >10mm. • Decrease of overtopping rates to prevent structural failure to sea wall and assets behind but no significant increase to utility.
Negligible	Adverse: Very minor loss or detrimental alteration to one or more characteristics, features or elements.		
	Beneficial: Very minor benefit to or positive addition of one or more characteristics, features or elements.		
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.		

Source: Adapted from DMRB Volume 11 Guidance

B.5.3.3 Significance of Effect Matrix

Subsequent to identifying an appropriate receptor sensitivity and magnitude of impact using Table B.7 and Table B.8, the likely significance category and overall significance of effects risk would be assessed by using the matrix provided within Table B.9 along with professional judgment to consider site specific factors that may be of relevance.

Table B.9: Scale for Evaluating the Significance Category with Respect to Impacts on Coastal processes and Flood risk Receptors – Effects can be Adverse or Beneficial

Magnitude of Potential Impact	Environmental Value (Sensitivity)				
	Very high	High	Medium	Low	Negligible
Major	Very large	Large / Very Large	Moderate / Large	Slight / Moderate	Slight
Moderate	Large / Very Large	Moderate / Large	Moderate	Slight	Neutral / Slight
Minor	Moderate / Large	Slight / Moderate	Slight	Neutral / Slight	Neutral / Slight
Negligible	Slight	Slight	Neutral / Slight	Neutral / Slight	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

Source: Adapted from DMRB Volume 11 Section 2 Part 4 (LA104)

Effects would be identified as neutral, slight, moderate, large or very large; adverse or beneficial.

For the purposes of this assessment, effects of Moderate (Adverse or Beneficial) and above would be considered to be significant.

B.6 Landscape and Visual

B.6.1 Methodology Overview

The methodology used for this scoping exercise would be based on the Guidelines for Landscape and Visual Impact Assessment (GLVIA), 3rd Edition: (Landscape Institute and Institute of Environmental Management and Assessment, 2013).

B.6.2 Establishing Baseline

B.6.2.1 Landscape

The landscape baseline study would consider the constituent elements, features and other factors that contribute to existing landscape character within the study area including:

- The physical influences on the landscape resource - including topography, geology, soils, microclimate, water bodies and water courses;
- The influence of human activity – including land use, open space, transport routes, public rights of way, national trails, historic green lanes, land management, the character of settlement and buildings and the pattern and type of fields and enclosure;
- The aesthetic and perceptual aspects of the landscape – including scale, complexity, openness, tranquillity, and wildness; and
- Heritage features – including conservation areas, listed buildings, registered parks and gardens and other elements contributing to historic landscape character.

Key sources of information include OS mapping, aerial photography and published documents on the DCC web site. In accordance with the guidance in GLVIA 3, existing landscape character assessments (including the Natural Resources Wales Landscape Character Assessment) and historic characterisation documents, where appropriate and up to date, would be used to inform the LVIA.

The findings of the desk study would be reviewed in conjunction with the site survey to identify local landscape character areas (LCA). These are broadly homogeneous units of distinct features and elements.

The value of each LCA would be established by considering statutory and non-statutory landscape designations indicating national or local value (such as Areas of Outstanding Natural Beauty) and a range of factors including:

- Landscape condition, quality and intactness;
- Scenic quality;
- Rarity (rare elements, features or landscape character type);
- Representativeness (whether the landscape contains a character, feature or element that is an especially important example of the type);
- Presence of features of conservation interest (ecological, earth science, historical, cultural);
- Recreational value;
- Perceptual aspects of the landscape such as wildness and/or tranquillity; and
- Cultural or historical associations with, for example, writers, artists, historical events.

B.6.2.2 Visual

The baseline study identifies the people in the area and important, designated or protected views potentially affected by the development. Viewpoints would be selected to represent the various visual receptor types in the study area including recreational, transport, active travel and employment receptors. Viewpoints would also be selected to represent specific views valued for their scenic quality or cultural associations or to demonstrate a specific issue. The selection of viewpoints would be based on the extent of the ZTV, the findings of the site survey, a review of planning policy documents and discussion with DCC.

Photographs would be taken to represent the character of the landscape and existing views.

B.6.3 Assessment of Significance of Effects

The assessment would identify the residual effects likely to arise from the development, taking into account mitigation measures and changes over time. The significance of effects would be assessed by considering the sensitivity of the receptor and the predicted magnitude of change in relation to the baseline conditions.

B.6.3.1 Landscape

The sensitivity of the landscape would be evaluated by considering the existing value of the landscape and its susceptibility to the type of change arising from the Scheme. There can be a complex relationship between the value attached to the landscape and its susceptibility to change, especially if the change is within or close to a designated landscape. The evaluation of sensitivity would be based on the criteria set out in Table B.10

Table B.10: Landscape Sensitivity

Landscape Value and Susceptibility to Change	Sensitivity
Designated landscape (such as AONB). Landscape of high scenic quality with a distinctive combination of features, elements and characteristics, outstanding views and a strong sense of place. A scarce or fragile landscape with cultural, historic or ecological elements which make a major contribution to landscape character. No or very few landscape detractors. Has components which are difficult to replace (such as mature trees). A tranquil landscape in good condition, largely intact, with an unspoilt character. A high susceptibility to change due to the type of development proposed. No or very limited potential for substitution or replacement.	High
Landscape locally designated (such as conservation area, regional park) or locally valued (for its recreational facilities and footpath networks for instance). Some scenic quality and a moderate sense of place. A landscape with some distinctive features, elements and characteristics. Some cultural, historic or ecological elements which contribute to landscape character. Some high use areas, but overall medium tranquillity. Few landscape detractors. A landscape in moderate condition, with some unspoilt characteristics and a moderate susceptibility to change due to the type of development proposed. Some potential for substitution or replacement.	Medium
Undesignated landscape, not valued for its scenic quality, with a disparate combination of features, elements and characteristics and a weak sense of place. Mainly common features and few or no cultural, historic or ecological elements that contribute to landscape character. Many landscape detractors. A landscape of low tranquillity, in poor condition and a low susceptibility to change due to the type of development proposed. Good potential for substitution or replacement.	Low

Source: Based on GLVIA 3 (LI and IEMA, 2013)

The magnitude of change to landscape character (Table B.11) would be determined by considering:

- The nature of an impact - whether the introduction of a Scheme would be of benefit or detriment to the existing landscape character;
- The scale of the change - extent of the loss of landscape elements, the degree to which aesthetic features or perceptual aspects of the landscape are altered (by the removal of hedgerows or introduction of new structures for example) and whether a key characteristic of the landscape is altered;
- The geographical extent of the area affected; and
- The duration of the change and its reversibility.

Table B.11: Magnitude of Change to Landscape Character

Magnitude	Criteria
High	Total loss or substantial alteration to key elements/features/characteristics of the LCA and/or its setting. Addition of new elements which conflict with key characteristics of the existing landscape. Changes that alter a substantial proportion the more LCA. Introduction of long-term and/or irreversible changes to an LCA or its setting.
Medium	Partial loss or alteration to key elements/features/characteristics of the LCA and/or its setting. Addition of new elements or features that are prominent in the landscape but which do not necessarily conflict with key characteristics of the existing landscape. Changes that alter part of an LCA or its immediate setting. Introduction of medium to long term and/or irreversible changes to part of an LCA or its setting.
Low	Slight loss or alteration to one or more key characteristics of the LCA and/or its setting. Addition of new elements or features that are largely characteristic of the existing LCA and/or its setting. Introduction of short to medium term changes to the LCA and/or irreversible changes to a small proportion of the LCA.
Negligible	No change to, or barely perceptible loss or alteration to key characteristics of the LCA and its setting. Addition of new elements or features that are characteristic of the existing LCA and/or its setting. Changes experienced close to the Scheme site at a very localised level.

Source: Based on GLVIA 3 (LI and IEMA, 2013)

B.6.3.2 Visual Amenity

The sensitivity of visual receptors would be evaluated by considering the value attached to specific views and the susceptibility of visual receptor to changes to views and visual amenity. The value attached to a view could derive from a planning designation or an association with a heritage asset. The susceptibility to change depends on the occupation or activity of the receptor and the extent to which their attention is focused on the view and visual amenity.

The evaluation of view value and susceptibility to change would be based on the criteria set out in Table B.12 and Table B.13.

Table B.12: Level of View Value

View Value	Criteria for Assessing View Value
High	A view of high scenic value. A view identified as of value on an Ordnance Survey map, tourist map or guidebook, or one recorded in art or literature of national significance. A view where the composition was a fundamental

	aspect of the design or function of a heritage asset and is an integral part of the setting of a heritage asset. A view with cultural associations, including landscapes known historically for their picturesque and landscape beauty, those which became subjects for paintings of the English landscape tradition, and views which have otherwise become historically cherished and protected.
Medium-High	A view of medium to high scenic value. A view identified as of value in a local guidebook. A view where existing adverse elements do not form a clearly apparent part of the view composition of the view. A view that may be recorded in art or literature of regional or local significance. A view where a heritage asset makes a partial contribution to the view. A view where the composition was an important aspect of the design or function of a heritage asset and forms part of the setting of a heritage asset. A view that may be identified in character area appraisals.
Medium	A view of medium scenic value. A view where existing adverse elements may form a noticeable part in the composition of the view. A typical and/or representative view. A view where the composition was a peripheral aspect of the design or function of a heritage asset.
Medium-Low	A view of medium to low scenic value. A view where existing adverse elements form a very noticeable part in the composition of the view.
Low	A view of low scenic value. An undistinguished or unremarkable view and / or a view where existing adverse element form a clearly apparent or dominant part of the view / composition of the view.

Source: Based on GLVIA 3 (LI and IEMA, 2013)

Table B.13: Visual Receptor Susceptibility to Change

Level of Susceptibility	Receptor
High	Occupiers of residential properties orientated towards the development. Walkers and visitors to heritage assets whose attention is focused on a landscape of recognised high quality. Designated or protected views. Views from a recognised high-quality landscape such as a National Park or an AONB.
Medium	People travelling along scenic roads through the landscape. Walkers and visitors to heritage assets whose attention is focused on a landscape of moderate quality. People walking along residential streets. Occupiers of residential properties with oblique views of the development.
Low	People at work and in educational institutions. People engaged in formal sports activities. People walking through urban areas (for example commuters). People on main roads or railways whose attention is not focused on the landscape (such as commuters).

Source: Based on GLVIA 3 (LI and IEMA, 2013)

The overall sensitivity of the receptor (based on combining the view value and the receptor's susceptibility) can be high, medium or low.

The magnitude of change to views would be determined by considering:

- The nature of an impact by judging whether the introduction of a Scheme would be of benefit or detriment to the existing view. The impact of a Scheme can be adverse or beneficial;
- The context of the existing view (e.g. whether it is across a natural landscape or an industrial site);

- The extent to which the view has been altered due to the loss/ addition of features and the proportion of the view the development would occupy;
- The scale and appearance of the Scheme and the degree of contrast/ integration with the existing view;
- The distance of the visual receptor from the development and the angle/ position of view;
- The duration and reversibility of the effect;
- The size and scale of the effect; and
- The geographical extent of the changes to the view.

The evaluation of the magnitude of change would be based on the criteria set out in Table B.14.

Table B.14: Magnitude of Change to Views

Magnitude	Criteria
High	Total loss or substantial alteration to key characteristics of the view Addition of new features or components that are continuously highly visible across the majority of the view and incongruous with the existing view. Substantial changes in close proximity to the visual receptor and within the direct frame of view. Introduction of long term or permanent change uncharacteristic of the view
Medium	Noticeable change or alteration to one or more key characteristics of the view Addition of new features or components that may be continuously highly visible across much of the view, but are largely characteristic of the existing view. Changes a relatively short distance from the receptor, but viewed as one of a series of components in the middle ground of the view Substantial change partially filtered by intervening vegetation and/or built form, or viewed obliquely Introduction of medium to long term change uncharacteristic of the view and/or permanent changes largely characteristic of the existing view or affecting a small proportion of the view
Low	Slight loss or alteration to one or more characteristics of the view Addition of new features or landscape components that may be continuously or intermittently visible in part of the view, but are largely characteristic of the existing view from a receptor Changes within the background of the view, viewed as one of a series of components in the wider panoramic view from a receptor Change largely filtered by intervening vegetation and/or built form, or viewed obliquely Introduction of short to medium term change uncharacteristic of the view and/or long term/permanent changes in a small proportion of the view.
Negligible	No change to, or barely perceptible loss or alteration in the view. Addition of new features or landscape components that are largely inconspicuous and characteristic of the existing view. Changes within the background of the view, viewed as an inconspicuous element within the wider panorama. Change almost entirely obscured by intervening vegetation and/or built form. Short term change affecting a small proportion of the view.

Source: Based on GLVIA 3 (LI and IEMA, 2013)

B.6.3.3 Significance of Effects

Effects may be adverse or beneficial. Major and moderate effects are considered significant.

Professional judgement would be used to determine the overall level of significance of effects on landscape and visual receptors in weighing the sensitivity of the receptors against the magnitude of change. The evaluation of the significance of effects would be based on the criteria set out in Table B.15 and Table B.16.

Table B.15: Significance of Effects on Landscape Character

Significance of Effects	Criteria
Major beneficial	A clear improvement or enhancement of existing character. Restoration of characteristic features previously wholly or largely lost through inappropriate management or previous development.
Moderate beneficial	A noticeable improvement or enhancement of existing character. Restoration of valued characteristic features previously largely lost through inappropriate management or previous development.
Minor beneficial	A small improvement or enhancement of existing character. Restoration of valued characteristic features previously partly lost through inappropriate management or previous development.
Negligible	Maintenance of the existing character, sense of place and/or local distinctiveness of the landscape.
Minor adverse	A small deterioration in the existing character due to the loss of characteristic features and or the introduction of uncharacteristic features which detract from the sense of place or local distinctiveness. Effects may relate to a small proportion of the character area.
Moderate adverse	A noticeable deterioration in the existing character due to the loss of characteristic features or the introduction of uncharacteristic features or elements which detract from the sense of place or local distinctiveness. Effects may relate to a medium proportion of the character area.
Major adverse	A clear deterioration in the existing character due to the loss of key characteristic features or the introduction of uncharacteristic features or elements which detract from the sense of place or local distinctiveness. Effects may relate to all or a large proportion of the character area.

Source: Based on GLVIA 3 (LI and IEMA, 2013)

Table B.16: Significance of Effects on Visual Receptors

Significance of Effects	Criteria
Major beneficial	A substantial improvement, affecting a large extent of the view.
Moderate beneficial	A noticeable improvement, affecting part of the view.
Minor beneficial	A small improvement, affecting a small extent of the view.
Negligible	No discernible deterioration or improvement in the existing view.
Minor adverse	A small deterioration, affecting a small extent of the view.
Moderate adverse	A noticeable deterioration, affecting part of the view.

Major adverse	A substantial deterioration, affecting a large extent of the view.

Source: Based on GLVIA 3 (LI and IEMA, 2013)

To achieve consistency in the evaluation of the significance of effects, the assessment would also be guided by the conversion below:

- Negligible = Neutral;
- Minor = Slight;
- Moderate = Moderate; and
- Major = Large/Very Large (depending on professional judgement).

For the purposes of the ES, effects of moderate adverse and above would be considered to be significant.

B.7 Materials

B.7.1 Methodology Overview

No specific industry guidance on significance criteria for the assessment on material resources exists, however, it is professional judgement that the significance criteria stated in DMRBLA110 'Sustainability and Environment Appraisal - Material Assets and Waste, is suitable for this Scheme. The use of the DMRBLA110 'Sustainability and Environment Appraisal - Material Assets and Waste[158] is also endorsed through the IAN 125/09(W)[159]. Despite the guidance being primarily for motorway and truck road projects it is regarded as suitable for other linear construction projects.

It is acknowledged that the use of material resources would likely cause adverse environmental effects, predominantly through transportation (both to and from site), from detrimental impacts to air quality and increased local noise levels. However, these effects are more logically dealt with in other Chapters, and have, therefore, not been included within the scope of this assessment.

B.7.2 Establishing Baseline

The existing baseline conditions would be identified from desk-based studies and information from ground investigations. This information would be used to determine the nature of existing materials on site that would be used in the construction of the coastal defence.

The potential locations of material sources would also be considered. The assessment of effects on material assets would encompass effects arising during the construction of the Scheme, up until the point when the Scheme opens.

B.7.3 Criteria for Determining Value/Sensitivity of Receptor

The categories for the significance of effect from the use of materials is provided in Table B.17 and the level of significance in Table B.18 (stated as significant or not significant). For both these tables "Region" means the authority comprising the second study area, in this case Denbighshire and North Wales. "Primary materials" describes materials that are from a non-renewable source.

Professional judgement would also be used to provide an assessment of effects based on several factors, including:

- The availability of the material resources;
- The type of materials required, e.g. primary/virgin materials, manufactured materials, recycled materials;
- The type of materials expected to:
    - Arise in the largest quantities;
    - Are primary/virgin materials; and
    - Comprise a large proportion of the value of the Scheme.

[158] Highways England (2019) Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 13 LA 110 Sustainability and environment. Appraisal. Material assets and waste (formerly IAN 153/11) [online] available at: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA%20110%20Material%20assets%20and%20waste-web.pdf accessed November 2020

[159] Welsh Government (2010) INTERIM ADVICE NOTE 125/09(W) Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment' [online] available at https://gov.wales/sites/default/files/publications/2017-10/interim-advice-note-12509w-supplementary-guidance-for-users-of-design-manual-for-roads-and-bridges-dmrb-volume-11-environmental-assessment.pdf accessed November 2020

Table B.17: Significance Categories and Descriptions for Material Assets

Significance Category	Description
Neutral	• Project achieves >99% overall material recovery / recycling (by weight) of non-hazardous Construction Demolition Waste (CDW) to substitute use of primary materials; and • Aggregates required to be imported to site comprise >99% re-used / recycled content.
Slight	• Project achieves 70-99% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and • Aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target.
Moderate	• Project achieves less than 70% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and • Aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target.
Large	• Project achieves <70% overall material recovery / recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute use of primary materials; and • Aggregates required to be imported to site comprise <1% re-used / recycled content; and • Project sterilises ≥1 mineral safeguarding site and/or peat resource.
Very Large	• No criteria: use criteria for large categories.

Source: Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 13 LA 110 Sustainability and environment. Appraisal. Material assets and waste (2019)[160]

Table B.18: Significance Criteria for Material Assets

Significance	Description
Not significant	Category description met for Neutral, Slight effect.
Significant	Category description met for Moderate or Large effect.

Source: Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 13 LA 110 Sustainability and environment. Appraisal. Material assets and waste (2019)[160]

Note: See Chapter 18.5.2 for overarching effect descriptors.

For the purposes of this assessment, effects of moderate adverse and above would be considered to be significant.

[160] Highways England (2019) Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 13 LA 110 Sustainability and environment. Appraisal. Material assets and waste (formerly IAN 153/11) [online] available at: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA%20110%20Material%20assets%20and%20waste-web.pdf accessed November 2020

B.8 Noise and Vibration

B.8.1 Methodology Overview

Further assessment is recommended using the methodology and criteria outlined in the following sections so that aspects requiring mitigation can be identified at an early stage and can be considered and applied through management plans for the construction phase.

The construction noise assessment would include the following methods:

- Consultation with DCC Environmental Health Officer (EHO) to confirm baseline (including measurement of existing ambient noise levels) and assessment methodology;
- Confirmation of likely construction methodology including plant inventories, location of construction compounds and construction programme;
- Confirmation of construction traffic movements and use of any haul roads including number of vehicle movements and location of routes;
- Construction noise would be predicted in accordance with methodologies for static and mobile plant from BS5228-1[161]; and,
- Construction vibration would be predicted and assessed in accordance with guidance from BS5228-2[162].

B.8.2 Establishing Baseline

Where practical it is recommended that baseline surveys are undertaken at representative NSRs to establish the baseline pre-construction noise levels for consideration within the construction noise assessment. The surveys would be undertaken for a suitable duration representative of periods when construction would be undertaken at the nearest NSR during representative noise conditions (i.e. outside of school holidays).

At the time of this scoping exercise, due to uncertainty over the implications of any future changes in ambient noise levels due to effects of Covid-19, it is recommended that agreement with DCC is sought to attain through measurement or select representative baseline noise levels for assessment at EIA. Where it is not practical to undertake measurements, results from East Rhyl EIA report (undertaken in 2018) could be used to inform baseline noise levels which are considered to be representative of conditions prior to effects of Covid-19 measures and can provide an indication of baseline noise levels.

B.8.3 Assessment of Significance of Effects

- Proposed assessment methodology:
  - Assessment of construction noise would be undertaken in accordance with BS5228-1 Example Method 1 ‘ABC Method’. The criteria for significant adverse effect are for construction noise to exceed relevant ABC thresholds for a duration of 10 consecutive days in any 15 days, or 40 days in any consecutive 6 month period (as per BS5228-1 guidance);
  - Assessment of construction vibration would be undertaken in accordance with BS5228-2 guidance. The criteria for significant adverse effect are for construction vibration to exceed 1mm/s;

[161] British Standards Institution (BSI) (2008). BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.

[162] British Standards Institution (BSI) (2008). BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.

  - Potential impacts on marine mammals and fish are subject to species types present in the nearby marine environment. Assessment would be undertaken using prevailing guidance with criteria established for relevant species types; and
- Mitigation measures for construction noise would be incorporated within the CEMP or CNMP for the Scheme.

There is potential for adverse effects to arise. Therefore, careful consideration of construction methodology is required to ensure that any potential significant adverse effects are mitigated.

B.9 Population and Health

B.9.1 Methodology Overview

The assessment methodology would comprise first assessing the sensitivity of receptors that have the potential to be affected by the construction or operation of the Scheme. A combination of the sensitivity of receptor and the magnitude of impact in relation to the receptor would be used to determine the significance of effects. Effects would be determined as neutral, slight, moderate, large or very large, and either beneficial or adverse.

B.9.2 Establishing Baseline

The baseline would be established through undertaking a desktop review of background documents, local authority publications, GIS data, maps and datasets. These would all be collated and analysed to establish a relevant population baseline for the LIA and WIA for this scoping Chapter and would be refined for the EIA Chapter. No surveying is proposed to be undertaken. The baseline data gathering would be proportionate, reflecting the types of indicators that may inform assessment of the potential significant effects.

B.9.3 Assessment of Significance of Effects

B.9.3.1 Criteria for Determining Value/Sensitivity

The sensitivity (value) of receptors would be determined according to the descriptions provided within Table B.19.

Table B.19: Scale for Evaluating the Sensitivity (Value) of Population and Health Receptors

Receptor Value (Sensitivity)	Description
High	• An already vulnerable receptor with very little capacity and means to absorb changes. • No alternative resources, access arrangements or opportunities are available within an easily accessible distance. • A highly or frequently accessed resource.
Medium	• A non-vulnerable receptor with limited capacity and means to absorb changes. • A limited range of alternative resources, access arrangements or opportunities are available within and easily accessible distance. • A moderately or semi-frequently accesses resource.
Low	• A non-vulnerable receptor with sufficient capacity and means to absorb changes. • A wide range of alternative resources, access arrangements or opportunities are available within an easily accessible distance. • An infrequently accessed resource.

Source: DMRB LA109

B.9.3.2 Criteria for Determining Magnitude of Effect

The magnitude of impact would be determined by the predicted deviation from the baseline conditions and the scale of the effect. The qualitative magnitude of each impact (in the absence of quantitative data) would be determined according to the descriptions provided within Table B.20.

Table B.20: Impact Magnitude Criteria for Receptors

Magnitude of Impact	Typical Description
Major	• Affects receptors within the LIA and potentially beyond. • Affects many receptors. • A substantial change (positive or negative) from the baseline position. • A large widening or narrowing of inequalities. • Majority of communities affected have high levels of deprivation. • The impact is permanent or long-term (e.g. more than a year). • Requires considerable intervention to return to the baseline.
Moderate	• Affects receptors beyond the application site into the LIA. • Affects a moderate number of receptors. • A notable change (positive or negative) from the baseline position. • A widening or narrowing or inequalities. • Majority of communities affected have average or above average levels of deprivation. • The duration over which the impact is experienced is medium-term (e.g. between six months and a year). • May require some intervention to return to the baseline.
Minor	• Affects receptors in the LIA only, and mostly within the application site • Affects a small number of receptors • A slight change (positive or negative) from the baseline position with evidence available to demonstrate change • A slight widening or narrowing of inequalities with evidence available to demonstrate change • Few people in a community affected (positively or negatively) • The duration over which the impact is experienced is short-term (e.g. between three and six months) • Baseline returns without intervention or with only limited intervention
Negligible	• Affects receptors within the site boundary only • Baseline remains consistent/no discernible change (positive or negative) from the baseline position • Majority of communities affected are not deprived • Impact is very short-term (e.g. less than three months) • Affects the well-being of very few receptors
No change	• No loss or alteration of characteristics, features or elements; no observable impact in either direction

Source: DMRB LA109

B.9.3.3 Significance of Effect Matrix

Subsequent to identifying an appropriate receptor sensitivity and magnitude of impact using Table B.19 and Table B.20 the likely significance category and overall significance of effects would be assessed by using the matrix provided within Table B.21 along with professional judgment to consider site specific factors that may be of relevance.

Table B.21: Rating of Effects Criteria

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

Source: Adapted from DMRB LA104

Effects would be identified as neutral, slight, moderate, large or very large; adverse or beneficial.

For the purposes of this assessment, effects of Moderate (Adverse or Beneficial) and above would be considered to be significant.

B.10 Traffic, Transport and Access

As outlined within Table 17.1, the transport impacts of the Scheme are considered unlikely to demonstrate significant effects during the construction period and would be minimal during the operational period.

Consequently, traffic, transport and access has been scoped out of the EIA.

However, a Transport Statement would be prepared to support this EIA and other disciplines. This would cover the points noted in Chapter 17.7.

C. Outline Business Case

Central Rhyl Coastal Defence Scheme

Outline Business Case

Denbighshire County Council

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
A1 C01	24/05/19	AS	AMM	SW	Final OBC
A1 C02	11/10/19	AS	AMM	SW	Amended with WG revisions

Comments sheet

Changes from SOC to OBC
Changes from OBC to FBC
.

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1 Executive Summary

1.1 Introduction

This document presents the Outline Business Case (OBC) for a coastal erosion and flood risk management scheme for Central Rhyl, Denbighshire, North Wales. The project aims to improve the existing coastal defences to provide increased flood and erosion protection to people and property in Rhyl, and also support regeneration of the town, achieving wider benefits alongside flood risk management and supporting the local community. The proposed scheme will manage flood risk to 548 residential and 44 non-residential properties over 100 years and manage erosion to key tourism infrastructure. Approval is being sought to proceed to Detailed Design and Full Business Case as part of the Welsh Government Coastal Risk Management Programme (CRMP).

1.2 Strategic Case

The proposed Central Rhyl Coastal Defence Scheme has considered a range of local strategies and recent studies, including:

- North West England and North Wales Shoreline Management Plan SMP2
- Denbighshire Local Flood Risk Management Strategy (Denbighshire County Council, 2014)
- National Strategy for Flood and Coastal Erosion Risk Management in Wales (Welsh Government, 2011)
- Denbighshire Strategic Flood Consequence Assessment (SFCA), (Denbighshire County Council, 2014)

The proposed scheme is in accordance with the policies in the above studies.

The Case for Change

The existing coastal flood and erosion defences at Central Rhyl consist of a series of stepped revetments, recurve walls and vertical walls in various states of repair. The coastal defences are deteriorating and in the central section (Section E) do not prevent wave overtopping under present day conditions, with properties at flood risk from a 20% AEP event and higher. As sea levels rise over time due to predicted climate change, flood risk will increase.

Across the majority of the frontage, defences are predicted to fail by 2038 if no works are undertaken. Once defences fail, the coastline will recede leading to loss of the promenade and associated assets including the wales coastal path and cycle route. Failure and breach of the coastal defences will lead to an increase in flood risk to people and property in Central Rhyl.

Once the defences fail and access to the promenade and sea front is lost there will be a significant impact on the tourism economy of Central Rhyl, as holiday makers and day trippers cease to travel to this seaside town and support the Wales tourism economy. Action is needed to manage flood and erosion risk at Central Rhyl in order to sustain the economy and well-being of the local community and encourage regeneration and investment in Rhyl.

Objectives and Critical Success Factors

The project set out to achieve the following project objectives, and meet the following critical success factors:

Table 1-1: Investment Objectives

SMART	Objective description	Indicator	Timescale
1	To develop a sustainable and adaptive option to reduce the risk of coastal flooding and erosion to people and property of Central Rhyl, improving the quality of life for the local community.	Number of people at risk from the 1 in 200 event today and in 2118.	Project in operation by 2022 and to the end of the design life.
2	To develop an option which will support regeneration of the Rhyl Waterfront area.	Landscape, townscape and heritage enhancements and increased development investment opportunities	Benefits seen immediately upon establishment and increasing over time as landscape planting establishes.
3	Seek to maintain and enhance biodiversity and promote the resilience of ecosystems, in accordance with Section 6 of the Environment (Wales) Act 2016	Net positive for biodiversity Existing biodiversity enhanced Areas of habitat created	Benefits seen immediately upon intervention and increasing over time as enhancement and creation schemes establish.

Table 1-2: Critical Success Factors

CSF	Category	Description
CSF1	Strategic fit	Must comply with Shoreline Management Plan and DCC local flood risk management plans
CSF2	Value for money	Must be economically viable option to manage coastal erosion and flood risk
CSF3	Supplier capacity	Must match the capacity of potential suppliers to deliver
CSF4	Potential affordability	Must be affordable by DCC and WG
CSF5	Potential achievability	Must be technically feasible and sustainable in the long-term
CSF6	Project specific	Must minimise impacts on the environment and provide enhancements where possible
CSF7	Project specific	Must assist the economy of Prestatyn by working with tourism and amenity use

1.3 Economic Case

Options Considered

A longlist of options to manage the flood and erosion risk was fi developed. A high level assessment was then undertaken in accordance with WG Business Case Guidance to identify from this extensive list, a short list of options to take forwards. Long list options that did not meet CSFs were rejected, with the exception of the Walkaway and Business as Usual baseline options. Additional 'Do Something' options were discounted based upon significant weaknesses and threats identified in the multi-criteria assessment. The options taken forward to short list for appraisal are presented below.

Table 1-3: Shortlisted Options

Option	Name	Description
WA	Walkaway	Do nothing, cease all maintenance.

		As sea levels rise with climate change and defences fail at the end of their residual life flood and erosion risk increases over time.
BaU	Business as Usual	Continue with existing maintenance regime to extend residual life of defences to 2068, managing flood and erosion risk for 50 years.
S1	Scour protection and concrete repairs	Existing stepped revetment defence will be repaired with concrete to extend the residual life of the existing defence. Rock armour scour protection constructed at the toe to manage erosion risk. Erosion risk managed beyond 2118, but flood risk increases over time with climate change.
S2	Concrete stepped revetment	Install a new concrete stepped revetment, across the whole frontage to provide a 0.5% AEP SoP for flood risk to 2118. Erosion risk managed for lifetime of scheme.
S3	Combined scour protection and stepped revetment.	Scour protection and concrete repairs along frontage to manage erosion risk, with stepped revetment in focussed areas to manage overtopping. Provides 0.5% AEP SoP for flood risk to 2118. Erosion risk managed for lifetime of scheme.

Key Findings

Economic appraisal of the shortlist options was undertaken in accordance with best practice guidance FRCEM-AG (EA 2010), the Multicoloured Manual and Handbook (FHRC 2013) and the Treasury Green Book (2018). As well as direct flood and erosion property damages the economic appraisal also included an assessment of tourism damages, intangible damages and indirect damages.

The costs for each shortlisted option have been estimated through Early Contractor Involvement based on the outline designs developed for each option.

The table below presents a summary of the economic appraisal of shortlisted options against a walkaway baseline as is required for the CRMP.

Table 1-4: Benefit Cost Ratio results (walkaway baseline)

Option	Present Value Costs (£k)	Present Value Damages (£k)	Present Value Benefits (£k)	Benefit Cost Ratio	Incremental Benefit Cost Ratio
Walkaway	-	74,020	-	-	-
Business as Usual	864	53,220	20,800	24.1	-
S1 - Scour protection and concrete repairs	21,957	39,490	34,530	1.6	0.7 (compared against BAU)
S2 - Concrete sea wall and stepped revetment	51,273	5,502	68,518	1.3	1.2 (compared against Scour)
S3 - Combination option	36,145	5,502	68,518	1.9	2.4 (compared against Scour)

The Business as Usual option is the most economically viable with a high BCR of 24.1. However, this option only delays failure of the defence and coastal recession, and results in slightly increased flood risk to the town as overtopping water builds up behind defences during storm events, unable to flow back out to sea. This option therefore does not provide a long-term solution to manage flood and erosion risk and does not achieve all critical success factors. As such this option is not considered viable. The economically preferred option achieving all CSFs is therefore Option S3, with a **benefit cost ratio of 1.9** compared to the walkaway baseline.

Preferred Option

In addition to economic appraisal, the shortlisted options were further appraised using multi criteria assessment (MCA) to identify on overall preferred option.

The overall preferred option is Option S3 – combined scour protection and stepped revetment:

- It meets all the CSFs and objectives
- It meets DCC's requirement to reduce flood and erosion risk to an acceptable standard, providing a 0.5% AEP in 2118.
- It supports the tourism economy, maintaining the promenade and beach access and the Wales Coastal Path.
- The option can be designed to provide a focal point, with integrated beach access to support regeneration plans for the town centre and high street.
- Environmental enhancements can be built into the scheme such as into the rock structure and landscape improvements along the promenade.
- The scheme is economically viable and affordable.

1.4 Commercial Case

The project has been undertaken by JBA Consulting on behalf of Denbighshire County Council with Early Contractor Involvement (ECI) support from Balfour Beatty. Delivery of the project will require subsequent procurement exercises being undertaken for both the Design and Construction Stages, with the latter being substantially larger.

Denbighshire County Council (DCC) have progressed the Central Rhyl Coastal Defence Project to date through the OBC stage using the Scape Framework and Framework Contractor Balfour Beatty. If the OBC is granted further funding, DCC's intention would be to put the Preconstruction (detailed design) and Construction stages through the same framework.

1.5 Financial case

The total value for Coastal Risk Management Plan Approval is: **£28,973,204**
The total value of the Welsh Government cost apportionment would be: **£21,729,903**
The total value of the DCC cost apportionment would be: **£7,243,301**

The intention to use the Local Government Borrowing Initiative to fund a scheme through CRMP will need to be approved through DCC internal committees. Further checks and approvals will be required before funding sign off. DCC will be in regular contact with WG regarding the capital funding required through the Revenue Support Grant should a scheme be progressed.

1.6 Management Case

Should a scheme progress, Denbighshire County Council will lead the Delivery of the Preconstruction design stage in the role of Client and ECC Project Manager. Balfour Beatty will deliver the design phase of the project in their role as the Scape CE&I Contractor. An additional party will be appointed as Designers.

The Balfour Beatty Project Manager who will be responsible for delivering the Preconstruction phase has been involved in leading the project from the Feasibility Stage. The intended Balfour Beatty Project Manager is appropriately experienced in delivering large scale Coastal Infrastructure Projects. Construction proposals have been developed in line with on-going Environmental Impact Assessment and Design Development.

2 Strategic Case

2.1 FCERM strategic fit and context

Rhyl is the largest town in Denbighshire and has a well-established history as a tourist destination. There are ongoing and future plans to regenerate Rhyl to enhance its appeal to tourist and investors. However, the coastal defences on the Central Rhyl frontage are deteriorating and the eroding promenade means that this important asset and integral part of Rhyl's regeneration could be lost. In addition, the current defences do not prevent wave overtopping to property adjacent to the frontage, sea level rise (SLR) is likely to increase flood risk further undermining regeneration attempts.

This Strategic Outline Case (SOC) presents the case for progressing a scheme to manage flood and coastal erosion risk at Central Rhyl, Denbighshire, North Wales. The project aims to improve the existing coastal defences to provide improved protection to people and property from coastal erosion and flood risk into the future. Alongside this, the project aims to work with local regeneration plans to support regeneration of the town, achieving wider benefits alongside flood risk management and supporting the local community.

Figure 2-1: Central Rhyl location plan and site extent

The project includes the coastline from the eastern edge of the recently completed West Rhyl coastal defence scheme, extending easterly along the coast to Splash Point where the proposed East Rhyl coastal defence scheme commences. Figure 2-1 shows the extent of the study area.

North West England and North Wales Shoreline Management Plan SMP2 – This document provides the policy decisions for flood and coastal management and covers the coastline from the Great Orme in Llandudno, to the Scottish Border on the Solway Firth. Central Rhyl is located in sub-Cell 11a – Great Orme's Head to Southport, further broken down into Sub Cell 11a4 - Clwyd Estuary to Point of Ayre. The recommended policy for Central Rhyl is 'Hold the Line' by maintaining, improving or raising the existing defences'. The long-term plan is to continue to manage flood and erosion to property and infrastructure in the built-up areas of Rhyl, including commercial, residential and amenity assets, infrastructure, cycle routes and footpaths. Improvement to the existing defences is therefore in line with the overall strategic policy for this area and approved by statutory stakeholders.

Welsh Government Coastal Risk Management Programme (CRMP) - This project has been identified as a candidate for further consideration as part of the Welsh Government's Coastal Risk Management Programme (CRMP). Plans for CRMP were announced by the Welsh Government in 2014 and are based around the use of long term borrowing and low interest rates by Welsh Government to support a programme of capital investment in coastal risk management infrastructure. Key details of the programme include:

- £150 million capital value investment;
- co-funded between Welsh Government and local authorities with Welsh Government contributing 75% of capital costs of construction;
- with construction scheduled 2018-2021 (extended to 2019-2022);
- focussed on managing coastal flood and erosion risk to properties, people and infrastructure;
- enabling adaptation to climate change and implementation of 2nd Shoreline Management Plan recommendations;
- achieving wider additional and community benefits alongside reduced flood and erosion risk;
- contributing across the breadth of Welsh Government Well-Being Objectives but with particular emphasis on Objectives 6,7 and 8, looking for wider benefits also in support of the other objectives:
    - Objective 6. Support the change to a low carbon and climate resilient economy
    - Objective 7. Connect communities through sustainable and resilient infrastructure
    - Objective 8. Support safe, cohesive and resilient communities

Improvements to the Central Rhyl defences aligns with the key objectives of the CRMP including reducing risk to people and property, providing wider benefits to Prestatyn and contributing to the Well-Being Objectives.

Denbighshire Local Flood Risk Management Strategy (Denbighshire County Council, 2014) - This strategy sets out how DCC as Lead Local Flood Authority (LLFA) will work with risk communities and alongside other risk management authorities to reduce flood risk. This strategy outlines the Council's objectives for managing flood and coastal erosion and describes the measures that will be taken to reduce flood risk to the residents of Denbighshire. Although there are no specific actions for Rhyl, Rhyl and Prestatyn are identified as one of the significant flood locations, and objectives include: 'Prioritising investment in the most at-risk communities.'

National Strategy for Flood and Coastal Erosion Risk Management in Wales (Welsh Government, 2011) - The National Strategy includes the following objectives related to intervention at Central Rhyl

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

This Strategy is currently undergoing an update but is expected to continue to align with these key objectives.

This flood management scheme is primarily being developed in response to the deteriorating condition of the existing defences, and concerns regarding the medium-term viability of the defences to manage erosion and flood risk. Rhyl is a socially deprived area (see Section 2 of the National Strategy) and the local community are likely to suffer the impacts of flooding more greatly than more affluent areas. The proposed coastal risk management scheme is in accordance with the objectives set out by the National Strategy. In addition, one of the main actions coming from this strategy is the CRMP of which the Central Rhyl scheme is a part.

Denbighshire Strategic Flood Consequence Assessment (SFCA), DCC, January 2018
DCC updated their SFCA in January 2018. The purpose of an SFCA is to identify the strategic flood risks to key communities in Denbighshire to support the preparation of the Local Development Plan. Rhyl is highlighted as one of the key flood risk locations in Denbighshire and refers to future schemes to reduce the risk of coastal flooding in Rhyl.

2.2 Strategic fit with recent and upcoming schemes

The CRMP is a time limited programme to enable the funding of coastal protection schemes in Wales. A strategic and integrated approach to coastal cells is the best way of prioritising locations of greatest FCERM need. Unfortunately, a Coastal Strategy has not been completed for the coastal cell that includes Central Rhyl and the timeframe for CRMP funding means that individual schemes are being promoted in advance of a Strategy. However, the Central Rhyl scheme is being developed with consideration of existing and upcoming schemes.

An integrated coastal model has been produced extending from the mouth of the River Clwyd to Barkby Beach, to include the extent of all Denbighshire schemes across this frontage, including West Rhyl, East Rhyl, Central Rhyl and Central Prestatyn schemes. This integrated model enables the interaction between each of the schemes to be considered, identifying any potential detriment to adjacent frontages or ‘backdoor’ flood risk between schemes so that these can be avoiding through scheme design. This approach also avoids the double counting of flood benefits between schemes.

A summary of the interaction is provided below, with the locations of each scheme presented in Figure 2-2.

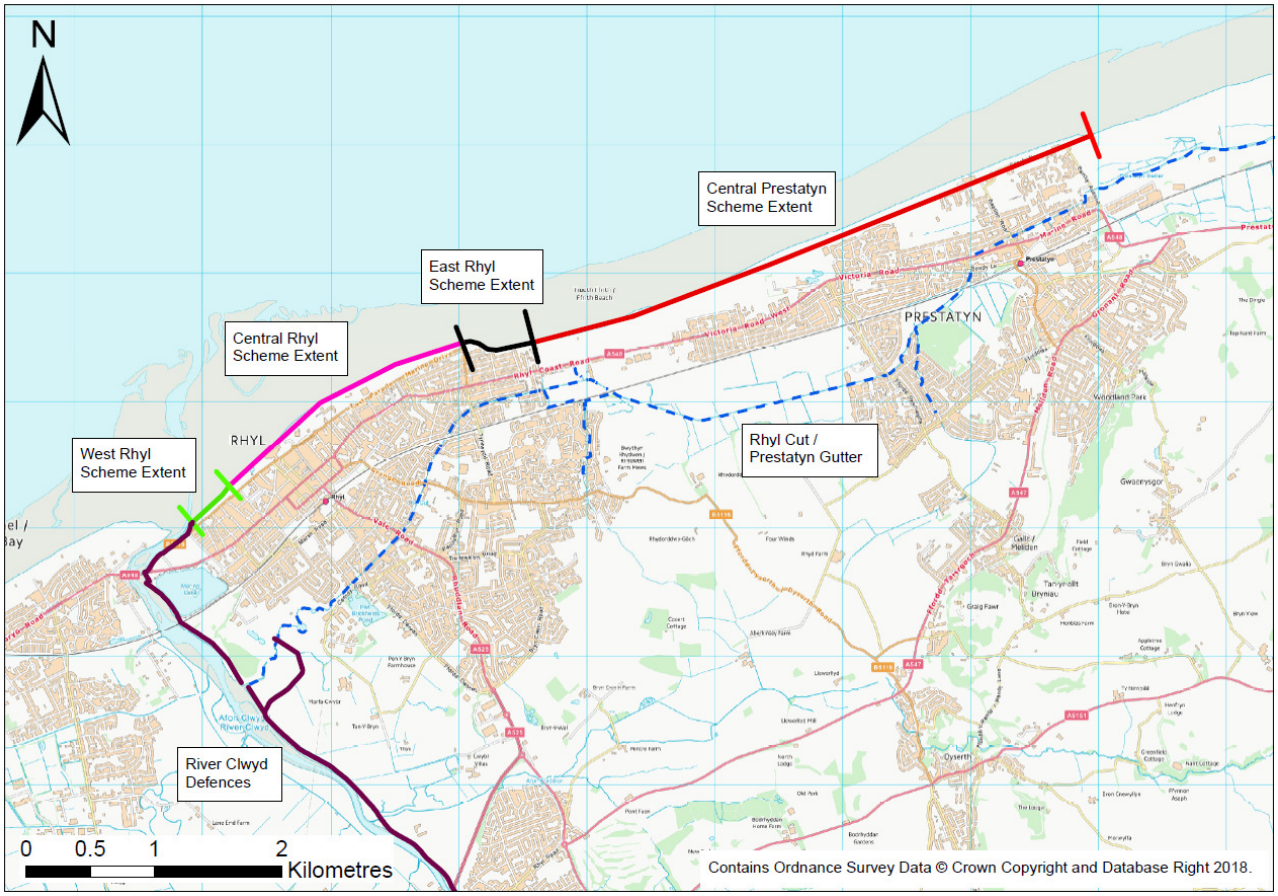

Figure 2-2: Extent of schemes in development or recently completed in the vicinity of the Central Rhyl scheme and location of Rhyl Cut and Prestatyn Gutter water courses

Central Prestatyn – A business case for Central Prestatyn is being developed alongside Central Rhyl. The OBC programme is being undertaken is in parallel with the Central Rhyl scheme and as such the two schemes are being modelled and assessed together to enable an integrated approach to the frontage. The two schemes are separated by the East Rhyl scheme, however due to the topography the flood areas of Central Prestatyn and Central Rhyl interact inland and as such benefits apportionment and backdoor flooding are addressed through the integrated modelling approach.

East Rhyl - The proposed East Rhyl rock revetment scheme is currently out for planning determination. Subject to planning and funding approvals construction will start in summer 2019. A scheme for East Rhyl was driven by the severe flooding in 2013. This scheme has been prioritised by DCC and so is the most advanced of the schemes on the Denbighshire coastline. The East Rhyl coastal cell has little interaction with Central Rhyl due to the higher ground separating them. However, an integrated model has been produced showing the flood reduction benefits of the East Rhyl scheme.

The proposed East Rhyl scheme has a greater potential to interact and overlap with a scheme at Central Prestatyn. An ideal approach would have been to cover East Rhyl and Central Prestatyn within the same project. Primary interaction is the golf course to the rear of the frontage. The East Rhyl scheme proposes to use an existing flood reservoir area here to store residual wave overtopping. The main wave overtopping flood pathway to Central Prestatyn is from this same golf course. Scheme selection will fully consider the East Rhyl

scheme and the coastal modelling for the Central Rhyl and Central Prestatyn schemes will integrate the benefits of the proposed East Rhyl scheme.

Where there is potential overlap in properties that benefit between the East Rhyl, Central Rhyl and Central Prestatyn schemes, they will be apportioned appropriately to prevent double counting.

West Rhyl – The West Rhyl Scheme comprises the coastline adjacent to the mouth of the River Clwyd, immediately east of the Central Rhyl scheme. The scheme includes new coastal revetment and wave walls, and primary and secondary flood defence walls to manage flood risk, with a new, widened promenade to provide amenity space and support regeneration of the area. Construction of the scheme was completed in 2015 and the new defences are represented within the Central Rhyl modelling.

As a result of the topography there is potential for overlap in properties that benefit between the West Rhyl and Central Rhyl schemes. An assessment of potential double counting has been undertaken as part of the development of this Central Rhyl OBC.

Clwyd Estuary – Tidal Clwyd Flood Risk Management Strategy was produced by Environment Agency Wales in 2011 in consultation with Denbighshire County Council (CC) and Conwy County Borough Council (CBC). A review of the Strategy was undertaken in 2018 on behalf of Natural Resources Wales to check whether the original preferred Strategy remained the best way of managing flood risk across the tidal Clwyd east and west flood cells. The Strategy and Review conclude that the Standard of Protection (SoP) of the defences along the east bank of the river, adjacent to the West Rhyl scheme, is currently good, and no scheme is proposed for the defences along this section within the next 20 years. As such the River Clwyd Flood risk has not been included in the Central Rhyl inundation modelling.

Rhyl Cut and Prestatyn Gutter – Tidal risk from Rhyl Cut/Prestatyn Gutter is low and will only be realised in future epochs, there is no justification for works here at the present time and the risk can be seen as residual and acceptable. NRW are undertaking a fluvial risk assessment of the watercourse but this is for a maintenance management plan and will not lead to any capital works. As such there is so no double counting between the proposed scheme and these watercourses.

Sandscaping Feasibility Assessment - DCC commissioned a study to undertake a Sandscaping Feasibility Assessment to assess the potential to implement a sandscaping option to manage flood and erosion risk along the Rhyl to Prestatyn frontage. Sandscaping is a form of beach nourishment which is undertaken on a much larger scale to achieve economies of scale and influence coastal processes to provide a long-term sustainable management approach with multiple benefits. This feasibility assessment was undertaken in parallel with the OBC and information was exchanged between the two projects. The sandscaping option is included in the option longlist and information from the sandscaping assessment undertaken helped inform the longlisting assessment. The full report for Stage 2 of this assessment can be found in Appendix L.

Although Stage 2 of the sandscaping assessment concludes that the scheme was technically feasible and could progress to Stage 3, the scheme was ruled out primarily due to high capital construction costs, high maintenance costs and the complexity and uncertainty of achieving the marine licence required. Obtaining the licence is likely to be very

costly and time-consuming, as well as not guaranteed due to the high volume of sand required and the designations that are present. Additionally, technical performance, buildability and enhancement opportunities to the wider seafront were all considered unlikely to be achieved to the required standard. As such, Stage 3 was not undertaken.

2.3 Sustainability and well-being strategic fit and context

The Well-being of Future Generations (Wales) Act 2015 (WBFGA) is legislation requiring Welsh public bodies to put long-term sustainability at the forefront of their thinking, and work to prevent and tackle persistent problems such as poverty, health inequalities and climate change. In order to create a more sustainable Wales, public bodies must work towards seven Well-being Goals and enact the five Ways of Working, whilst showing how they are doing this by publishing Local Well-being Plans.

The Seven Well-being Goals are;

1. 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 a 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.
2. 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).
3. 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.
4. A more equal Wales - A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio-economic circumstances).
5. A Wales of cohesive communities - Attractive, viable, safe and well-connected communities.
6. 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, sports and recreation.
7. 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.

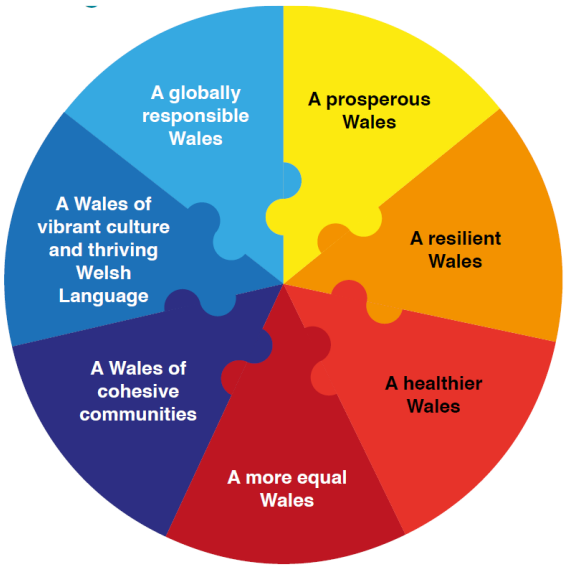

Figure 2-3: Seven Goals of the Well-being of Future Generations (Wales) Act (2015)

The five Ways of Working are;

1. Prevention - How acting to prevent problems occurring or getting worse may help public bodies meet their objectives
2. Integration - Considering how the well-being objectives may impact upon each of the well-being goals, on the other objectives, or on the objectives of other public bodies.
3. 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.
4. Collaboration – Acting in collaboration with any other person (or different parts of the body itself) that could help the body meet its well-being objectives.
5. Long Term – The importance of balancing short-term needs with the need to safeguard the ability to also meet long-term needs.

The Act also sets a requirement on Public Bodies in Wales to set and publish well-being objectives, that are designed to maximise their contribution to achieving each of the well-being objectives. For the sake of the practice of this Act, Conwy and Denbighshire have merged to form Conwy and Denbighshire Public Services Board and have published a set of 3 Priorities and 4 Additional Principles. These are:

1. People – Good Mental Well-being for All Ages
2. Community – Community Empowerment
3. Place – Environmental Resilience

1. To address inequalities and treat everyone equally
2. To support and promote the Welsh Language
3. To support access to appropriate accommodation
4. To avoid duplication

As the Central Rhyl Coastal Defence Scheme is an initiative by Denbighshire County Council, it is a requirement to test how it contributes to the WBFGA. Table 2-1 identifies opportunities for the proposed scheme to contribute to meeting the Local Well-being

Objectives how proposed work can maximise the Risk Management Authority's (RMA's) contribution to the WBFGA's seven Well-being Goals.

Table 2-1: Well-being objectives and opportunities

Well-being objective	Project opportunities
A prosperous Wales	Reduces flood and erosion risk to an important tourist destination in Wales and supports the planned regeneration of Central Rhyl The scheme will aim to use local labour and materials where possible, including the use of local rock sources.
A resilient Wales	Manage flood and erosion risk into the future, including capacity for predicted climate change. The scheme will be designed with consideration of the habitat and biodiversity of the area.
A healthier Wales	Reduction in stress to communities currently at flood and erosion risk (reduced flood risk to 552 residential properties).
A more equal Wales	Provision of benefits to a deprived community.
A Wales of cohesive communities	Provides increased flood protection to residential and non-residential properties over 100 years.
A Wales of vibrant culture and thriving Welsh language	Improvements/ continuation of the Wales Coastal Footpath and North Wales Cycle Route, encouraging people into sports and recreation such as walking, running and cycling.
A globally responsible Wales	Responsible use of sustainable materials.

2.4 The flood or erosion problem/s and current management arrangements

Heritage and Landscape

Central Rhyl is a seaside town on the North Wales coastline fronted by a promenade and wide sandy beach. The hinterland is densely developed with the town of Rhyl located immediately behind the defences and comprising a mix of commercial property in the town centre (hotels, shops, cafes), surrounding residential areas, caravan parks and other tourism assets mostly located along the coast, such as the SeaQuarium and Rhyl Arena.

Along much of the frontage the land immediately behind the promenade is higher and not at significant flood risk from still water levels. Land levels are however lower in the vicinity of Rhyl Arena and the SeaQuarium, towards the centre of the Central Rhyl Frontage. Behind this lower lying area the land falls towards the south, with low lying commercial and residential areas behind.

There are twenty-seven Listed Buildings within the Study Area, all of which are grade II. There are also two Conservation Areas; Rhyl Central Conservation Area and Rhyl, River Street Conservation Area. The Wales coastal path runs across the frontage along the existing sea defences as does the North Wales Cycle Path.

Biodiversity and Nature Conservation

The study area is located within or near the following designated sites:

- Liverpool Bay Special Protection Area (SPA)
- Dee Estuary Special Area of Conservation (SAC)
- Dee Estuary Special Protection Area (SPA)
- Dee Estuary Ramsar site
- Gronant Dunes and Talacre Warren SSSI

- Prestatyn Hillside SSSI
- Graig Fawr SSSI

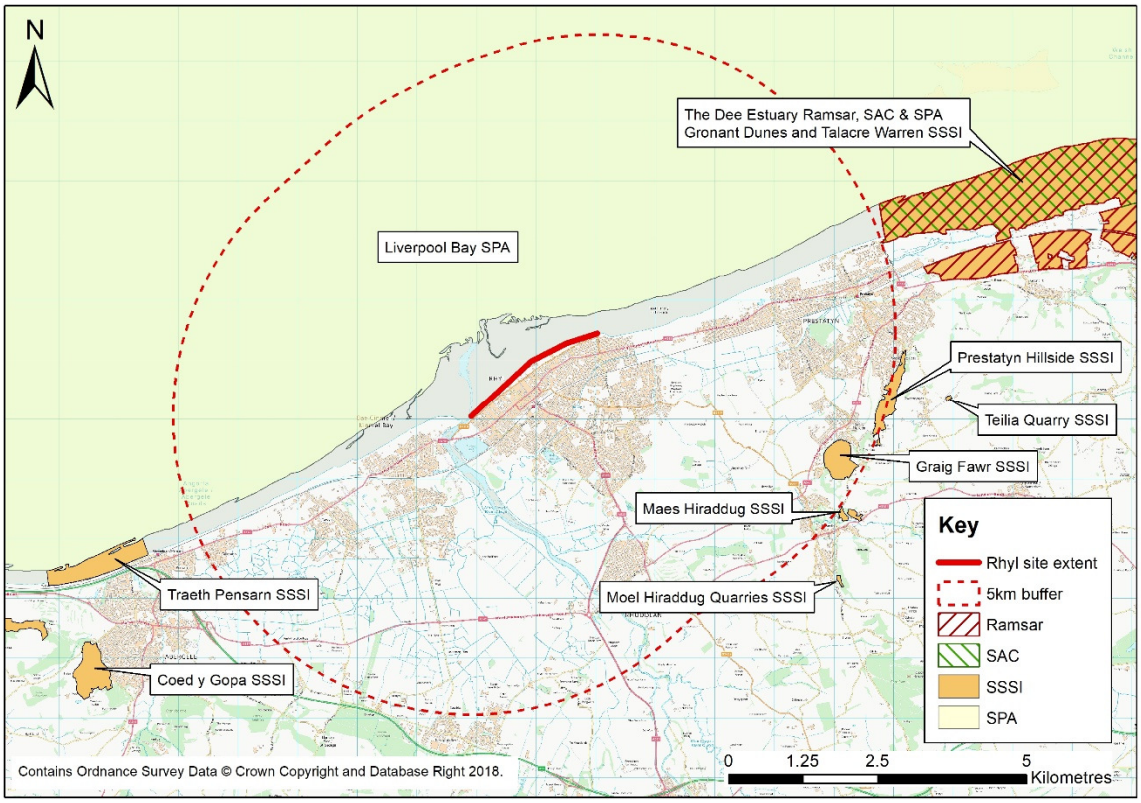

Figure 2-4: Statutory designated sites within 5km of the study area

The location of all statutorily designated sites located within 5km of the study area shown in Figure 2-4 and a more detailed assessment is provided in Appendix I, Preliminary Ecological Appraisal. Any proposed works must consider potential impacts and where possible incorporate enhancements to these sites.

Within 2km of the site there are also a number of non-statutory designated sites. These include two Local Nature Reserves (LNRs) and seven Wildlife Sites. There is also one Regionally Important Geodiversity Site (RIGS) within 2km of the proposed works; Splash Point RIGS.

Geomorphology

The Central Rhyl coastline is subject to a significant tidal range, with a typical range of 7m, and a difference of 9m between HAT and LAT. The beaches are predominantly sandy, with some shingle in the upper beach zone and the primary direction of sediment transport is from west to east, which feeds the growth of the Point of Ayr spit. However, shingle downdrift from Kinmel bay to Rhyl is limited by the ebb-tidal delta immediately east of the Clwyd Estuary mouth. In addition to the prevailing eastward longshore sediment transport mechanism, ridges and runnels along the Rhyl to Gronant coast (confirmed though beach profile analysis), are evidence of cross shore sediment transport.

Profile analysis confirms a general trend for beach lowering along the Central Rhyl foreshore which could impact upon the existing defences. Analysis of erosion rates presented in the SMP2 (2011) indicate that should No Active Intervention be taken to maintain the condition and stability of the existing defence line, the Central Rhyl coastline is anticipated to recede by up to 32m over the next 100 years, taking into account the residual life of the existing defences.

Existing Defences and Maintenance

The Central Rhyl coastline is defended by hard coastal defences comprising predominately concrete sea walls, wide promenades and set back flood walls. A sand beach and timber groyne field fronts the hard defences, offering some protection to the toe of the vertical structures.

An asset condition survey was undertaken as part of this study and identified that the existing defences are in fair condition, tending to poor in certain locations. A particularly poor section of defence at SeaQuarium was noted during the asset inspection, showing cracking through the concrete structure.

Figure 2-5 Cracking in defence fronting the SeaQuarium, Central Rhyl.

Defects associated with the structures are consistent with the age and materials of the structure (spalling, honeycombing, corrosion of rebar). In addition, beach lowering processes were noted throughout the frontage, leaving the toe of the defence vulnerable to failure through scour and beach lowering in the short term.

The structures are liable to failure in 2058 if the current maintenance regime continues, in a Business as Usual scenario. However if the maintenance is withdrawn, failure rates are expected to increase, with a likely failure year of 2038.

Following failure of the defences, there is likely to be a rapid loss of land as the retained height (often in excess of 2m) recovers to a more stable profile. Following a return to a more stable slope, the land behind will be liable to erosion processes. Failure may also result in an increase in flood risk from still water level flooding.

DCC are responsible for coastal risk management along the Denbighshire frontage. The current flood defences are managed by inspections every year and ongoing reactive maintenance through revenue funds.

Capital investment will be required in the short to medium term to prevent failure of the defences as ongoing maintenance through revenue funds cannot sustain the current defences.

Flood events are currently managed through:

- Event forecasting: A large proportion of Rhyl is located within NRW defined Flood Warning areas ('Prestatyn and Rhyl' and 'Clwyd Left Bank'). A coastal flood forecasting system is currently run by NRW, and if coastal conditions exceed established thresholds an alert or warning is issued.
- Event response: Upon receipt of an NRW coastal alert/warning, or through anecdotal or observed wave overtopping by emergency responders.

Do Nothing Scenario

Central Rhyl is at risk of coastal flooding and recent events have been severe.

- In February 1990 a storm event led to 108 residential properties flooding in Rhyl and Prestatyn, caused by the overtopping of sea defences.
- In December 2013 a storm event resulted in significant overtopping of the coastal defences at Rhyl, causing flooding to residential properties, with significant damage to the coastal infrastructure. This event led to deep flooding of 130 residential properties and 400 people had to be evacuated from their homes and others had to be rescued by boat. This flood event predominantly impacted upon East Rhyl but also affected the Central Rhyl promenade.

The primary source of flooding is failure of the existing defences, leading to a breach in the location of the SeaQuarium and Rhyl Arena, where the defences are in poorest condition and land elevations are lowest. The flood risk increases overtime as still water levels increase with climate change, further sections of defence fail, and the risk of wave overtopping increases (Figure 2-5). In a 0.5% AEP (Annual Exceedance Probability) event in present day, 255 residential and 11 non residential properties are estimated to be at risk of flooding, increasing to 1147 residential and 65 non residential properties at risk in a 0.5% AEP event in 2118 including an allowance for climate change. The Figures in Appendix F show the current flood extents in the area now and in the future.

The Central Rhyl study area shown in Figure 2-6 is the area of focus for this study. This area has been identified as the area most at risk from flooding via the Central Rhyl coastal defences. The area to the east is associated with the progressing East Rhyl scheme. Areas inland are associated with the Prestatyn OBC recently currently being undertaken as a result of a flow route from Prestatyn coastal defences along the Rhyl Cut.

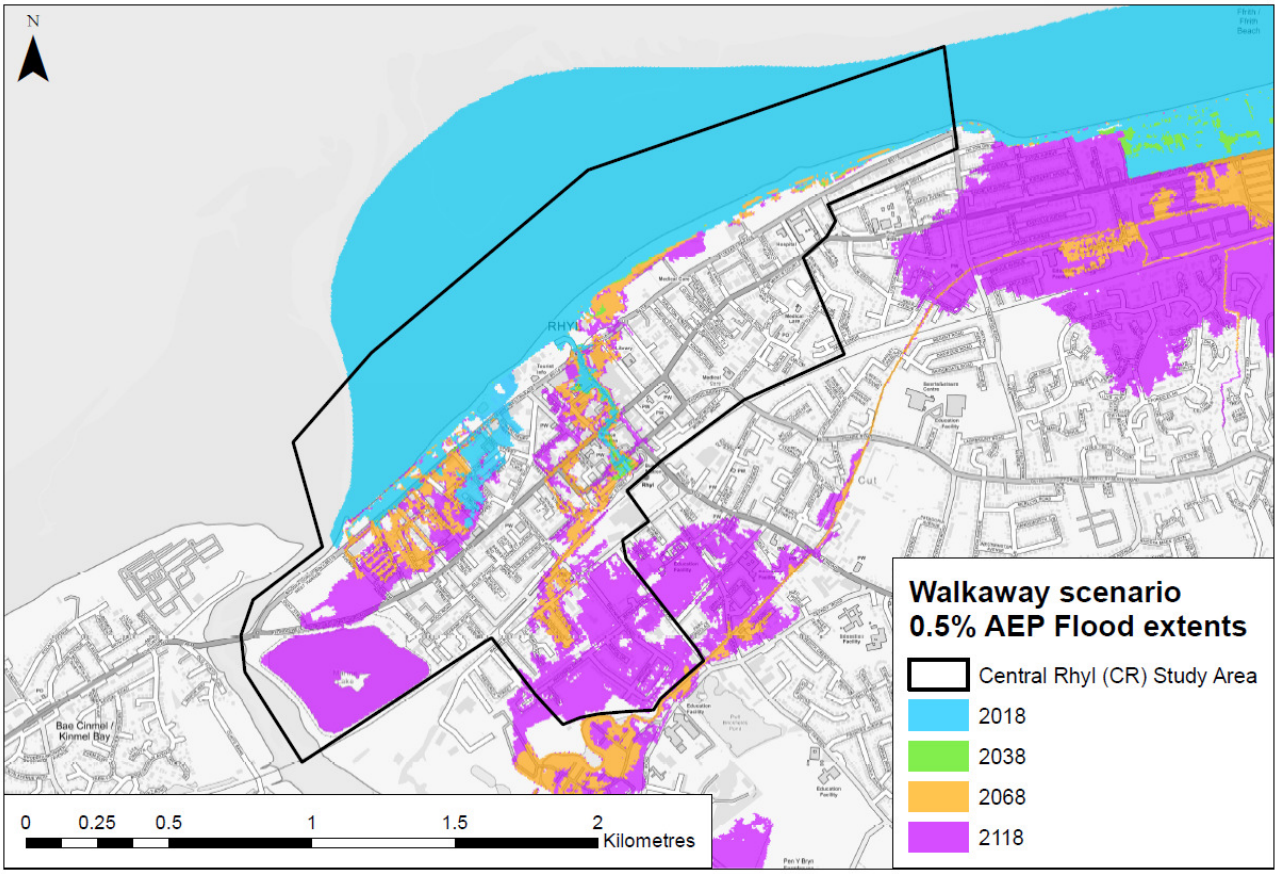

Figure 2-6: Predicted flood extents Central Rhyl for a 0.5% AEP event in 2018, 2038, 2058 and 2118

Defences along the Central Rhyl frontage are decreasing in effectiveness and across the frontage the majority are predicted to fail by 2038 if no works are undertaken. Once defences fail, the coastline is predicted to erode at an estimated rate of 0.4m yr following initial collapse of the defence. This will lead to loss of the promenade and associated assets as well as loss of the wales coastal path and cycle route. By 2119 the coastline is estimated to have receded by up to 32m, resulting in the loss of 9 non residential properties by 2068 and a further 3 by 2118. Once the defences fail and access to the promenade and sea front is lost there will be a significant impact on the tourism appeal of Central Rhyl, reducing visitor numbers to the area, as well as having a direct impact on the local community.

The OBC flood and erosion risk modelling shows that action is needed to protect Central Rhyl to sustain this community and encourage regeneration and investment in Rhyl as a popular tourist destination.

2.5 Investment Objectives

The project objectives for the Central Rhyl Scheme are outlined in Table 2-2. These aim to provide clear aims against which potential options can be appraised.

The objectives also link to the National Strategy for Coastal Erosion Risk Management in Wales.

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

Table 2-2: Investment Objectives

SMART	Objective description	Indicator	Timescale
1	To develop a sustainable and adaptive option to reduce the risk of coastal flooding and erosion to people and property of Central Rhyl, improving the quality of life for the local community.	Number of people at risk from the 1 in 200 event today and in 2118.	Project in operation by 2022 and to the end of the design life.
2	To develop an option which will support regeneration of the Rhyl Waterfront area.	Landscape, townscape and heritage enhancements and increased development investment opportunities	Benefits seen immediately upon establishment and increasing over time as landscape planting establishes.
3	Seek to maintain and enhance biodiversity and promote the resilience of ecosystems, in accordance with Section 6 of the Environment (Wales) Act 2016	Net positive for biodiversity Existing biodiversity enhanced Areas of habitat created	Benefits seen immediately upon intervention and increasing over time as enhancement and creation schemes establish.

2.6 Summary of potential opportunities and benefits from investment

The top five opportunities which can be identified at this stage are listed in Table 2-3.

Table 2-3: Top 5 Opportunities

Nature of Opportunity		Description	Impact	Action Plan
O1	Combine with Prestatyn works	Procure and undertake Prestatyn and Central Rhyl works in combination.	Potential cost and programme efficiencies	Balfour Beatty and JBA procured for both schemes through SCAPE for both schemes at OBC. Consider joint procurement and programming of construction works at FBC.
O2	Improved beach access	The new design will give an opportunity to improve access to the beach and improve the promenade for walkers and cyclists.	Amenity enhancement	Include beach access in detailed design considerations
O3	Incorporation of tourism and regeneration enhancements and wider benefits to achieve partnership funding.	The strategic nature of the project presents an opportunity to coordinate work with other stakeholders through early consultation to achieve enhancements and wider benefits which will attract partnership funding and help DCC achieve it's regeneration goals.	Potential partnership funding opportunities or funding for additional enhancements to the proposed scheme.	Early liaison with stakeholders to identify wider goals
O4	Improve well-being of deprived community of Rhyl.	Managing flood and erosion risk to Rhyl which is considered to be a deprived community and hence less able to recover from flood events than more affluent communities.	Reduced risk leading to reduced worry and concern amongst community of Rhyl	Ensure robust business case for scheme which will effectively manage flood risk to Central Rhyl.
O5	Maximise benefits of existing infrastructure	Improving existing defence infrastructure.	Minimise costs and Carbon footprint of scheme.	Asset condition survey and intrusive investigations.

2.7 Summary of potential risks, constraints and dependencies from investment

During the OBC stage the risk register has been developed and updated during Design Team Meetings. The top five risks and their status are listed below in Table 2-4.

Table 2-4: Key Strategic Risks

Risk		Description	Potential Impact	Action Plan
R1	Change in support by Welsh Government and/or DCC	Lack of secure funding from Welsh Government	Scheme unable to go ahead without funding. Flood and erosion damages.	Engagement with WG throughout development of the business case, providing updates on progress and preferred way forwards.
R2	Robustness of the economic case	Assumptions made in the economic case including those for tourism benefits and double counting of benefits in Rhyl could be questioned.	If there is a successful challenge to the assumptions, the economic case for the scheme could be undermined.	Transparency with WG now on the assumptions made in the economic case, and agreement at OBC stage.
R3	Financial Case	Scheme costs could increase as the preferred option moves through the design stage	If the costs increase significantly, the scheme may no longer be affordable for DCC and WG	Detailed cost estimate at OBC stage including costing exercise by contractor Balfour Beatty. Application of data and lessons learnt from nearby East Rhyl scheme e.g. GI data,
R4	Delay in EIA process and Marine Licence (ML) approval	Delays in consenting approvals may result in project falling outside of the CRMP window.	Lack of secure funding from Welsh Government and abortive design work. Flood and erosion damages.	Early liaison with stakeholders and consideration of EIA and ML requirements early in design process. Advance detailed design stage to allow program buffer for construction.
R5	Change in guidance before completion of Full Business Case.	Change in guidance results in requirement for updates to modelling, economics and or option design at FBC stage.	Increase in cost and programme. Potential for scheme to become unviable or to fall outside of the CRMP funding window.	Keep up to date on upcoming guidance updates. Engagement with WG throughout development of the business case. Advance detailed design stage to allow program buffer.

The following dependencies have been identified at national and local levels:

- The project is dependent on Welsh Government approval for further Welsh Government funding.
- The project is dependent on Denbighshire County Council approval for 25% contribution funding.

2.8 Stakeholder engagement (Strategic Case)

A Stakeholder Engagement Plan (SEP) was developed to guide and record stakeholder engagement during the design process. The SEP followed the "Building Trust with Communities" guidance developed by the Environment Agency, which encourages the project team to engage with stakeholders early on to understand their concerns, interests, and priorities.

A variety of engagement methods have been used including site visits and meetings. A stakeholder meeting was held in November 2018 to discuss options with key stakeholders (this was focused on the sandscaping option being considered at that time, but also allowed discussion of other options being examined). Attendees included Clwyd-Powys Archaeological Trust (CPAT) providing input regarding cultural heritage issues, NRW (Planning Liaison and Coastal Processes) and also relevant Local Authority Officers (in relation to Planning and Biodiversity issues).

Wider stakeholder engagement considering all options was undertaken at long-list to short list stage in January 2019 – to allow key consultees to raise any concerns and feed into the design process. Information provided included sketches showing the designs involved and the initial assessment of options.

Stakeholders were also given the opportunity to input to identification of the preferred option i.e. confirming which option should be taken forward (taking into account environmental, social, engineering, feasibility and cost factors) at a Stakeholder meeting held in Rhyl on 3rd April 2019.

3 Economic Case

3.1 Critical Success Factors (CSFs)

Critical success factors have been developed from the project objectives. The Critical Success Factors (CSF) can be defined as attributes essential to the successful delivery of the scheme and against which options can be assessed. DCC and the project team have defined the following CSF's to represent the requirements of Denbighshire County Council (DCC), stakeholders and project partners. Table 3-1 presents the full set of CSFs for the scheme.

Table 3-1: Critical Success Factors for the Central Rhyl study area

CSF	Category	Description
CSF1	Strategic fit	Must comply with Shoreline Management Plan and DCC local flood risk management plans
CSF2	Value for money	Must be economically viable option to manage coastal erosion and flood risk
CSF3	Supplier capacity	Must match the capacity of potential suppliers to deliver
CSF4	Potential affordability	Must be affordable by DCC and WG
CSF5	Potential achievability	Must be technically feasible and sustainable in the long-term
CSF6	Project specific	Must minimise impacts on the environment and provide enhancements where possible
CSF7	Project specific	Must assist the economy of Prestatyn by working with tourism and amenity use

3.2 Approach to options assessment

The assessment of options to manage flood risk and coastal erosion at Rhyl was undertaken by the project team consisting of Denbighshire County Council, JBA Consulting and Balfour Beatty. All possible options were identified and assessed as part of a long list workshop. All opportunities and constraints for each of the options were highlighted as part of a scored multi-criteria assessment. Do Something options with a high multi-criteria assessment score and which conformed to all of the CSFs were taken through to short list, as were the obligatory Walkaway and Business as Usual options to provide a baseline for comparison. Short list options were then assessed in greater detail, including concept designs, technical assessment of viability, economic appraisal and environmental assessment.

3.3 Identify Long List

A long list of options for Central Rhyl was developed based on discussions across the project team, focused around understanding the existing risk based on flood risk maps, erosion rates and defence condition assessments, an environmental constraints plan, engineering judgement and understanding of the Walkaway and Business as Usual scenarios. These were evaluated against the project objectives and CSFs, as well as undertaking a multi-criteria assessment using a SWOT (strength, weaknesses, opportunities and threats) analysis and the PESTLE framework (political, economic, social, technical, legal and environment factors). All options were assessed and scoring agreed at a project workshop held on 18 December 2018.

Due to the length of the frontage, the complexity of the site and the unique issues facing individual areas, the frontage has been split into sub-cells. These cells are named Sections

A-I. The overarching issue identified in Sections A-I is deterioration of existing assets leading to failure of defences and loss of promenade therefore all longlist options have been designed to take this into primary consideration.

The following provides a summary of the longlist options identified for Central Rhyl:

1. **Walkaway** – do nothing, cease all maintenance
2. **Business as Usual** – continue with existing maintenance regime
3. **New concrete sea wall** – install a new concrete sea wall
4. **New sheet pile sea wall** – install a new concrete capped sheet pile sea wall
5. **New rock armour revetment** – install a new rock armour revetment
6. **New concrete stepped revetment** – install a new concrete stepped revetment
7. **Rock scour protection** – install a new, double layer of rock armour at the toe to reduce risk of scour in combination with concrete repairs
8. **Encasement of the existing primary defence** – install a new concrete facing to the existing sea wall to reduce the rate of deterioration
9. **Encasement of existing primary defence with rock scour protection** – install a new concrete facing to existing sea wall to reduce rate of deterioration, in combination with rock works to reduce risk of scour
10. **Enhance existing groynes** - enhance the existing beach groynes, increasing the crest elevation and generally increasing the size
11. **Beach nourishment/recharge** – beach nourishment and/or recharge to the foreshore to encourage a high gently sloping beach to dissipate wave energy, as a short-term option
12. **Offshore sandscaping** – offshore sandscaping to encourage a high, gently sloping beach to dissipate wave energy
13. **Additional offshore options** – additional offshore options (e.g., breakwaters or geotubes) to dissipate wave energy

3.4 Screen the performance of each measure

Table 3-2 and Table 3-3 below summarises the decision making behind elimination of options to reach the option short list. Table 3-2 provides screening information against the long list (as a condensed version of the multi-criteria assessment (MCA) undertaken and presented in Appendix J), whilst Table 3-3 shows screening against the investment objectives and CSFs.

Table 3-2: Long List screening table

				Benefits Delivered / Risks Involved				
Option	**Type**	**Option Description**	**Section(s) Applicable**	**Strengths**	**Weaknesses**	**Opportunities**	**Threats**	**Short listed**
Obligatory options								
1	Walkaway	Do nothing, cease all maintenance	A-I	Low capital cost Low maintenance costs	High flood damages Failing defences will become unsafe and access restrictions may be required Risk to life during flood event Does not fulfil SMP2 Policy of HTL Loss of amenity as defences degrade	Works with natural coastal processes	Health and safety issues associated with failure	Yes
2	Business as Usual	Continue with existing maintenance regime	A-I	Low capital cost	High maintenance costs High future flood damages Failing defences will become unsafe and access restrictions may be required Does not fulfil SMP2 Policy of HTL in the medium to long term Risk to life during flood event in medium to long term		Health and safety issues associated with failure	Yes
Options to manage the risk of deterioration in defences leading to failure								
3	New concrete sea wall	Install a new concrete sea wall, as a long-term option	A-I	High standard of protection for long design life Meets SMP2 HTL Policy	High capital cost Medium maintenance costs Limited future adaptation to climate change, poor sustainability score	Potential amenity and community opportunities - access improvements	Potential for continued scour and ongoing beach losses	
4	New sheet pile sea wall	Install a new concrete capped sheet pile sea wall, as a long-term option	A-I	High standard of protection for medium design life Meets SMP2 HTL Policy	High capital cost High maintenance cost Shorter design life due to corrosion of piles Limited future adaptation to climate change - loss of amenity. Poor sustainability score. Landscape impacts - conflict with stakeholder goals		Scour risk may continue Corrosion of sheet pile may reduce design life	
5	Rock armour revetment	Install a rock armour revetment	A-I	Maximises lifetime of existing defences Minimal maintenance costs Meets SMP2 HTL Policy	High capital cost Loss of amenity due to introduction of rock on beach, poor sustainability score		Health and safety risk of rock armour	
6	Concrete stepped revetment	Install a concrete stepped revetment	A-I	Offers high standard of protection Meets SMP2 HTL Policy	High capital cost Poor sustainability score	Potential amenity and community opportunities - access improvements	Health and safety risk of algae growth on steps	Yes
7	Rock scour protection (just to toe of defence)	Double layer of rock armour installed at the toe to reduce risk of scour.	A-I	Maximises lifetime of existing defences Minimises risk of scour Meets SMP2 HTL Policy Limited consenting requirements	Medium-high capital cost Some flood risk in future Unlikely to manage flood risk or erosion in the long term. Not fully meeting SMP2 policy, Loss of amenity		Health and safety risk of rock armour	

8	Encasement of the existing primary defence	Concrete facing to existing sea wall to reduce rate of deterioration of wall.	A-I	Maximises lifetime of existing defences Meets SMP2 HTL Policy Limited consenting requirements	Medium capital costs Some flood risk in the future Unlikely to manage flood risk or erosion in the long term. Not fully meeting SMP2 policy,		Scour risk likely to continue	
9	Encasement of the existing primary defence with rock scour protection	Concrete facing to existing sea wall to reduce rate of deterioration of wall in combination with rock works to reduce risk of scour.	A-I	Maximises lifetime of existing defences Minimises risk of scour Limited consenting requirements	Medium capital cost High future flood damages Cannot manage flood risk or erosion in the long term. Not fully meeting SMP2 policy,		Health and safety risk of rock armour	Yes
10	Enhance existing groynes	Enhance the existing beach groynes, increasing the crest elevation and generally increasing the size, and reinstate derelict groynes	A-I	Promotes beach building Reduces risk of failure of existing defences	Medium capital cost Medium maintenance costs Without beach nourishment unlikely to be sufficient to raise beach to provide 100-year protection		Needs regular maintenance to be effective	
11	Beach nourishment / recharge	Beach nourishment and/or recharge to the foreshore to encourage a high gently sloping beach to dissipate wave energy.	A-I	Mitigates scour risk Can meet SMP2 policy Improved community well-being and recreation opportunities	High capital cost High maintenance cost Potential environmental impacts to be assessed - Could influence stakeholder support Potentially complex marine consenting	Increase amenity value of beach, although promenade would still require improvements for amenity value.	Needs regular maintenance to be effective	
12	Sandscaping	Sandscaping to encourage a high gently sloping beach to dissipate wave energy. Dedicated study undertaken to inform this option. *(Sandscaping feasibility study provided in Appendix L. Stage 3 of study not completed as option ruled out in OBC shortlisting)*	A-I	Mitigates scour risk Can meet SMP2 policy Sustainable option working with natural processes and providing opportunities for environmental enhancement Improved community well-being and recreation opportunities	High capital cost High maintenance cost Potential environmental impacts (re dredging and loss of intertidal/shallow subtidal features to be assessed – Could influence stakeholder support Potentially complex marine consenting	Can achieve long design life and high standard of protection Additional opportunities for environmental enhancement re landscape and biodiversity	Relies on existing defence for long term performance Reduced certainty in performance (when compared with hard engineering) Marine risk in dredging and supply of material	
13	Additional offshore options	Additional offshore options (e.g. breakwaters or geotubes) to dissipate wave energy, as a long-term option	A-I	Mitigates scour risk Low maintenance cost Can meet SMP2 policy	Very high capital cost Poor sustainability score Potentially complex marine consenting		Marine risk	

Table 3-3: Appraisal of options against the Critical Success Factors (CSFs). (Red – does not meet requirements, Yellow – does meet requirements, Green – enhances or exceeds requirements)

				Critical Success Factor								
Option	**Type**	**Option Description**	**Section(s) Applicable**	**CSF 1 Strategic**	**CSF 2 Value for Money**	**CSF 3 Supplier Capacity**	**CSF 4 Affordability**	**CSF 5 Achievability**	**CSF 6 Regenera-tion**	**CSF 7 Biodiversity Landscape Environment**	**MCA Score**	**Short-listed?**
1	Walkaway	Do nothing, cease all maintenance	A-I								35	Yes
2	Business as Usual	Continue with existing maintenance regime	A-I								35	Yes
3	New concrete sea wall	Install a new concrete sea wall, as a long-term option	A-I								39	
4	New sheet pile sea wall	Install a new concrete capped sheet pile sea wall, as a long-term option	A-I								32	
5	Rock armour revetment	Install a rock armour revetment	A-I								37	
6	Concrete stepped revetment	Install a concrete stepped revetment	A-I								42	Yes
7	Rock scour protection (just to toe of defence)	Double layer of rock armour installed at the toe to reduce risk of scour.	A-I								40	Yes
8	Encasement of the existing primary defence	Concrete facing to existing sea wall to reduce rate of deterioration of wall.	A-I								39	
9	Encasement of the existing primary defence with rock scour protection to toe	Concrete facing to existing sea wall to reduce rate of deterioration of wall in combination with rock works to reduce risk of scour.	A-I								39	
10	Enhance existing groynes	Enhance the existing beach groynes, increasing the crest elevation and generally increasing the size, and reinstate derelict groynes	A-I								36	
11	Beach nourishment / recharge	Beach nourishment and/or recharge to the foreshore to encourage a high gently sloping beach to dissipate wave energy	A-I								36	
12	Sandscaping	Sandscaping to encourage a high gently sloping beach to dissipate wave energy. (S*andscaping feasibility study provided in Appendix L. Stage 3 of study not completed as option ruled out in shortlisting*)	A-I								36	
13	Offshore options	Offshore options (e.g. breakwaters or geotubes) to dissipate wave energy	A-I								36	

3.5 Identify the Short List

From Table 3-4, all the Do Something options that did not meet the CSFs were rejected and not taken forward to the shortlist, with the exception of the Walkaway and Business as Usual baseline options. Additional Do something options were also discounted based upon significant weaknesses and threats identified in the multi-criteria assessment, summarised in Table 3-2 and presented in Appendix J. The options taken forward to short list for appraisal are presented in Table 3-4.

Table 3-4: Rhyl shortlisted options

Option	Long list option	Name	Description
WA	1	Walkaway	Do nothing, cease all maintenance
BaU	2	Business as Usual	Continue with existing maintenance regime
S1	7	Scour protection and concrete repairs	Existing stepped revetment defence will be repaired with concrete to extend the residual life of the existing defence. Rock armour scour protection constructed at the toe, as a long-term option
S2	6	Concrete stepped revetment	Install a new concrete stepped revetment, as a long-term option
S3	Combination of 6 and 7	Combined scour protection and stepped revetment.	Scour protection and concrete repairs along frontage with stepped revetments in focussed areas.

The Do something Options taken forward provide a varying standard of protection and design life.

Business as Usual maintains the defences for as long as possible but by 2068 the defences will be in such a deteriorated state that maintenance alone will not be sufficient. At this point it is assumed defences will fail / breach and erosion will commence.

S1 is designed to maintain the existing defence level by preventing erosion for 100 years, but flood risk will increase over time as sea levels rise.

S2 is designed to manage the risk of erosion and also flood risk due to tidal inundation and wave overtopping, to provide a standard of protection of 0.5% AEP in 100 years, with an allowance for climate change.

S3 is a combination of S1 and S2. Erosion will be managed across the eastern part of the frontage through implementation of S1 where erosion is the primary risk and land elevations mean flood risk is limited. S2 will be implemented to the western part of the frontage where the land levels are lower and wave overtopping and tidal inundation result in flood risk to the town. This combined option focusses the necessary works where they are required, reducing costs but providing a 0.5% AEP SoP in 100 years with an allowance for climate change.

Each Do something shortlisted option was taken forward to concept design and further investigation as part of this OBC.

3.6 Assessment of Short List

The three short list options were further investigated in terms of the engineering design, sustainability, well-being and economic performance. This includes hydraulic modelling incorporating inundation and wave overtopping to assess the impact of the option in terms of flood risk, environmental appraisal of options, development and appraisal of concept designs, economic appraisal and wider benefits appraisal.

Engineering performance of Short List OBC

Each of the Do Something short list options have been developed to concept design, providing general arrangements, cross-sections, appropriate details, assumptions and calculations where appropriate. These have been produced in accordance with RIBA Stage 2, as such that only high-level structural and geotechnical considerations have been made. Concept designs and proposed cross sections for the Do something short list options are provided in Appendix A

Option 1 – Walkaway

Under the Walkaway option no improvement works would be undertaken, and all maintenance will be ceased, with the exception of making the assets safe once failure has occurred. Existing defences are likely to fail by 2038, reflecting the residual life of the existing frontage. Following defence failure, the coastline is predicted to erode, and flood routes will open up into the town. PV costs to make this option safe in the long-term have not been included within the economic analysis. This option provides the baseline case for the economic appraisal.

During the present day 0.5% AEP event, the inundation modelling indicates that 261 properties are at risk of flooding in 2018. The number of properties at risk increases to 1,208 for the same event with a 100-year climate change allowance.

Option 2 - Business as Usual

Business as Usual consists of the continued implementation of the existing maintenance programme. However, based on the existing defence condition it will not be possible to manage flood and erosion risk across the study area in the longer term with maintenance only. By year 2068 the defences are likely to have deteriorated to such a condition that failure would occur without significant capital works being undertaken. As such this option delays defence failure and erosion but does not prevent it over the project lifetime. Based on this it has been assumed that maintenance will occur between years 0-50, costing £25,000 per annum. Once defence failure has occurred, the assets will need to be made safe. PV costs to make this option safe in the long-term have not been included within the economic analysis.

During the present day 0.5% AEP event, the inundation modelling indicates that 264 properties are at risk of flooding. The number of properties at risk increases to 1,212 for the same event with a 100-year climate change allowance. This shows a slight increase in properties at risk over the project lifetime, as a result of the flood mechanisms and land elevations along the Rhyl coastline. Under walkaway, when defences fail and a breach occurs the overtopping sea water flows inland during high tide levels, but due to the land sloping slightly seawards, this water is then able to flow out of the breach and back out to sea when tide levels fall. Under Business as Usual, when breaches are prevented, water overtops the defences at higher tide levels but as the tide levels fall, with the defence in place this water is unable to flow back out to sea and is instead trapped behind the defence and ponds resulting in greater flood

depths and extents. This indicates that continued maintenance of the existing defences will not improve the flood risk to Central Rhyl when compared with the walkaway scenario.

Option 3 – [S1] Scour protection and concrete repairs
Under this option, concrete repair works to the existing defences will be undertaken to extend the residual life of the defence, and rock armour scour protection will be added to the defence toe to manage scour and prevent undermining and failure of the defence. The rock toe protection will be buried below beach level and formed in a double interlocking layer. The existing promenade will remain unmodified. This option has not been designed to increase the standard of protection against flood risk along the frontage as the defence levels will not change but aims to manage failure of the defence due to undermining, increasing the residual life of the defence and preventing erosion of the frontage. This option assumes a one-off capital cost in Year 1 for the rock works, with concrete repair costs at 40-year intervals in addition to an annual maintenance allowance.

Through prevention of erosion and failure of the defences this option will maintain the amenity value of the frontage, maintaining the promenade, access to the beach, the Wales Coastal Path and many amenity assets located along the seafront. This is a key wider benefit of the scheme and will support the regeneration plans of this deprived coastal town and well-being of future generations.

During the present day 0.5% AEP event, the inundation modelling indicates that 266 properties are at risk of flooding. The number of properties at risk increases to 1,538 for the same event with a 100-year climate change allowance. This is an increase in flood risk compared to both Walkaway and Business as Usual. This increase in flood risk is due to the prevention of defence breaches. As with Business as Usual, but to a greater extent, overtopping water during a storm event is trapped behind the defences and unable to flow back out to sea as the tide falls. This results in increased flood water depths and extents compared to a Walkaway scenario where water could flow out to sea via defence breaches. This indicates that although this option will manage erosion risk but will not improve the flood risk to Central Rhyl.

Option 4 – [S2] New sea wall and stepped revetment
Option 4 will place a precast concrete stepped revetment over the existing stepped structure to dissipate wave energy arriving at the structure toe. The design of this option will prevent erosion of the revetment toe, as well as reducing the risk of wave overtopping and still water flooding and enhancing the amenity value of the seaside town. This option can be developed to provide increased access onto the beach and will be designed to be aesthetically appealing to seaside visitors. Improvement to the promenade could be incorporated and the Wales Coastal Path would be enhanced and integrated into the defence. A gravel filter layer will sit beneath the new revetment, with slots incorporated into the toe pile at one metre intervals to allow for drainage. A concrete capping beam will sit on top of the pile, at the toe of the revetment.

This option assumes a one-off capital cost in Year 1 for construction with an ongoing maintenance cost of £1,217 per annum thereafter. The option is designed to provide a SoP of 0.5% AEP in 100 years to Central Rhyl, with an allowance for climate change.

During the present day 0.5% AEP event, the inundation modelling indicates that 20 properties are at risk of flooding. The number of properties at risk increases to 620 for the same event with a 100-year climate change allowance. The properties which remain at flood risk once the scheme is in place are located immediately behind the recently completed West Rhyl defences. These properties flood as a result of water overtopping these West Rhyl defences and water depths are shallow (Figure 3-1). This residual flood risk is due to the West Rhyl scheme being designed to a lower climate change allowance, as was best practice at the time of scheme development. This study does not look to improve the West Rhyl defences as the SoP currently provided is appropriate and the defences are in good condition. These properties are not removed from the study area as they also flood from the Central Rhyl frontage in the baseline scenario and have a reduced flood risk as a result of the proposed Central Rhyl scheme.

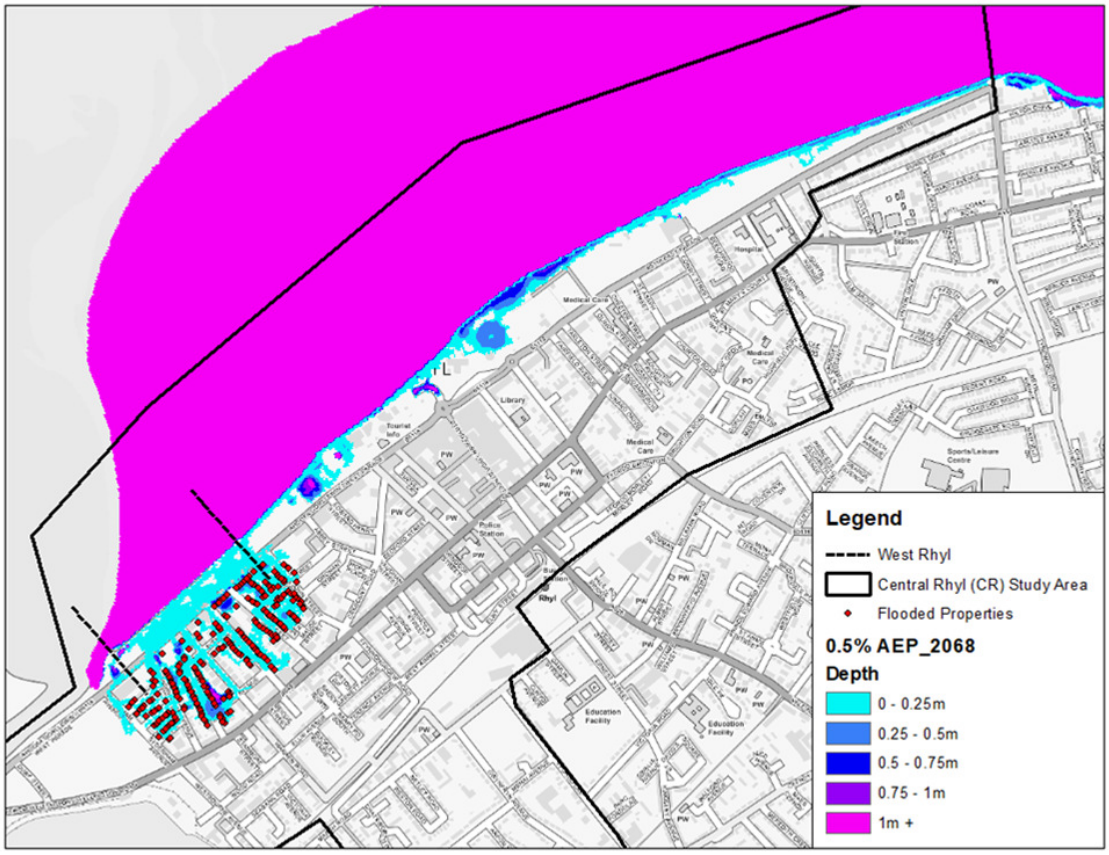

Figure 3-1: Properties identified as flooding in the 2068 0.5% AEP event with implementation of Option S3, Stepped Revetment and New Sea Wall.

Option 5 – [S3] Combination of scour protection and stepped revetment
Combined Option S3 incorporates both S1 and S2 Do Something options; including scour protection, concrete repairs, new sea wall and stepped revetment.

On assessment of S2 it was identified that this option would provide the required SoP but that capital costs were high and there would be potential environmental impacts

through the construction of a relatively large concrete structure across the frontage. S1 meanwhile managed erosion risk maintaining the amenity value but led to increased flood risk as water ponded behind defences. On analysis of the inundation modelling and failure mechanisms a more focussed option was therefore developed to provide an optimised way forwards employing combination of these two options across the frontage as and where required (S3).

This combined option includes scour protection and concrete repairs eastwards of the Rhyl RNLI station. Along this section failure of the sea wall and resulting erosion are the key risk to people and property. Land elevations along this section are such that flood risk is not a concern and as such implementation of improved defence levels is not required and implementation of concrete repairs and toe scour protection will be sufficient to maintain a 0.5% AEP standard of protection in 100 years to property.

Westwards of the RNLI station, a new concrete stepped revetment and sea wall will be constructed to manage flood risk due to wave overtopping and still water levels. Along this section flood risk is a major concern, with wave overtopping and in future still water levels resulting in flood risk to people and property. Construction of new defences will manage flood risk and erosion along this section to provide a 0.5% AEP standard of protection in 100 years.

This combined option reflects where the critical flow paths are within Rhyl and aims to minimise the materials and whole-life costs. This option assumes a one-off capital costs in Year 1 for construction of erosion and flood risk protection, with a continued maintenance cost of £1,217 per annum thereafter.

This option will provide the same benefits as Option S2, however the associated costs will be lower due to the targeted intervention. As such, during the present day 0.5% AEP event, the inundation modelling indicates that 20 properties are at risk of flooding, increasing to 620 for the same event with a 100-year climate change allowance. The properties which remain at flood risk once the scheme is in place are located immediately behind the recently completed West Rhyl defences as discussed for S2 above.

Other sources of flood risk

Properties in Central Rhyl may also be at flood risk from Rhyl Cut and also from the tidal River Clwyd.

Assessment of the Rhyl Cut flood risk has been undertaken as part of the Prestatyn Coastal Defences OBC, being undertaken in parallel with this study and using the same hydraulic modelling. This modelling shows that assets within the Central Rhyl study area are not at flood risk from Rhyl Cut or Prestatyn Gutter.

The River Clwyd Strategy review is currently underway. Discussion with NRW indicates that Central Rhyl may be at flood risk in future years from this flood source but that works are not required to the estuary defence on the right bank of the River in the near future. As such double counting was not assessed in detail.

The potential for groundwater flooding at Rhyl has not been investigated and will require assessment if the Preferred Option requires detailed design. At this OBC stage it has been assumed that there is no risk of groundwater flooding.

Ground Investigation
A Geotechnical and Geoenvironmental Desk Study has been undertaken for the Rhyl frontage (Appendix K), and a full ground investigation will be undertaken at detailed design. At this OBC stage, it is assumed that the ground investigations will not expose any unforeseen conditions which would impact the design of any option. An allowance for ground condition risk is however included in the preferred option risk register and option costings which may be reduced once GI has been undertaken at detailed design. Ground investigation works have recently been undertaken for the detailed design of the East Rhyl Coastal Defences. The East Rhyl frontage is located immediately adjacent to the Central Rhyl defences and as such the results of the East Rhyl GI works have been taken into account within the development of the Central Rhyl concept options and option costings. The consultants and contractor working on the East Rhyl works have also developed the West Rhyl OBC and incorporated their knowledge into this project.

Summary
The engineering performance of each of the three short list options were assessed in order to select a Preferred Option to be selected as the most appropriate way forward for DCC to adopt at Rhyl.

The Walkaway option will result in the short-term failure of the existing defences along the Rhyl frontage due to continued erosion and scour. This option is not considered technically viable as it will considerably reduce the standard of protection with future climate change. Similarly, the Business as Usual option will not result in a sufficient standard of protection to address the flood risk along the frontage, although will prolong the life of the existing structures. Both the Walkaway and Business as Usual options will also require the decommissioning of the existing structures in the short or medium term in order to make the failing defences safe.

As an advancement to the Business as Usual, option S1 has been designed to prolong the residual life of the existing defences in the longer term with the provision of a new rock armour toe and protect the frontage against erosion. However, aside from concrete repairs to the existing structures and maintenance of the defences, the standard of protection will remain as present, and thus will not result in sufficient standard of protection to address flood risk along the frontage in the long term.
Option S2 been designed to an acceptable standard of protection by installing a new primary defence. The existing defences will not need to be maintained and no additional structures will be required during the appraisal period, although maintenance will be required along the remaining frontage. This option uses standard construction techniques where construction will be within the public realm.
Option S3, as a combination of S1 and S2, has been designed to utilise the advantages of these options as such that each section of the frontage has been assessed separately for erosion and flood risk to optimise the volumes of materials and costs required whilst achieving the best technical performance in the long term in terms of standard of protection required.

Sustainability and well-being performance of Short List OBC
This section summarises how each option contributes towards environment, sustainability and delivery of the Well-Being of Future Generations Act.

Table 3-5: Summary of Sustainability and Well-being of Future Generations act

Sustainability and well-being performance of short list		Walkaway	Business as Usual	S1 – Scour protection and concrete repairs	S2 – New sea wall and stepped revetment	S3 – Combination Option
Does the option meet local well-being objectives?		Individuals' homes would become more susceptible to flooding and erosion over time, potentially increasing stress and mental health issues. Community empowerment would not be supported. Would not defend against an increasing flood and erosion risk so would not enhance environmental resilience.	Would not provide a greater standard of flooding protection to residents of Central Rhyl than there is at present, so would not contribute to enhancing environmental resilience. Erosion risk would be delayed but not prevented - providing minimal benefits but not fully alleviating stress and mental health issues. Regular maintenance but no improvement works would mean properties would become more susceptible to flooding over time, which could compromise local mental health.	Would provide greater protection to properties in Central Rhyl from erosion and maintain amenity value of promenade, increasing environmental resilience and supporting local mental well-being. However, this option would result in increased flood depths and perception of increased flood risk. Homes would become more susceptible to flooding and erosion over time, potentially increasing stress and mental health issues. Community empowerment would not be supported. Would not defend against an increasing flood risk so would not enhance environmental resilience. Construction of the structure could temporarily increase disturbance of Rhyl residents, producing a slight negative impact on community well-being.	Would provide greater protection to properties in Central Rhyl from flooding, increasing environmental resilience and supporting local mental well-being. Construction of the structure could temporarily increase disturbance of Rhyl residents, producing a slight negative impact on community well-being. This option also requires annual maintenance which may have a minor impact on an infrequent basis. Option would include enhancements such as improvements to Wales Coastal Path and improved beach access to support community well-being, fitness and recreation.	Would provide greater protection to properties in Central Rhyl from flooding, increasing environmental resilience and supporting local mental well-being. Construction of the structure could temporarily increase disturbance of Rhyl residents, producing a slight negative impact on community well-being. This option also requires annual maintenance which may have a minor impact on an infrequent basis. Option would include enhancements such as improvements to Wales Coastal Path and improved beach access to support community well-being, fitness and recreation.
How has the option been developed following the 5 ways of working?		Would not help to meet long-term needs or act to prevent current or future problems. Walkaway may also hinder Local Authorities from achieving their own well-being goals.	Flood risk and erosion is managed only in the short term and likely to get worse. This would do very little to help long-term needs or prevent future problems. Business as Usual, in future, could hinder Local Authorities from achieving their own well-being goals.	Would help to safeguard the ability to meet long-term needs in terms of managing erosion. Options does not prevent an increase in the severity of flooding in Rhyl which could hinder Local Authorities from achieving their own well-being goals. Community engagement in such a project would achieve a collaborative way of working.	Would help to safeguard the ability to meet long-term needs. Preventing an increase in the severity of flooding in Rhyl may help DCC meet its objectives. Community engagement in such a project would achieve a collaborative way of working.	Would help to safeguard the ability to meet long-term needs. Preventing an increase in the severity of flooding in Rhyl may help DCC meet its objectives. Community engagement in such a project would achieve a collaborative way of working.
How does each option maximise the RMA's contribution across the 7 WBFGA well-being goals?	A prosperous Wales	Would not contribute to prosperity in Rhyl, placing the town under a threat to its prosperity from tidal flooding and erosion. Potential for the Local Authority to save resources spent on this resource for other uses.	Would not contribute to prosperity in Rhyl, placing the town under a threat to its prosperity from tidal flooding and erosion as the existing defences become less effective. Maintenance would use local labour where possible.	Would manage erosion risk to residential areas of Central Rhyl, supporting tourism and a prosperous economy. This scheme would use local labour where possible. Ongoing annual maintenance costs are associated with this option; however, they are comparably lower than existing Business as Usual annual maintenance costs.	Would reduce flood risk to residential areas of Central Rhyl. This scheme would use local labour where possible. Ongoing annual maintenance costs are associated with this option; however, they are comparably low to the existing Business as Usual annual maintenance costs. Would support proposed Rhyl development plans.	Would reduce flood risk to residential areas of Central Rhyl. This scheme would use local labour where possible. Ongoing annual maintenance costs are associated with this option; however, they are comparably low to the existing Business as Usual annual maintenance costs. Would support proposed Rhyl development plans
	A resilient Wales	Would not manage flood risk, thereby would not contribute to the resilience of the Rhyl community.	Would manage flood and erosion risk as it is at present but offers no capacity to defend against predicted climatic change.	Manages erosion risk into the future but offers no capacity to defend against flood risk and predicted climatic change.	Manages flood risk, with the capacity for predicted climate change.	Manages flood risk, with the capacity for predicted climate change.

	A healthier Wales	Likely to lead to increase in community stress as defence against flooding is ended, negatively impacting on health.	Likely to lead to increase in community stress as defence against flooding steadily reduces as flooding becomes more severe, and failure leads to erosion, negatively impacting health.	Likely to lead to increase in community stress in future as defence against flooding steadily reduces as flooding becomes more severe, negatively impacting on health	Reduction in stress to communities currently at flood and erosion risk (reduced flood risk to properties and increased SoP).	Reduction in stress to communities currently at flood and erosion risk (reduced flood risk to properties and increased SoP).
	A more equal Wales	Offers no protection to Rhyl, one of the most deprived settlements in Wales – the poorest in society will be those suffering the most from climatic change.	Offers no long-term flood or erosion protection to Rhyl, one of the most deprived settlements in Wales – the poorest in society will be those suffering the most from climatic change.	Would manage erosion risk, one of the most deprived settlements in Wales, contributing to an increase in affluence and competitiveness. However, offers no flood protection to Rhyl, one of the most deprived settlements in Wales – the poorest in society will be those suffering the most from climatic change.	Would increase flood defences to Rhyl, one of the most deprived settlements in Wales, contributing to an increase in affluence and increasing the town's competitiveness.	Would increase flood defences to Rhyl, one of the most deprived settlements in Wales, contributing to an increase in affluence and increasing the town's competitiveness.
	A Wales of cohesive communities	Would not provide flood or erosion protection to Rhyl, threatening its cohesion.	Would not provide increased flood protection or manage erosion risk to Rhyl, threatening its cohesion in future, as climate change increases the frequency and severity of flood events.	Would not provide increased flood protection to Rhyl, threatening its cohesion in future, as climate change increases the frequency and severity of flood events. Manages erosion risk which will however help support a cohesive community.	Provides increased flood and erosion protection to properties and a greater standard of protection.	Provides increased flood and erosion protection to properties and a greater standard of protection.
	A Wales of vibrant culture and thriving Welsh language	Not expected to contribute to Welsh culture or language.	Not expected to contribute to Welsh culture or language.	Not expected to significantly contribute to Welsh culture or language. Welsh language information boards can be placed around the construction site.	Not expected to significantly contribute to Welsh culture or language. Welsh language information boards can be placed around the construction site.	Not expected to significantly contribute to Welsh culture or language. Welsh language information boards can be placed around the construction site.
	A globally responsible Wales	Unlikely to have a significant positive or negative impact in contributing to a globally responsible Wales.	Unlikely to have a significant positive or negative impact in contributing to a globally responsible Wales.	May result in coastal squeeze, reducing viable habitat for local biological communities.	May result in coastal squeeze, reducing viable habitat for local biological communities.	May result in coastal squeeze, reducing viable habitat for local biological communities.
Performance of each option given climate uncertainty (now and in the future) and expected future climate change?		More likely than any of the other options to perform poorly in expected future climate changes, and result in more frequent and severe flooding and erosion of the coastal frontage in Central Rhyl.	Would result in failure of defences in medium term and also existing defences overtopping more frequently. A Business as Usual Scenario would be likely to perform poorly given future climate uncertainty.	Rock at toe provides adaptable approach to climate change for erosion. No improvements to defence level resulting in existing defences overtopping more frequently. As no change to primary defences, would be likely to perform poorly given future climate uncertainty.	Would provide a greater standard of protection than currently and would be relatively resilient to future climate change.	Would provide a greater standard of protection than currently and would be relatively resilient to future climate change.
The adaptability and resilience of options to future change?		Offers no resilience to future changes and means that the defences will eventually fail, sooner than in any other scenario.	Offers resilience to current conditions but does not offer further adaptability or resilience to any future changes.	Would offer a SoP against erosion greater than a WA or BaU Scenario. It would require maintenance, but costs would be more predictable and regular, meaning it is more resilient to future socio-economic change. However, option offers no resilience in terms of flood risk and with no works to existing defences other than erosion protection.	Would offer an SoP greater than a WA or BaU. Would require maintenance, but costs are predictable and regular, so it is more resilient to socio-economic change. Maintenance could involve heavy machinery which could be opposed in future.	Would offer an SoP greater than a WA or BaU Scenario. This scenario would require maintenance, but costs would be more predictable and regular, meaning it is more resilient to future socio-economic change. Maintenance would involve heavy machinery working in amenity areas, which could be opposed in future.
Has appropriate environment assessment been undertaken?		Environmental assessment has not been undertaken as this option is considered as putting local residents under unacceptable risk.	Environmental assessment has not been undertaken as this option is considered as putting local residents under unacceptable risk.	Environmental considerations and constraints were considered in the options appraisal. Given the location of the adjacent Liverpool Bay SPA and the extent of the proposals (affecting over 5% of the North Wales coastal waterbody), it is likely that HRA, statutory EIA, and detailed WFD assessment would be required.	Environmental considerations and constraints were considered in the options appraisal. Given the location of the adjacent Liverpool Bay SPA and the extent of the proposals (affecting over 5% of the North Wales coastal waterbody), it is likely that HRA, statutory EIA, and detailed WFD assessment would be required.	Environmental constraints were considered in the appraisal, during which this became the preferred option. A PEIR has been produced and can be found as an appendix to this document. Given the location of the adjacent Liverpool Bay SPA and the extent of the proposals (affecting over 5% of the North Wales coastal waterbody), it is likely that HRA, statutory EIA, and detailed WFD assessment will be required.

Economic performance of Short List

Flood Damages

As required by the MCM and Green Book, the assessment of project benefits has been based on an estimated 100-year present value discounted damages avoided by project implementation. The estimation of average damages has incorporated three main components:

1. A hydraulic flood modelling study of the area based on the Coastal Flood Boundary Conditions dataset, current sea level rise estimates and EurOtop neural network wave overtopping calculations. The flood damages were assessed using the modelled flood depths and National Receptor Dataset (2014) in accordance with FCERM AG and the MCM/Green Book economic analysis methods, using a JBA proprietary software package called FRISM, thereby assessing average 100-year damages with rising sea levels as part of the economic analysis. Flood damage estimates have been derived for; direct tangible damages, emergency costs, vehicle damages and intangible damages.
2. Based on the asset condition report and coastal processes report it is estimated that defences will fail at the end of their residual life and erosion of the promenade will lead to loss of assets along the seafront as the coastline recedes. Coastal recession rates have been based on the NCERM rate of 0.4m/yr (see Appendix E Coastal Processes).
3. The tourism economy is extremely important to the economy of Rhyl as a seaside town and also to the Wales economy. Tourism numbers are estimated at 1.7 million in 2017 based on STEAM data provided by DCC. As coastal defences fail, and the promenade and seafront assets are lost the tourism appeal of the town will decrease resulting in significant economic impacts. The economic damages for loss of tourism due to defence failure have been calculated based on best practice methodology as presented in MCM (FHRC 2013).

The results of the damage assessments have been used to calculate the economic benefits of each shortlisted option compared to the baseline case, Walkaway. In addition, the shortlist options have been presented using Business as Usual as the baseline case as required by the latest WG Business Case guidance.

Summary economic figures for each of the options are found in Table 3-6 below. This table shows the damages for each option and then the benefits compared against the Business as Usual and then Walkaway baselines.

Additional detail regarding the economic analysis, is provided in Appendix G - Economic Appraisal Report. Table 3-6 provides a summary of the benefits of the shortlisted options.

Table 3-6: Summary of Present Value Flood Damages and Benefits for Shortlisted Options

Scenario	Property Type	0.1% AEP [2118] Number of Properties flooded	Present Value Damages (£k)						PVb against WA (£k)	PVb against BAU (£k)
			Property Damages	Emergency Damages	Indirect Damages	Intangible Damages	Vehicle Damages	Total Damage		
Walkaway (WA)	Res	1,378	5,513	349	829	1,519	107	9,040	-	-
	Non Res	210	723							
	Total	1,588	6,236							
Business as Usual (BAU)	Res	1,393	5,645	402	853	1,505	105	10,037	-997	-
	Non Res	222	1,708							
	Total	1,615	7,173							
S1	Res	1,646	24,551	1,679	3,860	2,470	1,494	39,490	-30,450	-29,453
	Non Res	333	5,436							
	Total	1,979	29,987							
S2/S3*	Res	699	3,344	214	606	802	67	5,502	3,538	4,535
	Non Res	33	470							
	Total	732	3,814							

*Option S2/S3 have the same option benefits therefore have been combined to avoid duplication. These options have different associated costs so are assessed as separate options in the Benefit-Cost Ratio table.

Erosion Damages
Residential and non-residential erosion damages were calculated for both the Walkaway and Business as Usual scenarios at 5-year intervals between 2018 and 2118. Based on the current condition of defences along the Rhyl frontage, erosion was assumed to commence along each section as the defence failed. In the years following failure, recession distances were calculated using NCERM 95% erosion rate of 0.4 m/yr (Environment Agency, 2012).

Table 3-7 presents the properties written off to erosion and the respective year of less for Business as Usual and Walkaway scenarios. In Walkaway this totals £1,277k total damages, reducing to £344k in Business as Usual as defence failure is delayed. All 'Do Something' options mitigate erosion and no erosion damages are incurred.

Table 3-7: Year of loss to erosion for each property in Central Rhyl for the Walkaway and Business as Usual scenarios

Address	Walkaway Yr of Loss	Business As Usual Yr of Loss
Kiosk (water Games)	20	25
Kiosk (souvenirs)	20	25
Shop	30	60
Goods kiosk	30	30
Ice cream kiosk	35	35
Apollo cinema	45	45
Building C	35	-
Building D	45	45
Ice cream kiosk	90	90
Seaquarium	45	65
Lifeboat house	60	85
Sun Centre	90	-
Total PV damages (£k)	**1,227**	**344**

Tourism Damages
The existing promenade, beach access and seafront amenities are key to attracting tourists to the area. Should the defences and promenade be allowed to fail this would have a significant detrimental economic impact, with tourists likely to stop travelling to Rhyl. The economic impact of defence failure and loss of tourism has been calculated in accordance with the MCM and handbook (FHRC 2015) and FCERM AG (EA 2010) based on the value of enjoyment method.

The value of enjoyment assessment was undertaken based on example values set out in the MCM. Of the sites listed, Herne Bay was taken as the most representative of the Rhyl erosion scenario with changes described as 'deterioration in beach, seawall and promenade collapse in parts'. This gives a loss per adult visitor of £7.69 per adult visitor uplifted to 2019.

STEAM data provided by DCC states 2017 visitor numbers of 1.7 million. It is assumed that 80% of these visitors visit Rhyl for the seafront amenity. To allow for further uncertainty in the numbers high, medium and low tourism scenarios were assessed with 100%, 75% and 50% of visitors no longer revisiting the site post defence failure respectively. The lower 50% scenario is applied in the OBC to present a conservative approach.

Under the walkaway scenario, it is assumed that tourism damages commence in year 25, assuming visitors may initially continue to visit the area to see the eroded, failing defences. In the Business as Usual scenario, half of the frontage is first breached in year 20, therefore damages start to accrue from year 25. It is assumed that half of the visitors would fail to visit at this time, with the remaining being lost once the full frontage is breached in Year 50. Table 3-8 provides a summary of the economic tourism damages calculated. Similarly to erosion damages, tourism is largely based on the presence of the promenade. Therefore, Options S1 to S2, which prevent erosion of the promenade accrue no tourism damages.

Table 3-8: Rhyl Walkaway and Business as Usual tourism damages and benefits (low tourism estimate)

Option	No. of visitors lost (k)	PVd (£k)	Benefits against WA (£)	Benefits against BAU (£)
Walkaway	650	63,752	-	-
Business as Usual	650	42,839	20,913	-
S1	650	0	63,752	42,839
S2/S3	650	0	63,752	42,839

Total Damages

Table 3-9: Summary of total damages, inclusive of flood, erosion and tourism.

Damage Category	Business as Usual (Baseline) (PV£)	Option 1 (PV£)	Option 2 (PV£)	Option 3 (PV£)
Total damages	53,220,641	39,490,076	5,501,911	5,501,911
Total damages avoided (Benefits)		13,730,565	47,718,730	47,718,730
Damage Category	**Walkaway (Alternative Baseline) (PV£)**	**Option 1 (PV£)**	**Option 2 (PV£)**	**Option 3 (PV£)**
Flood damages	74,018,885	39,490,076	5,501,911	5,501,911
Flood damages avoided (Benefits)	-	34,528,809	68,516,974	68,516,974

Costs

The costs for each shortlisted option have been estimated through Early Contractor Involvement based on the outline designs developed for each option. These include estimates of capital costs, maintenance costs, design fees, consultant and client costs, site investigation and survey and risk. An optimism bias of 40% has been applied to all costs based on the scheme being costed through ECI, having incorporated information from the adjacent East Rhyl scheme and due to the level of detail available on option design.

Benefit Cost Ratio

Table 3-10: Summary of Economic Appraisal (Walkaway Baseline)

Option	Present Value Costs (£k)	Present Value Damages (£k)	Present Value Benefits (£k)	Benefit Cost Ratio	Incremental Benefit Cost Ratio
Walkaway	-	74,020	-	-	-
Business as Usual	864	53,220	20,800	24.1	-
S1 - Scour protection and concrete repairs	21,957	39,490	34,530	1.6	0.7 (compared against BAU)
S2 - Concrete sea wall and stepped revetment	51,273	5,502	68,518	1.3	1.2 (compared against Scour)
S3 - Combination option	36,145	5,502	68,518	1.9	2.4 (compared against Scour)

The Business as Usual option is the most economically viable when compared to Walkaway with a high BCR of 24.1. However, this option only delays failure of the

defence and coastal recession, and results in slightly increased flood risk to the town as overtopping water builds up behind defences during storm events, unable to flow back to sea. This option therefore does not provide a long-term solution to manage flood and erosion risk. This is shown in that it does not achieve all critical success factors outlined in Section 1.3. As such this option is not taken forwards as a preferred option.
The next highest BCR is S3, the combination option with a BCR of 1.9 with Walkaway as the baseline. This option provides a long-term solution to managing flood and erosion risk and meets the CSFs and overall project objectives. Rock sour protection prevents erosion along the eastern section of the frontage while a new wall and stepped revetment manage wave overtopping and still water flood risk along the western section. This option will provide a long-term solution to flood risk management and will also work to support local regeneration plans for the town and maintain the tourist appeal of this deprived seaside town.

The results of the BCR analysis with Business as Usual as the baseline option are presented in Table 3-11. The BCR of the economically preferred option remains above unity at 1.3 when using BAU as the economic baseline. The combination option is therefore taken forwards as the preferred economic option.

Table 3-11: Benefit Cost Ratio Results (Business as Usual Baseline)

Option	PV Costs (£k)	PV Damages (£k)	PV Benefits (£k)	Benefit Cost Ratio	Incremental Benefit Cost Ratio
Business as Usual	864	53,220	-	-	-
S1 - Scour protection and concrete repairs	21,957	39,490	13,730	0.6	-
S2 - Concrete sea wall and stepped revetment	51,273	5,502	47,718	0.9	1.2 (compared against Scour)
S3 - Combination option	36,145	5,502	47,718	1.3	2.4 (compared against Scour)

Wider Benefits
Alongside the flood risk and erosion benefits identified the proposed coastal defence scheme will also support the ongoing regeneration plans for Rhyl Town Centre. DCC has received Welsh Government funding and raised council match funding for regeneration of the deprived town and High Street. This includes more than £1.3 million of Welsh Government Targeted Regeneration Investment to revitalise the town centre, £2.5 million of Welsh Government investment to acquire the Queen's Buildings, £40 million of funding for a new community hospital at the Royal Alexandra Hospital and £900,000 to develop affordable housing in West Rhyl.

The latest regeneration plans for the high street and town centre include proposals focussed around improving access between the waterfront and promenade to the town centre. This is to encourage those visiting the seafront to travel into the town centre and help support the local economy, whilst also aiming to improve the visual appeal of the town. Management of flood risk and maintaining the promenade and seaside access by preventing failure of defences will be key to providing this link between the

town and beach. Investment in the defences will therefore bring significant wider benefits, supporting regeneration which in turn will support the local economic and help improve the health and well-being of the local community. The preferred option of a stepped revetment along the western section of the frontage could be designed to provide a focal point along the frontage to link the town and seafront, providing great amenity value as well as providing flood risk management. The rock works along the eastern section of the frontage would maintain the integrity of the promenade and prevent loss of this key amenity asset.

Preferred Option Costs

Table 3-12: Present Value cost summary table for preferred option

Costs	Present Value costs (£k)
Costs up to OBC	
Staff costs	20
Site investigation and survey	-
Consultants' fees	113
Contractors' fees	77
Subtotal	**211**
OBC to construction:	
DCC staff costs	397
BB (contractor) staff costs	352
Site investigation and survey	900
JBA (consultant) design fees	1,200
Subtotal	**2,848**
Construction:	
Construction costs	15,709
Inflation allowance	-
Environmental mitigation	813
BB/contractor staff and site supervision costs	4,646
DCC staff costs	349
JBA and DCC Site supervision	650
Subtotal (total PV capital)	**22,167**
Future costs:	
Maintenance	34
Future Capital Works (Concrete Repairs – year 40)	66
Future Capital Works (Concrete Repairs – year 80)	21
Risk contingency:	
Risk (50th %ile)	682
Optimism bias (40%)	10,327
Total costs from summary	**36,145**

Financial performance of Short List
The scheme is being funded through DCC Local Government prudential borrowing, supported by Welsh Government as part of the Wales Coastal Risk Management Programme. There were limited opportunities for wider benefits that could lead to other funding contributions. Those identified were:

- Regeneration – Denbighshire is trying to increase investment in Rhyl and has already attracted funding from WG for regeneration purposes. As DCC is looking to attract private developers, obtaining contributions from developers for a coastal defence scheme is likely to deter investors. The improved coastal protection from all Do Something options will give investors and developers confidence leading to increased land values. So, the scheme will increase value but not gain contributions from regeneration.

- Amenity value of the beach – All do something options provide an increased amenity value by preventing failure and erosion of the promenade. Options S2 and S3 will also result in the beach becoming more accessible. The beach at Central Rhyl is adjacent to hotels and other tourist amenities. Given the seasonal nature of tourism in this area, and all caravan sites being located outside of the Rhyl study area, it is unlikely a sufficient contribution can be sought from businesses relying on the beach.

- Direct beneficiaries – The direct beneficiaries are local residents and tourists, however given the area being classed as one of the most deprived settlements in Wales, it would be difficult to negotiate contributions.

- The Crown Estates - The intertidal zone of the defence is managed by DCC through a Lease of the Foreshore from The Crown Estate (TCE). An increase in amenity value could lead to an increase in fees from TCE rather than a contribution.

Selection of Preferred Option
The shortlisted options were further appraised using multi criteria assessment (MCA) to identify on overall preferred option. This assessment was undertaken as a project team workshop to ensure all disciplines were covered and the results are presented in Table 3-13 below. This analysis was supported by various background studies provided as Appendices.

The overall preferred option is Option S3 – combined scour protection and stepped revetment with the highest MCA score.

- It meets all the CSFs and objectives
- It meets DCC's requirement to reduce flood and erosion risk to an acceptable standard, providing a 0.5% AEP in 2118.
- It supports the tourism economy, maintaining the promenade and beach access and the Wales Coastal Path.
- The option can be designed to provide a focal point, with integrated beach access to support regeneration plans for the town centre and high street.
- Environmental enhancements can be built into the scheme such as into the rock structure and landscape improvements along the promenade.

- The scheme is economically viable and affordable.

Table 3-13: Shortlist Multi Criteria Assessment

	Walk Away (WA)	Business As Usual (BAU)	S1	S2	S3
Central Rhyl & Prestatyn OBC Central Rhyl Options Appraisal Multi-Criteria Analysis	Do nothing, cease all maintenance	Continue with existing maintenance regime	Rock Armour Scour Protection	Concrete stepped revetment	Combined Option Stepped Revetment by Aquarium, Rock Armour Scour Protection to east
Engineering					
Capital Costs	5	4	2	1	2
Maintenance costs	4	3	3	5	4
Buildability	3	3	2	4	3
Standard of Protection - Erosion	1	2	5	5	5
Standard of Protection - Flood Risk	1	1	1	5	4
Design Life	1	2	3	5	4
Ease of maintenance	1	2	2	5	3
scour / beach lowering / defence under	3	3	5	4	4
Reliance on existing infrastructure	1	1	2	5	3
Climate Change Adaptability	1	2	3	2	3
Environmental					
Coastal Processes	3	3	3	3	3
Biodiversity & Nature	3	3	2	2	2
Landscape & Visual	1	1	2	5	4
Archaeology	3	3	2	2	2
Population, human health &	1	2	3	5	4
Climate change & Sustainability	3	2	2	1	1
Water Quality (construction)	3	3	2	2	2
Strategic Policy (SMPs)	1	2	4	5	5
Consents and Licences	3	3	2	2	2
Public Health and Safety	1	2	2	4	3
Score	43	47	52	72	63

Scoring	
Very Negative	1
Negative	2
No change/Neutral	3
Positive	4
Very Positive	5

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3.7 Further Development and Testing of Preferred Option

Outline Design and reassessment of costs

The following describes how the costs were estimated for the shortlisted options at OBC stage.

Capital costs

At this stage, Balfour Beatty have developed the capital costs based on the Conceptual Design Proposals for all shortlist options. In pricing these designs, Balfour Beatty made use of current local supply chain costs (dredging using Liverpool bay sources, local rock placement plant capabilities etc) and recent experience on similar Coastal Defence Projects (in particular Fylde Coast Defence works). Potential variation in capital costs between OBC and construction are identified as:

- design development (i.e. length of defence structures, extents of landscaping works etc)
- unknown impacts of the UK leaving the EU
- unexpected impact of inflation
- unexpected restrictions on working practice (for example road delivery of rock considered for rock sour works, should this not be possible marine delivery may be required)
- discovery of ecological, archaeological or other such concerns which result in a revision to construction practice beyond that which have been identified in the design services to date.

Maintenance costs

Maintenance costs were estimated for the new structures using guidance in the Environment Agency report 'Cost estimation for coastal protection'1 and existing ongoing maintenance cost information provided by DCC. Maintenance costs provided by DCC take into consideration the ad hoc repairs required after a storm event as well as ongoing maintenance requirements.

In general, substantial schemes, which are likely to have much higher initial construction costs, may require a much lower level of long-term maintenance commitment. In considering scheme maintenance for the combined option, higher maintenance requirements have been considered for the existing structure and rock scour protection along the eastern section, with lower maintenance requirements for the new sea wall concrete stepped revetment along the western section.

Staff costs

Staff costs include all DCC, JBA and BB's costs from the OBC stage to the completion of construction. These costs are itemised as either consultant/contractor fees, cost consultant fees or site supervision. JBA's fees have been estimated based on a percentage of the construction costs and BB have estimated their costs within the SCAPE contract. DCC costs have been estimated by Wayne Hope (Denbighshire Flood Risk Manager).

1 Cost estimation for coastal protection – summary of evidence Report –SC080039/R7, Environment Agency, 2015

Risk and optimism bias
A 40% optimism bias has been applied. This has been reduced from 60% based on the inclusion of data and lessons learned from the adjacent East Rhyl scheme, inclusion of ECI in the development of the costs and the inclusion of a monte carol analysis risk register for the preferred option. An optimism bias spreadsheet calculator is available for this scheme.

The risk register for the preferred option is provided in Appendix H. In accordance with best practice guidance the 50th%ile has been included in the economic appraisal and the 95th%ile in the financial case for funding approval.

Planning and Marine Licence will be required for the construction works and it is considered likely that an EIA will be necessary for scheme construction, although Screening response has not yet been received to confirm this.

Sensitivity Testing
Sensitivity testing of the short-listed options was undertaken to assess the robustness of the preferred option. Further information on the sensitivity test conducted for the options can be found in the economics report in Appendix G. Sensitivity testing was undertaken on the price of rock used in the scour protection and the tourism figures used in the benefits assessment.

It has been reported that the price of rock may be affected by the United Kingdom leaving the European Union (EU). As leaving the EU is likely to happen prior to the construction of this scheme, a sensitivity test on the price of rock was undertaken.
The results indicate that 50% increase, S3, combined option remains economic and remains the preferred option.

As discussed in section 2.6.3, high, medium and low scenarios were assessed for tourism damages based on visitor numbers declining. In order to take a conservative approach to incorporating tourism damages, the 50% value was used in the main assessment. This was due to tourism damages being much larger than flood and erosion damages. In order to test the effect of higher damages against the anticipated Benefit-Cost Ratios, a sensitivity was undertaken.

Using the higher tourism values the Benefit Cost Ratios of all options increase to over 2.0, with S1 scour protection becoming the highest with a BCR of 3.0. With the increased tourism damages, combination option (S3) remains the preferred option due to a positive BCR and an iBCR considerably above unity.

3.8 Stakeholder engagement (Economic Case)
Initial engagement on the options for Central Rhyl and Central Prestatyn was undertaken at a Sandscaping Workshop (held on 29th November at the Nova Centre, attended by representatives from NRW (Delyth Rowlands, Planning and Emmer Litt, Coastal Processes), CPAT (Mark Walters), Flintshire (Amanda Davies Biodiversity) and DCC Officers (Joel Walley, Biodiversity – and Sarah Stubbs, Planning). RSPB were also invited.

Further information on the long-list options being considered was shared with stakeholders in January 2019 (18th January) and a Stakeholder Engagement Workshop run on 3rd April 2019 at the Rhyl Fire Station to present and discuss short-list options. This was attended by NRW (Gareth Thomas, Planning Ryan Knowles, Flood Risk, James Williams, Drainage and

Emmer Litt, Coastal Processes), Sustrans, (Glyn Evans), Ion Developments (Jenny Moroney) and Denbighshire County Council Officers (Joel Walley and Wayne Hope).

Issues raised during the workshop and in related correspondence which should be incorporated into detailed design include:

- CPAT concerns re excavations in the beach – and appropriate surveys, investigations and assessments during detailed design stage for any options
- Sustrans request for consideration of impact on walkers and cyclists using the existing Promenade and coast path
- DCC Biodiversity concerns re potential impact on sediment transport and secondary impacts on the Little Tern colony at Gronant Dunes.
- A formal request for comment through NRW's Discretionary Advice Service was made in advance of the April Workshop. The NRW response provided covered both Central Rhyl and Central Prestatyn – some issues were common to both. Key points and issues that were raised by NRW are summarised in Appendix I.

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4 Commercial Case

4.1 Procurement Strategy

Description of the procurement strategy

Denbighshire County Council (DCC) have progressed the Central Rhyl Coastal Defence Project to date through the OBC stage using the Scape Civil Engineering and Infrastructure Framework (Scape CE&I) using the Framework Contractor Balfour Beatty. If the OBC is granted further funding, DCC's intention would be to put the Preconstruction (detailed design) and Construction stages through the same framework. Scape is a public sector organisation established to facilitate the delivery of Construction and Consultancy Services to public sector clients in line with EU Procurement Regulations.

The Scape Procure CE&I framework is an efficient procurement, single contractor framework, that enables early contract involvement to help develop schemes from inception onwards as well as provide a quick route to construction for developed schemes.

The CE&I framework is an OJEU compliant route to delivery and is summarised below with the various routes to contract.

Table 4-1: Routes to contract

Project Stage	Scape Gate	Route for Progression
Inception	Access Agreement	Signed with Scape to enable client access to all Scape Procure Frameworks
Feasibility	Project Request	Signals the start of feasibility and enables Balfour Beatty to commence ECI activities through which a feasibility report is produced with target costs for the entire scheme and durations for preconstruction.
Project Delivery Stage 1 - Preconstruction	Two Stage NEC Delivery Agreement (Option C)	A two Stage NEC3 Option C Contract starts the Preconstruction Period, within which are a number of discrete budget items for call off at the clients Discretion. A two Stage NEC3 Contract is in place between DCC and BB currently. These items include: Stage 1 Contractor Works (OBC Delivery) Stage 1 Contractor Works (Other Preconstruction, including Design) Stage 2 Works (Construction) Stage 1 Contractor Works (OBC Delivery) have been called off and delivered on behalf of Denbighshire County Council. Following approval of this OBC, DCC can call off Budget Item 2 (Other Preconstruction, Including Design), at which point BB will procure a consultant to deliver design services, and manage delivery on behalf of DCC.
Project Delivery Stage 2 -	Two Stage NEC Delivery Agreement (Option C)	Following completion of Detailed Design within Stage 1 Contractors Proposals are compiled by Balfour Beatty for delivery of Stage 2 Works (Construction).

Construction		The proposals form a Target Cost for delivery of Stage 2 Services, which will be reviewed and audited by DCC, and if acceptable instructed, following which the Construction Stage will be delivered.
Completion	Completion Certificate	Period for production of case studies, value reports and defects period

Balfour Beatty became involved in the Central Rhyl OBC project at **Feasibility Stage.** For this initial stage, DCC commissioned Balfour Beatty to complete a Feasibility Report advising on budget, programme and routes for progression prior to progressing to an OBC.

Following a tender process including written submissions and interviews, JBA Consulting were appointed by Balfour Beatty to deliver the OBC within Stage 1 - Preconstruction. This stage has included the completion of an OBC and preparation of a ground investigation (GI) specification and EIA screening material in advance of progressing with a preferred option through planning.

If the preferred option is given approval by Welsh Government, then the detail design will be commissioned under the existing NEC3 Option C Two Stage Contract Preconstruction Activities.

If the project progresses through the Preconstruction Stage, DCC intend on progressing the Delivery Stage of the project through the Scape CE&I Framework using the Framework Contractor Balfour Beatty. Balfour Beatty would deliver all physical Construction Works on site. Should an additional party be commissioned for the detailed design, then they would provide design support.

Construction Services would be delivered under an NEC 3 Engineering and Construction Contract (Option C).

4.2 Community Benefits

If a scheme is approved in Central Rhyl, the proposed contractor on the SCAPE Framework will be required to deliver the scheme in a way that benefits the local community. Before the construction starts, the contractor will fill out the Communities Benefits Measurement Tool to give quantified evidence of how the scheme will benefit the community.

In addition, Balfour Beatty's Value for Money Tool kit will be used to identify quantified social value. Both the Value for Money Tool Kit and Scape KPIs are focussed towards bringing benefit to the community.

Compared to similar projects it is estimated that up to 50 construction staff would be employed for a scheme at Central Rhyl, some of whom would be recruited from the local area. This would increase employment within the construction industry. Any workers that come in from other areas would spend money in Rhyl, contributing to the local economy. In the longer term the coastal defences may make Rhyl are more attractive place to live work or visit, which would improve the economic prospects for the town.

Value for money of SCAPE procurement process
Value for Money has been (and will be delivered) through delivery of the project through the Scape CE&I Framework in the following ways:

- **Main Contractor Selection –** Balfour Beatty have been competitively procured to the role of delivery partner on the Scape CE&I Framework. Balfour Beatty were identified as the best contractor for delivery of the framework out of three possible candidates, scoring more than 2% higher than the nearest competitor on a 50/50 weighted quality/price submission.
- **Sub-contractor Selection –** part of the procurement process of the framework agreement requires an open competition to be run for all sub-contractors on a project. This enables Balfour Beatty to work in an open way with the client to identify their needs and values and embed these within the supplier selection process, therefore ensuring value for money in each recommendation made to the client.
- **Project Cost –** Project Cost results from the resultant costs from Balfour Beatty and the supply chain. Following the competitive Procurement of Balfour Beatty to deliver the framework and the open competition held for the supply chain the full project will be competitively tested.
- **Social Value –** through detailed performance management, social value and local economic impact can be measured through-out the project delivery, as well as being estimated prior to construction. Targets of 75% local spend and labour, 85% SME spend and engagement as well as a robust Employment and Skills plan developed throughout pre-construction to provide local jobs, apprenticeships, school engagement and on-going training all provide measures to help maximise social value.
- **Time efficiencies –** Across the framework it is averaged that 20 weeks of procurement time is saved on projects over £5m.
- **Collaboration / ECI Development –** The project development is delivered jointly by DCC, Balfour Beatty and the supply chain. This enables the management/minimisation of risk, increase of project certainty and management of cost
- **Programme and budget certainty–** As a result of the Collaboration and Early Contractor Involvement (ECI) Balfour Beatty have currently delivered 100% of projects on time and on budget through the Scape CE&I framework

Measurement of Value for Money
If a scheme is progressed through the delivery of the Construction stage, Value for Money will be measured. This will ensure delivery in line with the above expectations making use of a Value for Money Toolkit. This toolkit identifies cost efficiencies across the project to ensure best value is delivered by;

- Identifying efficiency delivered through supply chain procurement
- Identifying quantifiable social value delivered through the project
- Value demonstrated through implementation of appropriate Value Engineering
- Identification of Savings delivered through use of the Scape CE&I Framework route (procurement costs, construction time savings, inflation costs etc.)

A screen print of the toolkit below shows the overall picture. The cost efficiency tab shows the financial calculation, based on each subcontract package. Cost efficiency at framework level (applied to the prelim value) is also factored in and taken from the framework tender. This calculation is in the data collation tab.

The spreadsheet quantifies value generated through the SCAPE Process by assessing the value gained through Subcontract procurement, a quantification to social value, value engineering, client savings (including procurement etc), inflation etc.

Balfour Beatty — **Predictive Value for Money Report** — Scape Procure, Civil Engineering & Infrastructure

SAMPLE CLIENT						SAMPLE PROJECT	
Total Project Cost	Cost Efficiency	Value Engineering	Client Savings	Inflation Savings	Value for Money (VfM)	Added Social Value (SV)	Total VfM (including SV)
£3,036,483	£1,368,750	£95,000	£137,000	£46,536	£1,647,286	£1,090,428	£2,737,714
	38.57%	3.66%	5.28%	1.79%	49.30%	35.91%	85.21%

Using Scape Procure and Balfour Beatty has provided procurement savings, value engineering and added social value that can be expressed in Value for Money terms as fiscal amounts against the overall project value.

Scape Stage 2 Project Order Total Cost Budget	Scape Stage 4 @ Delivery Agreement Total Cost Budget	Stage 2 to Stage 4 Variance	Accepted Client Budget Change	
£3,152,403	£3,036,483	-£115,920	*100%*	

Cost Efficiency	The actual cost compared to the average cost of comparative tenders, including framework tender and project tenders
Social Value	The social value added in the implmentation of the project, calculated using Social Value Portal
Value Engineering	Agreed value engineering savings generated in the preconstruction and construction stages of the project
Client Savings	Savings in client procurement costs through using the framework
Inflation Savings	The amount of inflation costs avoided by procuring the project more quickly using the framework

Notes 1 : Total Project Cost = Scape Gate 4 Delivery Agreement Contract Value

Notes 2 : Cost Budget = Project Order Scape Gate 2 Estimate for Construction Works (excluding Preconstruction and Scape Fees)

Value for Money will also be measured through the use of 21 Key Performance Indicators, ensuring delivery in line with Clients expectations. The KPIs measured include

- Six separate KPI's on Customer satisfaction
- Four separate KPI's on time and cost
- Supply chain satisfaction
- SME Spend
- Programme and budget certainty
- Zero Riddor
- Fair Payment
- Waste Reduction
- Considerate Constructors
- Local Spend
- Local Labour
- Employment Skills
- The KPIs require extensive monthly contractor input of KPI data into the FIREFLY monitoring system

Table 4-2: Procurement timescales

Activity Description	Start	End
Submit OBC	30/05/2019	22/08/2019
Detailed design	18/10/2019	11/05/2020
Completion of FBC	10/08/2020	16/10/2020
Planning application	28/07/2020	07/01/2021
Construction contract	11/10/2021	12/10/2023

Procurement report
The Scape Framework is a single supplier framework so DCC have no tender reporting for the appointment of Balfour Beatty for this OBC stage.

A procurement report will follow once Target Cost has been agreed at the end of Preconstruction. Should a scheme be progressed, the contractors Proposals will be developed and submitted for acceptance to DCC at an appropriate stage in the preconstruction contract prior to the start of Construction contract stage. DCC are under no obligation to progress with construction until the target cost proposals put forward by BB are accepted by DCC. DCC will appoint an independent quantity surveyor to represent DCC to audit the submitted target cost.

4.3 Key contract terms and risk allocation

The outline contract terms and risk allocation for the construction contract have not been included at the OBC stage. At FBC stage the following documents will be included:

- Works information
- Site information
- Site boundary
- Risk Register
- Programme
- Activity Schedule
- Delivery Agreement (contract terms)

4.4 Stakeholder engagement (Commercial Case)

The use of Scape for procurement has been internally agreed and approved by Denbighshire County Council through the OBC and potentially into the Preconstruction stage. This framework has been approved of and used successfully for other FCERM projects in DCC. Further approval will be required before proceeding with Scape through the design stage. Welsh Government have been informed that the project is being progressed through Scape.

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5 Financial Case

5.1 Financial scale and breakdown

The financial costs have been calculated by Balfour Beatty based on previous schemes and outline designs provided by JBA. By the time the scheme gets to the detailed design and FBC stage, construction and enabling works costs will have been obtained as competitive process from the supply chain.

A Quantified Risk Register has been developed through the OBC and can be found in Appendix H. The contingency (project risk) accounts for 16% of the total construction cost.

If the preferred option goes through to detailed design, the costs will be further refined once the design is complete and further supply chain prices are obtained to allow open-book scrutiny of the final target cost. An open book target cost value will be developed for appointment of the Contractor should the scheme get to the Construction Phase.

The financial breakdown in Table 5-1 includes all costs up to the end of the OBC. As this is the upfront investment costs breakdown, it includes inflation but does not include future maintenance costs. This is the amount which is being sought for spending approval minus the funding already received from WG.

Table 5-1: Financial Breakdown Table

	Cash Costs (£)
Previously approved costs (up to OBC)	*210,624*
FBC to Construction:	
Investigation work	900,000
Design / development	1,551,800
Engineering / construction works	22,716,804
Internal staff costs	396,600
Other costs (Risk 95 %ile)	3,408,000
Subtotal	**28,973,204**
Total (Inc. OBC costs)	**29,183,828**

5.2 Funding sources

The intention is that the scheme will be funded by DCC through the Local Government Borrowing Initiative, with repayment 75% of the loan coming from Welsh Government via the annual Revenue Support Grant settlement over a period of 25 years.

5.3 Funding timescales

Funding covering the first borrowing/repayment year will be made direct from the Coastal Risk Management Programme budget. The following years will come from the Revenue Support Grant described above.

5.4 Financial summary

Table 5-2: Financial Summary

Funding Source	Funding needs (£)					
	Year 0 2019	**Year 1** 2020	**Year 2** 2021	**Year 3** 2022	**Year 4+**	**Total**
Local government borrowing	2,136,300	9,796,801	9,796,801	-	-	21,729,903
Council contribution (25%)	712,100	3,265,600	3,265,600	-	-	7,243,301
Sum of funding requirement per year	2,848,400	13,062,402	13,062,402	-	-	28,973,204

5.5 Stakeholder engagement (Financial Case)

The intention to use of Local Government Borrowing Initiative to fund a scheme will need to be approved through DCC internal committees. Further checks and approvals will be required before funding sign off. DCC will be in regular contact with WG regarding the capital funding required through the Revenue Support Grant should a scheme be progressed.

6 Management Case

6.1 Project management (including management of health, safety and well-being)

Should a scheme progress, Denbighshire County Council (DCC) will lead the Delivery of the Preconstruction design stage in the role of Client and ECC Project Manager. Balfour Beatty will deliver the design phase of the project in their role as the Scape CE&I Contractor. Designers will be appointed.

The Balfour Beatty Project Manager who will be responsible for delivering the Preconstruction phase has been involved in leading the project from the Feasibility Stage. The intended Balfour Beatty Project Manager is appropriately experienced in delivering large scale Coastal Infrastructure Projects. Construction proposals have been developed in line with on-going Environmental Impact Assessment and Design Development.

Balfour Beatty have extensive recent experience in the delivery of Coastal Defence Projects around the United Kingdom, recent relevant experience includes;

- East Rhyl – Preconstruction
- Cleveleys Promenade and Revetment works on behalf of Wyre Borough Council
- Anchorsholme Coastal Defences on behalf of Blackpool Council
- Rossall Coastal Defences on behalf of Wyre Council
- Redcar Sea defences on behalf of the Environment Agency
- Dymchurch Sea Defences on behalf of the Environment Agency

6.2 Change management

The Construction Contract will be delivered under an NEC3 ECC Option C Contract. Change Management will be controlled making use of the systems included in the NEC3 suite of contracts;

- Early Warnings will be raised notifying a matter which could influence the cost, programme or performance of the construction works
- Collaborative Risk review sessions will be held reviewing all raised Early Warnings enabling pro-active management of potential sources of change to the project.
- Changes to the Scope of Works will be implemented by way of a Compensation Event, through which potential change will be proactively priced, programmed and managed
- Changes to the scope of works will not be implemented without formal notification from the NEC3 ECC Project Manager working on behalf of Denbighshire County Council.

6.3 Benefits realisation

The benefits realisation table below is based on the project objectives which are also linked to the National Strategy for Coastal Erosion Risk Management in Wales in the following ways:

- reducing the consequences for individuals, communities, businesses and the environment from flooding and coastal erosion - Benefit 1 - the reduction in risk to people and reduction in damages to property.

- raising awareness of and engaging people on flood and coastal erosion risk – Benefit 2 - stakeholder engagement during the consultation process
- providing an effective and sustained response to flood and coastal erosion events – Benefits 2, 3 4 are provided over a 100-year period with options for adaptation
- Prioritising investment in the most at-risk communities – Benefit 4, targeting the Central Rhyl area that currently has a low yr SoP increasing with climate change

Only benefit 4 can be measured in year one. The reduction in risk to people and economic damages should be measured in the following ways:

- Annual inspection of the existing and new defences to ensure their condition meets the design standard
- Post storm reviews through estimating the return period of the storm against how the new defences performed.

Table 6-1: Benefits realisation table

Description	Targeted benefit	Baseline measure (BaU)	Assumptions used to calculate benefit	Benefit Owner (name)	Period over which benefits delivered
1-Reduction in risk to life.	Reduced risk to residential properties at risk from the 1 in 200 year event	266 properties are at currently risk from the 1 in 200 yr event, increasing to 1,212 in 2117	Based on Central Rhyl Study Area	DCC	100 years
2 - Reduction in flood damages	PV damages	N/A	See above and based on the BaU PV damages against the Do Something damages.	DCC	100 years
3-Prioritising investment to those most at risk	No residential properties at risk from the 1 in 200 year event for 100 years.	266 properties are at currently risk from the 1 in 200 yr event, increasing to 1,212 in 2117	Based on Central Rhyl Study Area	WG	100 years
4 – Engagement with the public on flood risk	100 people to receive flood awareness information	No awareness raising plans without the scheme	The information is informative and effective.	DCC	~10 years

6.4 Risk Management

As previously discussed, a Quantified Risk Register has been developed through the OBC stage. The current iteration of the Quantified Project Risk Register is available in Appendix H and focusses on risks to construction cost and programme. To date this Risk Register has been a jointly owned document used for identification and control of risks to which the project could be exposed to.

This Risk Register will be further developed and reviewed again following completion of Detailed Design and prior to the agreement of the Contractors Proposals for Construction. Risk Owners will be allocated and distributed to the most appropriate risk owner through the Contract for remaining Construction related Risks.

If a scheme progressed to construction, the Risk Register will be reviewed in dedicated Sessions between the Contractor and the Client Team to review current risks, progression of mitigation and potential change which could occur in the contract.

If the scheme does not go ahead, the fall-back position will be continued monitoring of the existing defences and beach levels to ensure a breach is not imminent. Residents will need to be informed that a scheme will not be taking place and flood awareness sessions may be required in the future to inform people of the remaining risk and how to mitigate risk to life and property.

Table 6-2: The top five risks that the project faces

Risk Description	Mitigation
Variation in cost of materials	Early engagement with contract suppliers and monitoring of market costs
Noise and vibration restrictions	Early engagement on construction methods and working hours
Archaeology (unforeseen remains)	Regular liaison and communications with heritage departments
Contaminated ground in constriction areas	GI and contaminated land assessment as part of detailed design
Objection from third parties	Consultation meetings and addressing third party concerns early

6.5 Post-project evaluation

Should a scheme be completed, Denbighshire County Council will complete a Post Project Appraisal in conjunction with the full design team to evaluate the achievement of the project against the Critical Success Factors. This evaluation will result in a review of the previously mentioned Benefits Register and development of appropriate Case Studies / Lessons Learnt reports.

6.6 Stakeholder engagement (Management Case)

There has been internal agreement at DCC for:

- Denbighshire County Council to lead the Delivery of the design in the role of Client and ECC Project Manager.
- Balfour Beatty to deliver the design phase of the project in their role as the Scape CE&I Contractor.

- Engineering consultants will be appointed to lead the design and act as Designers Site Representative to Certify the Design and contribute to the management of Quality Control on site.