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Cyfrol 1 Testun y Prif Adroddiad a Crynodeb Annhechnegol

East Rhyl Coastal Defence Scheme Environmental Statement

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Final Report

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www.jbaconsulting.com

JBA Project Manager

Sam Wingfield
JBA Consulting
Mersey Bank House
Barbould Street
Warrington
WA1 1WA

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Contract

This report describes work commissioned by Balfour Beatty, on behalf of Denbighshire County Council, and JBA Consulting carried out this work.

Prepared by Ben Sullivan MSc GradIEMA

Assistant EIA Consultant

Reviewed by Mark Cope BSc MSc FGS MIEMA CEnv REIA

Principal EIA Consultant

Approved by Tim Carter BSc MSc CMLI MIEMA CEnv

Technical Director

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East Rhyl Coastal Defence Scheme Non-technical Summary of the Environmental Statement



Background

An Environmental Impact Assessment is a requirement for some construction projects, where significant effects on the environment are considered likely. It was decided that the East Rhyl Coastal Defences project requires an Environmental Impact Assessment because of its scale, and because of the sensitivity of the surrounding environment. The project would involve the construction of 600m of new coastal defences. The Liverpool Bay and associated wetlands on the North Wales coastline are very important habitats for birds. The Rhyl foreshore is an important archaeological site. A residential population is located adjacent to the coastal defences, and tourism is important to the local economy.

The East Rhyl Coastal Defences Environmental Statement provides a detailed technical report on the likely significant environmental effects of the project, both positive and negative, and where possible sets out how the effects can be avoided, offset or reduced. This non-technical summary provides a summary of the Environmental Statement in non-technical language.

The Problem

Rhyl has historically been protected from coastal flooding by a range of coastal defence structures constructed in the 1950s. The coastal defences in the east of the town are no longer performing as intended, and in recent years wave overtopping flooding has caused significant damage and disruption to residential properties.

During a storm in 2013 deep flooding of 130 residential properties led to 400 people being evacuated from their homes, with some people having to be rescued by boat. Since then flood forecasting studies have shown that the risk of this happening again is set to increase with climate change projections for increased sea level rise and storminess. The effectiveness of the existing defences will therefore continue to decline. Action is needed to protect East Rhyl now and in the future to sustain the local community and to continue to promote Rhyl as a tourist destination, which is important to the local economy.

The Solution

It is proposed that new coastal defences are constructed, comprising a rock armour revetment designed to absorb wave energy during future storm events. The rock armour would be approximately 600m long by 30m wide. The sea wall would also be replaced with a larger structure. The Promenade would be raised by less than 1m to maintain views of the sea from the coastal path (see Figures 1 and 2 below).

During construction of the new sea defences, works would occupy 13 hectares of the Promenade and an area of beach between the Pavilion Theatre and Rhyl Golf Course. The project would take approximately three years to construct, programmed between late spring 2019 to early summer 2022. During this time the Wales Coast Path and National Cycle Network Route 5 would be diverted around the works, and access to this section of the beach and public spaces would be limited.

The new coastal defences would protect up to 472 residential properties to an acceptable standard for approximately 60 years. Beyond 60 years the performance of the coastal defences would be expected to reduce due to the increasing effects of climate change.



Figure 1: Location of the proposed new defences (red area) and the extent of the construction site (blue area)

Construction of the Scheme

Non-tidal construction activities would take place between 07:00 and 19:00 Monday to Friday. Tidal construction activities would be dependent on the timing of the low tides, and therefore night time working will be required for these activities. Members of the public and local residents would be kept informed on the scheme through community engagement. Also, a project website has been created to provide local residents and businesses with news about the scheme at: www.eastrhylcoast.co.uk.

Heavy goods vehicles would deliver the rock armour, precast concrete and other bulky materials to a construction compound located on East Parade. The vehicles would follow a route to the site from the A55 at Junction 27, onto Fford Abergele then onto St. Asaph Avenue to Kinmel Bay. From here the vehicles would pass along the A548, and through Rhyl town centre to East Parade. The route is shown on Figure 3 below. A secondary compound containing offices would be accessed via Garford Road.

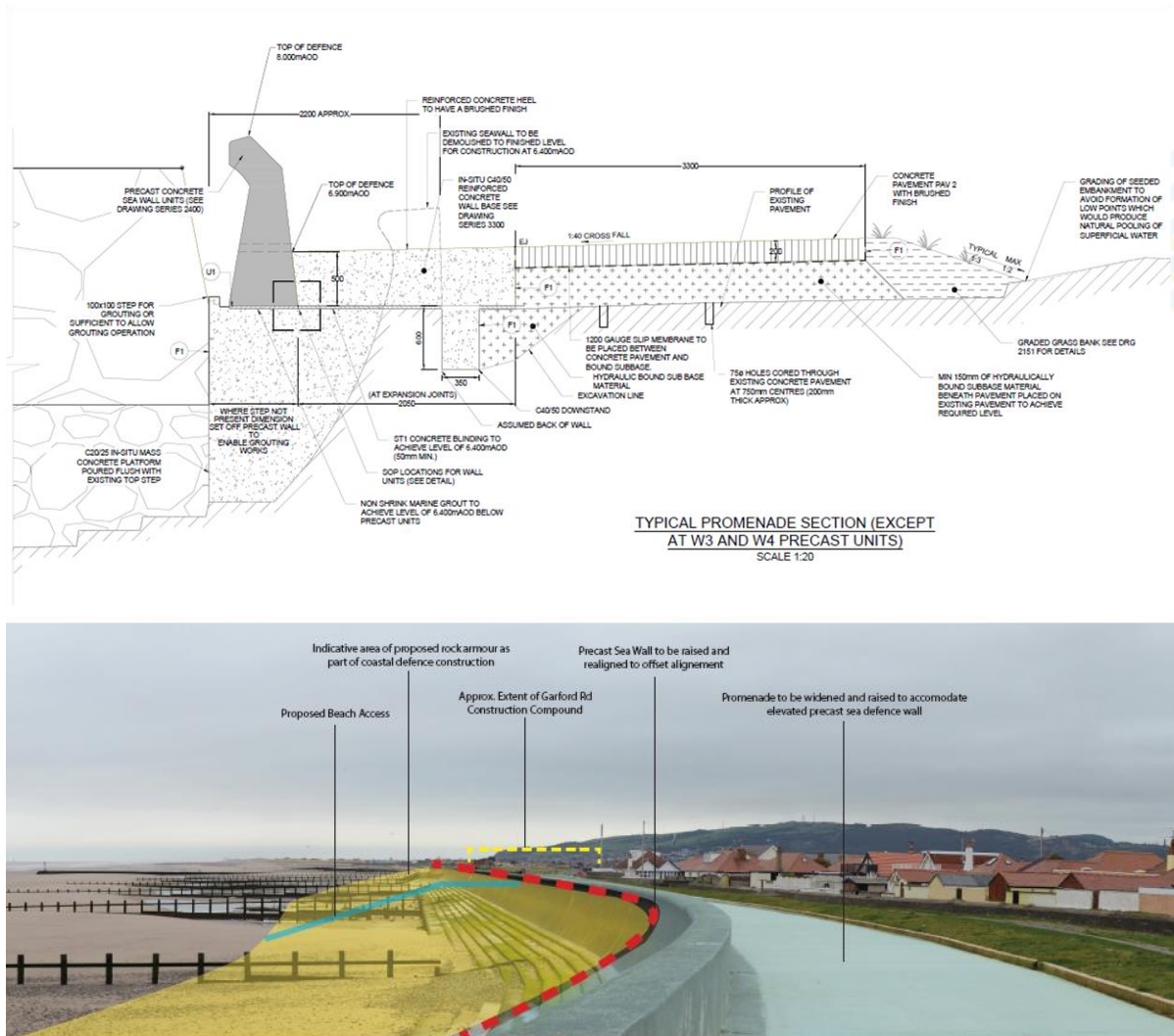


Figure 2: Typical Promenade Cross-section (above) and indicative view of the proposed defences looking east from The Promenade (below).

Construction vehicles and materials would access the beach via a temporary slipway. The 3 tonne to 6 tonne rock used for building the new revetment would be transported to the beach and stockpiled. The stockpiling would begin in late 2019 and last for approximately 2 years while construction of the revetment is ongoing. The revetment would be built in two 10m to 20m sections at a time. This work would only take place during low tide and would be completed 3 hours before the high tide.

New access steps through the rock armour revetment and the new sea wall would be precast off-site by a concrete manufacturer, transported by heavy goods vehicle to the site compound and then assembled on the construction site. Piling activities would be required to construct foundations for the access steps. The new sea wall would also need to be founded on a new concrete buttress. Once the new rock armour is in place, the old sea wall would be demolished and replaced. The order of the works would ensure that residents were protected from flood events at all times during construction. When construction of the new coastal defences is completed, all areas of public open space occupied during construction would be restored to their original use.

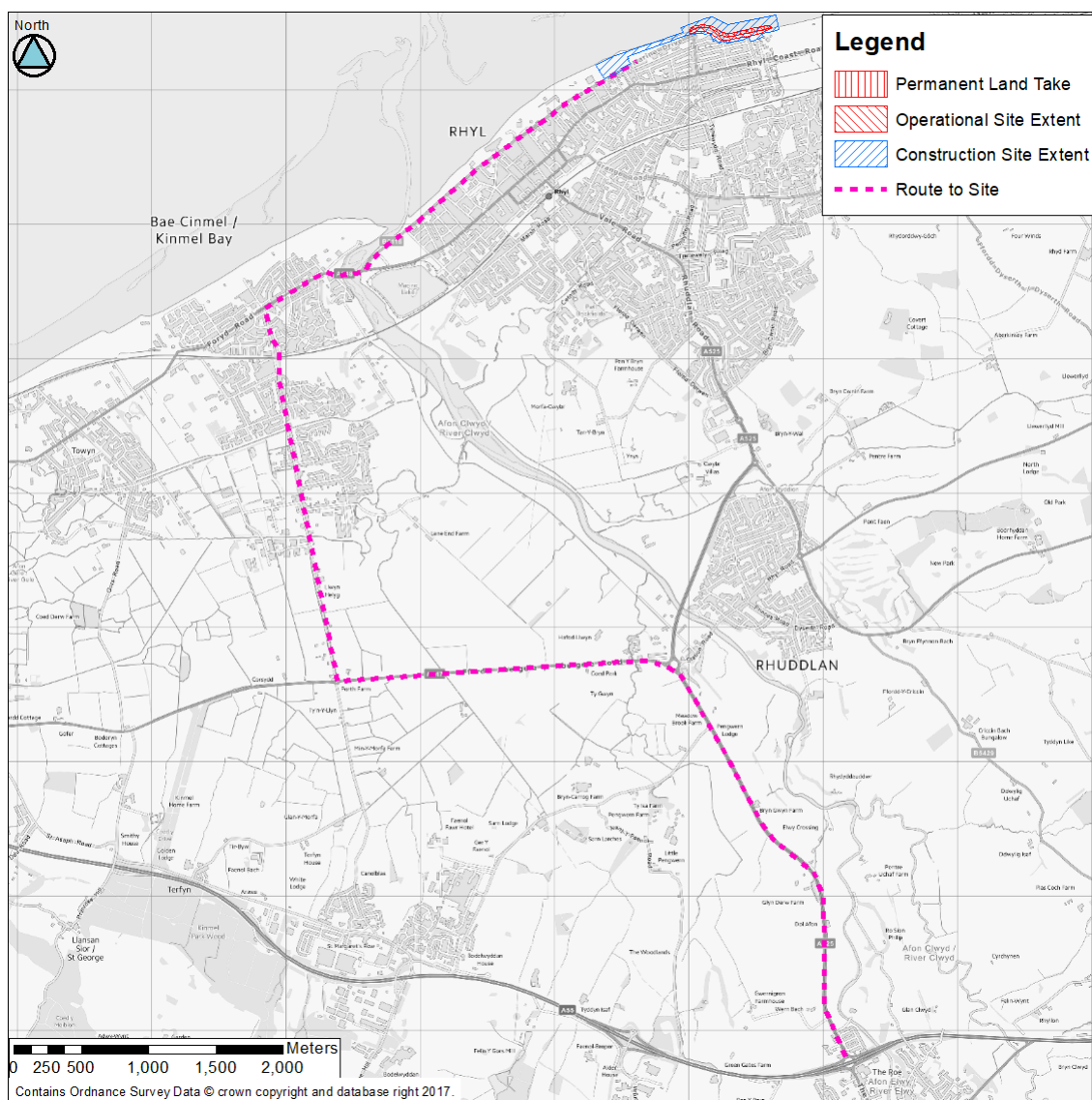


Figure 3: Heavy goods vehicle access route to the construction site

Summary of Environmental Effects

Coastal Processes

Rock storage and activities on the beach during construction are likely to cause small scale changes to patterns of erosion and deposition on the immediate beach. However the effect of this on natural beach processes would be localised and temporary.

Over 1200 cubic metres of beach would need to be excavated during construction. Most of this would be reused to cover over the toe of the revetment. Any remaining material that is washed offshore during the tidal cycle would be a very small volume in comparison to the 20,000 cubic metres of material that naturally moves across the beach in sand ridges each year.

During any storm events a greater amount of the excavated beach material is likely to be washed offshore, but again the amount would be small in comparison to that naturally mobilised during storm events.

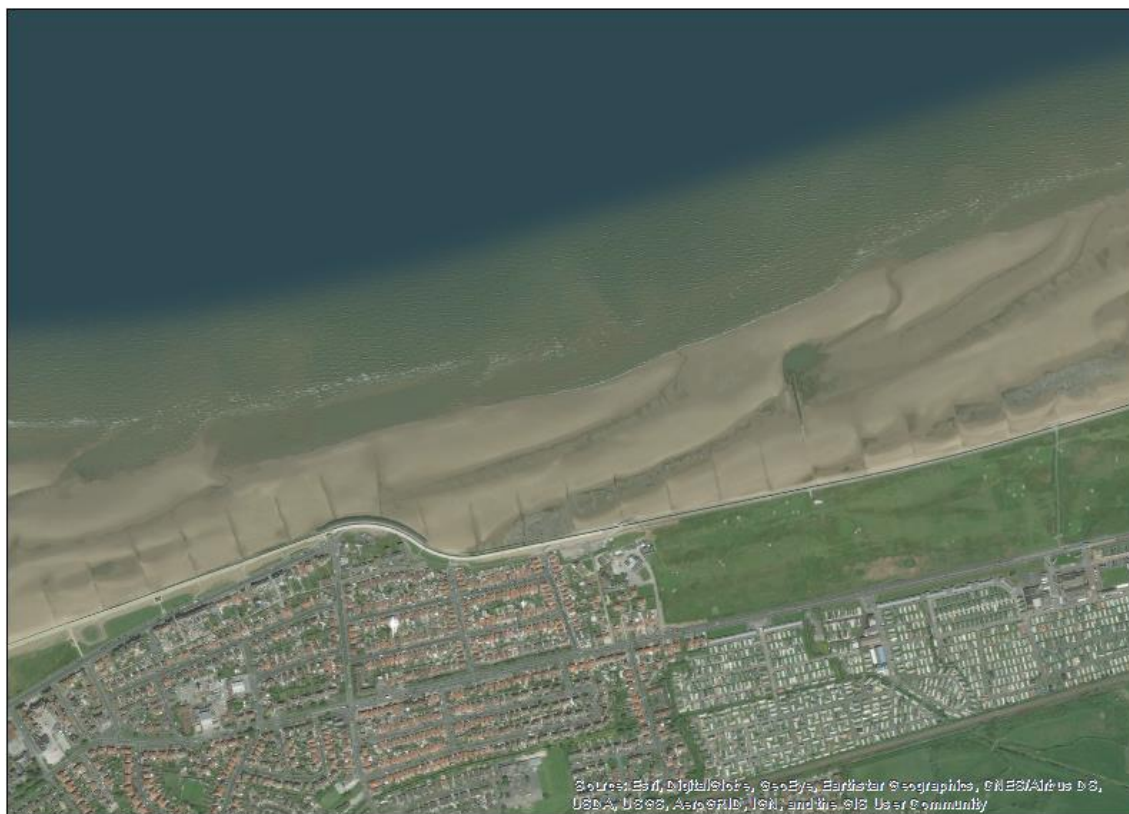


Figure 4: Sand ridges operating at a large scale on Rhyl beach can clearly be seen on aerial photography

Some of the existing timber groynes on the beach would need to be removed to make way for the new coastal defences. A gap would be retained behind the groynes to enable safe passage behind the groynes. Approximately 550 cubic metres of beach would need to be excavated to remove the groynes. It is unlikely that these changes would affect how the remaining groynes operate on the beach.

The temporary slipway proposed to give construction access from the Promenade onto the beach may cause changes in the movement of sediments at this location. However any change would be temporary and very small in comparison to the natural processes operating.

Approximately 800 cubic metres of beach material would be required to maintain an access track for construction vehicles on the beach.

The new revetment would reduce the size of the beach immediately in front of the coastal defences by approximately 12 %. The rock armour would trap some sand, but this would be limited by the size of the area occupied by the coastal defences.

The coastal defence proposals have been assessed against hydromorphological, biological and chemical objectives for the North Wales coastal waterbody, as is required by the Water Framework Directive. The assessment concluded that there would be no impacts upon the North Wales coastal waterbody. An assessment of the impact of the proposed development on bathing water quality required by the Bathing Water Directive also concluded that there would be no impact from the coastal defence proposals.

Biodiversity & Nature Conservation

There are a number of areas protected for wildlife within close proximity to the coastal defence proposals. Within 200m of the construction site is the internationally designated Liverpool Bay Special Protection Area, and within 5km is the Dee Estuary Special Protection Area, Special Area of Conservation and Ramsar site. The Liverpool Bay SPA is designated to protect the foraging habitat of important species of birds, including Common Scoter and Red Throated Diver. The Dee Estuary is designated to protect habitat used by internationally important assemblages of overwintering birds. In addition, the largest breeding population of Little Tern in the UK nests on a shingle spit within the Dee Estuary in summertime, and together with Common Tern forages within the Liverpool Bay SPA. Areas protected for wildlife are shown on Figure 5 below.

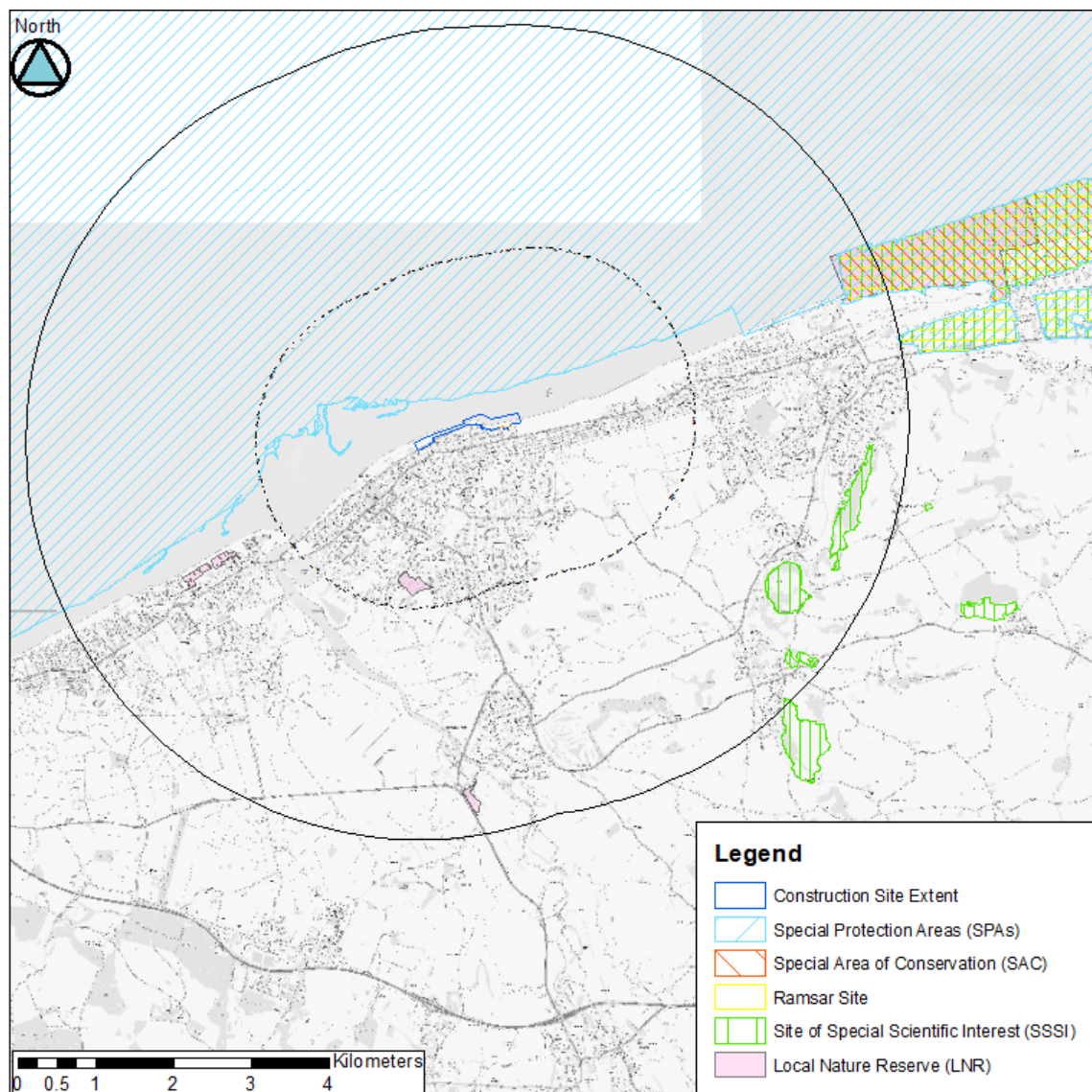


Figure 5: Areas protected for wildlife within 5km of the construction site

There would be no direct impacts on protected bird species from the construction works. Works on the beach would be undertaken at low tide only, and there would be no works within any designated wildlife sites. Although there could be indirect impacts on birds that forage on the beach from disturbance, the works will generally be a significant distance away within the upper section of the East Rhyl foreshore. Alternative foraging habitat is also available as the footprint of the works is very small in comparison to the area of available intertidal habitat on the North Wales coastline. Given that construction work on the foreshore would take place at low tide, fish would not be disturbed or affected by the construction works.

The Coastal Hydromorphology assessment concluded that the impact on movement of beach material would be very small in comparison to natural processes operating. Therefore any temporary and localised impacts would be very limited in comparison with the large area of foraging habitat available to fish species and to Little Tern and Common Tern on the North Wales coastline.

Intertidal habitats would be directly affected by construction activities on the foreshore, which is likely to affect small concentrations of marine worms. However, these species are common locally and would be expected to recolonise the beach rapidly following construction.

The potential for pollution to intertidal habitats to occur during construction would be managed with good construction practices, particularly where vehicles and equipment are operating directly on the beach. Construction activities on the beach would be monitored by an environmental specialist to ensure good construction practice are being followed.

Some of the groynes on Rhyl Beach support a non-native invasive barnacle species. To ensure that this non-native species of barnacle does not spread elsewhere, any groynes removed during construction would be disposed of appropriately.

Landscape & Visual

The character of Rhyl is a built-up area on a low lying coastline, with open views across the Liverpool Bay, and views across a large flat beach at low tide. Existing views out to sea are dominated by the Rhyl Flats Offshore Wind Farm. 5km inland to the east is the Clwydian Range & Dee Valley Area of Outstanding Natural Beauty.

The character of Rhyl town would be temporarily affected during construction by the presence of construction vehicles and equipment. This would be most visible around the site of the construction compound on Marine Drive.

The Wales Coast Path and National Cycle Network Route 5 would be diverted inland around the construction site, which would impact on views during construction. When the coastal defences are completed a small impact on views from these routes would remain. The proposals would also result in the temporary loss of some areas of public open space.

The construction site would be visible from part of Rhyl Golf Course and would therefore temporarily affect views in this area. Similarly views for motorists and pedestrians along East Parade, Marine Drive and Rhyl Coast Road would be slightly changed during construction, but there would be no long-term changes when the defences are complete.

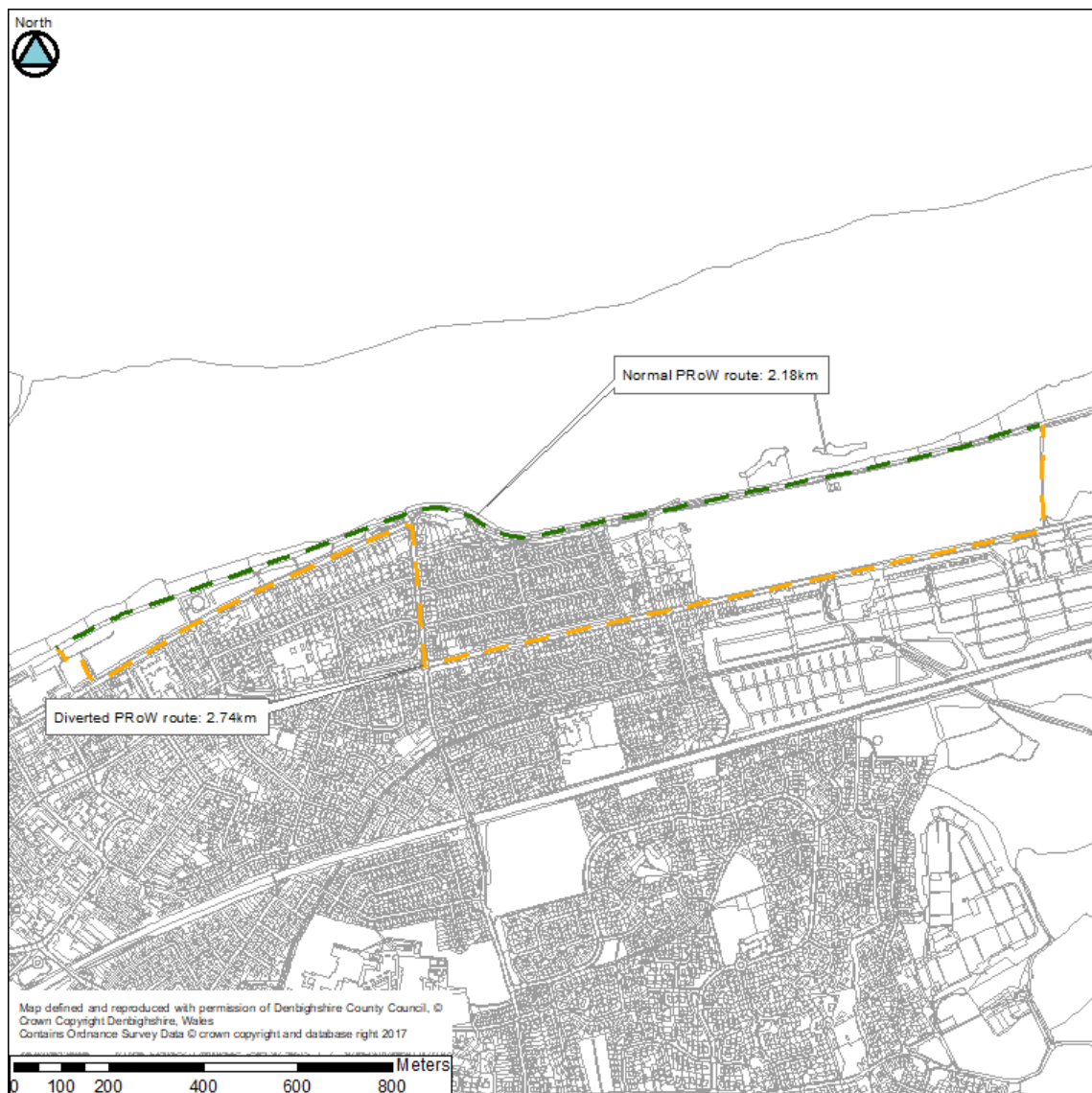


Figure 6: Proposed diversion route for the Wales Coast Path and National Cycle Route

People who live in some of the houses along the following residential streets would see slight changes in their views during construction: Rhyl Coast Road, Tynewydd Road, Molineaux Road, Garford Road, Brynheddydd Bay, Beechwood Road, Alexandra Road, Grosvenor Road, Old Golf Road, Eaton Avenue and Hilton Drive. When the new defences are finished there would be no obvious change in the views from these areas. Views would be affected to a greater degree from properties on East Parade, Marine Drive, north of Brynheddydd Bay and the Splash Point Apartments, but again the changes would be slight in the long-term.

Cultural Heritage

Within 1km of the construction site there are 74 listed buildings, many of which are in the Rhyl Conservation Area. Five of these are within 500m of the site: a Lookout tower in the boundary wall on East Parade; a Belgian Refugee War Memorial off East Parade; two designations at Grafton Lodge, on Fairfield Road, and the Royal Alexandra Hospital. Out of these, only the setting of the Royal Alexandra hospital would be affected during construction and this would be temporary (see Figure 7 below). There would be no long-term effects on the Conservation Area or any of the listed properties on completion of construction.

There are 2 World War II aircraft crash sites within 1km of the development proposals, although neither would be affected by the proposals.

There have been some important archaeological remains found on Rhyl Beach, within the construction site, including an antler mattock, a spearhead and axes. Within the construction site at Splash Point there are the remains of historic fish traps and a possible causeway. As there is potential for these and other unknown features to be damaged or lost as a direct result of construction activities, the area of the construction site around Splash Point will be subject to an archaeological investigation prior to the start of construction activities on the beach.

Much of the construction site on the beach has been identified as containing peat deposits and tree remains associated with an ancient submerged forest (see Figure 8 below). Prehistoric human footprints have also been recorded. Given the significance of these archaeological features and high potential for other unknown features to be present on the construction site, detailed archaeological investigations and recording will be undertaken before the commencement of construction activities on the beach.



Figure 7: The view from The Promenade towards the Royal Alexandra Hospital on Marine Drive. The main construction compound would be located on this grassed area.



Figure 8: Tree remains associated with an ancient submerged forest on Rhyl foreshore.

Socio-economics

Approximately 12,000 people live in East Rhyl. The population of this area is slightly older than the Wales average, with many retired people and fewer young people living there. A quarter of the working age population in East Rhyl is economically inactive which is above the national average. Rhyl is one of the more deprived towns in Wales. The biggest challenges in Rhyl are low incomes, high levels of unemployment and crime rates. These problems are all worst in the west of the town.

Up to 50 construction staff would be employed, some of whom would be recruited from the local area. This would slightly 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 a more attractive place to live, work or visit, which would improve the economic prospects for the town.

Because East Rhyl is predominantly a residential suburb of Rhyl, it is not expected that local tourism would be negatively impacted by the proposals. However, movements of heavy goods vehicles along West and East Parade would make Rhyl temporarily less appealing for day visitors which could impact on visitor numbers. A Traffic Management Plan would minimise the effect of construction traffic.

Site notices in Rhyl and this Non-technical Summary would be made available in the Welsh Language. In addition, a Community Liaison Officer with the ability to speak Welsh would be employed.

Construction of the scheme would not make access to schools, surgeries or the town centre more difficult. During construction, there would be about 8 hectares of the beach closed to the public during the scheme along with some greenspace on Rhyl Promenade. During construction, residents of Rhyl may find it slightly more difficult to find open greenspace as a result.

The new coastal defences would be larger than the current defences, so available space on the beach would be reduced by about 1.5 hectares, although this is less than 1% of the size of Rhyl Beach at low tide. Part of the Promenade would be closed to the public during construction. However, the land required for the construction site has been minimised as much as possible.

Community consultation sessions have been undertaken to allow local residents to voice their opinion on the scheme. The views expressed will be used to inform the proposals and to minimise any impacts of the proposals on the local community.

Traffic & Transport

Deliveries to the construction site would enter the main site compound from East Parade, near to the Pavilion Theatre. East Parade and West Parade are 9m wide single-carriageway roads with a 30mph speed limit. Both roads contain crossing points.

Within 400m of the site, buses can be caught that go to Prestatyn (#35, PS1), Rhuddlan (PS1), Flint (#11, 19) and the Rhyl Circular Route (#47). Rhyl train station is approximately 2km from the site and is on the Chester to Holyhead line.

West Parade would experience four more heavy good vehicles per hour than it normally does. This may make it slightly more difficult to cross the road at times. It may also make it less appealing to walk along West Parade as a pedestrian, as some people can feel intimidated by the movements of large heavy good vehicles. A Traffic Management Plan would be written to manage this, but there would still be a slight impact.

The construction work would only create very small increases in traffic in the local area. The Rhyl Coast Road / Tynewydd Road Junction would see less than one additional vehicle per minute. No stretch of road would see more than four extra heavy good vehicles per hour. The increases in traffic would not be large enough to make the roads more dangerous for road users or pedestrians or make journeys slower.

Other Construction Effects

The coastal defence works are likely to give rise to dust impacts given the close proximity of residential properties. A dust management plan would be prepared to effectively manage this risk.

The small increase in heavy goods vehicle traffic movements would not affect air quality in Rhyl, or noticeably increase traffic noise. However construction activities close to residential properties are likely to create significant noise disturbances. Residential properties on Brynhedydd Bay, Molineaux Road, Tynewydd Road, Garford Road and Splash Point Apartments, would experience the greatest increases in background noise levels during construction. Given the requirement for tidal working on the beach, noise disturbance would also occur at night. Noise levels have been assessed as a worst-case scenario. Noise monitoring would be undertaken during construction, with construction activities adapted through best practicable means to ensure acceptable noise levels at individual residential receptors.

Some construction activities would cause vibration, although these activities would generally not be close enough to residential receptors to have an impact. Piling of the foundations of the access steps may be felt at residential properties closest to this construction activity.



Figure 9: View from the sea wall on The Promenade with residential properties behind.

The construction compounds would be artificially lit. Some of the closest residential properties on Marine Drive, Garford Road and Brynheddydd Bay may therefore experience light spill and glare during construction. To minimise this impact, working areas would not be over-lit, lights would be switched off when not in use and the lights will be directed to avoid light spill on adjacent property.

Beach samples have been analysed for contaminants and elevated levels of bacteria. All the samples were found to be below target levels except one, for which there was a slight exceedance of cadmium. However, this small exceedance would be unlikely to impact on water quality given the volumes of material disturbed would be small. Similarly, a bitumen coating was found to be present on some of the existing coastal defences at Splash Point. This was found to be stable and so would not present any hazard to the marine environment.

Approximately 150m of existing groynes and 400 cubic metres of concrete sea wall would need to be demolished and disposed of during construction. The groynes would be appropriately disposed of away from the marine environment. The concrete demolition waste would be reused as fill or hardstanding on site where possible, or appropriately disposed of offsite.

To reduce the risk of marine pollution fuel and chemicals would be stored at least 10m away from the beach. Refuelling would only take place at designated refuelling areas located away from the beach.

A Construction Environmental Management Plan has been prepared to ensure that commitments made in the Environmental Statement are carried through to the construction phase. It outlines the roles and responsibilities of those involved in the delivery of the project, and sets out the environmental actions required to achieve a series of environmental management objectives.

Sustainability & Climate Change

It has been calculated that the carbon emissions generated by the proposals over the 37-month construction period would be approximately 30,000 tonnes. This would represent a 2% increase in carbon emissions in Denbighshire and an increase in emissions from Wales of 0.04%. This impact is arguably outweighed by the need to protect residents of East Rhyl from the adverse effects of climate change associated with sea level rise and increased storminess, to maintain Rhyl as a viable settlement. The coastal defences would provide protection for a period of 60 years.

Cumulative Effects

The closest residential properties to the development proposals would be subject to combined effects during construction, principally visual impacts from construction activities; disturbances from construction noise impacts during both the day time and night time; light spill/glare impacts from site compound at night; and impacts from increases in construction related traffic in and around Rhyl.

The residential receptors most affected by cumulative effects during construction are those that will also receive the most benefit in terms of flood defence. Whilst this does not diminish the fact that impacts would occur for up to 3 years during construction, it is important to take the context of the flood defence scheme into consideration when determining the acceptability of the impacts. A Community Liaison Officer would be appointed to keep residents informed and liaise between the construction contractor and the local community. This will ensure that any disruptive construction activities are well communicated to residents in advance of works, and that the views or concerns of residents are taken into account by the construction contractor when planning the works.

The Environmental Impact Assessment has identified that the development proposals are compliant with national land and marine planning policies. Overall, it is considered that the improved coastal protection provided by the proposed coastal defences would have a positive impact upon Rhyl, its residents and visitors, and its economy.



Figure 10: Visualisation of the completed coastal defences, viewed from the slipway near Rhyl Golf Course looking towards Splash Point.

Contents

| | | |
|-----|---|-----|
| 1 | Introduction | 1 |
| 1.1 | Background | 1 |
| 1.2 | Cymraeg | 1 |
| 1.3 | Site description and history | 1 |
| 1.4 | Legislative basis of the Environmental Statement | 2 |
| 1.5 | Scope and Content of the Environmental Statement | 3 |
| 1.6 | Related Technical Information | 5 |
| 2 | The Proposed Development | 7 |
| 2.1 | Planning Policy Context | 7 |
| 2.2 | Environmental Constraints | 12 |
| 2.3 | Alternatives and Design Evolution | 16 |
| 2.4 | Outline Design | 18 |
| 2.5 | Detailed Design Development | 19 |
| 2.6 | Detailed Design Proposals | 19 |
| 2.7 | Construction of the Scheme | 20 |
| 2.8 | Operation of the Scheme (60 years) | 24 |
| 2.9 | Future operation and decommissioning (60 to 100 years and 100+ years) | 25 |
| 3 | Environmental Impact Assessment Methodology | 26 |
| 3.1 | The EIA Process | 26 |
| 3.2 | EIA Screening and Scoping | 28 |
| 3.3 | The Environmental Statement | 35 |
| 3.4 | EIA Method of Assessment | 37 |
| 4 | Coastal Hydrology and Hydromorphology | 44 |
| 4.1 | Introduction | 44 |
| 4.2 | Baseline Conditions | 44 |
| 4.3 | Assessment Methodology | 52 |
| 4.4 | Potential Impacts & Significant Effects | 55 |
| 4.5 | Mitigation Measures | 61 |
| 4.6 | Residual Effects | 61 |
| 5 | Biodiversity and Nature Conservation | 62 |
| 5.1 | Introduction | 62 |
| 5.2 | Baseline Conditions | 62 |
| 5.3 | Assessment Methodology | 71 |
| 5.4 | Potential Impacts & Significant Effects | 75 |
| 5.5 | Mitigation Measures | 79 |
| 5.6 | Residual Effects | 80 |
| 6 | Landscape and Visual Impact | 82 |
| 6.1 | Introduction | 82 |
| 6.2 | Baseline Conditions | 84 |
| 6.3 | Assessment Methodology | 88 |
| 6.4 | Potential Impacts & Significant Effects | 89 |
| 6.5 | Mitigation Measures | 93 |
| 6.6 | Residual Effects | 94 |
| 7 | Cultural Heritage | 96 |
| 7.1 | Introduction | 96 |
| 7.2 | Baseline Conditions | 98 |
| 7.3 | Assessment Methodology | 108 |
| 7.4 | Potential Impacts & Significant Effects | 110 |
| 7.5 | Mitigation Measures | 116 |

| | | |
|------|--|-----|
| 7.6 | Residual Effects | 120 |
| 8 | Population, Human Health & Socio-economics | 121 |
| 8.1 | Introduction | 121 |
| 8.2 | Baseline Conditions | 121 |
| 8.3 | Assessment Methodology | 132 |
| 8.4 | Potential Impacts & Significant Effects | 132 |
| 8.5 | Mitigation Measures | 137 |
| 8.6 | Residual Effects | 138 |
| 9 | Traffic and Transport | 139 |
| 9.1 | Introduction | 139 |
| 9.2 | Baseline Conditions | 140 |
| 9.3 | Assessment Methodology | 141 |
| 9.4 | Potential Impacts & Significant Effects | 144 |
| 9.5 | Mitigation Measures | 147 |
| 9.6 | Residual Effects | 147 |
| 10 | Other Construction Effects | 148 |
| 10.1 | Introduction | 148 |
| 10.2 | Baseline Conditions | 148 |
| 10.3 | Assessment Methodology | 152 |
| 10.4 | Potential Impacts & Significant Effects | 155 |
| 10.5 | Mitigation Measures | 158 |
| 10.6 | Residual Effects | 160 |
| 11 | Sustainability and Climate Change | 162 |
| 11.1 | Introduction | 162 |
| 11.2 | Baseline Conditions | 162 |
| 11.3 | Assessment Methodology | 167 |
| 11.4 | Potential Impacts & Significant Effects | 169 |
| 11.5 | Mitigation Measures | 175 |
| 11.6 | Residual Effects | 176 |
| 12 | Cumulative Effects | 177 |
| 12.1 | Introduction | 177 |
| 12.2 | Baseline Conditions | 177 |
| 12.3 | Assessment Methodology | 178 |
| 12.4 | Potential Impacts & Significant Effects | 179 |
| 12.5 | Mitigation Measures | 186 |
| 12.6 | Residual Effects | 187 |
| 13 | Summary | 188 |
| 13.1 | EIA Outcomes | 188 |
| 13.1 | Concluding remarks | 195 |

List of Figures

| | |
|---|-----|
| Figure 1-1: Site Location | 2 |
| Figure 3-1: The interaction of design and EIA processes ¹⁹ | 27 |
| Figure 4-1: Sediment Sub-cells, defined in Halcrow (2010) | 46 |
| Figure 4-2: Coastal locations from Little Orme to Dee Estuary | 46 |
| Figure 4-3: Large Delft3D model grid with nested grid (red box), from Great Ormes head (west) to Point of Ayr (east) | 53 |
| Figure 4-4: Delft3D nested model grid | 53 |
| Figure 4-5: Formation of the ridges extending from Splash Point | 58 |
| Figure 7-1: The location of exposed deposits in Area A (arrowed), lying on the landward side of a runnel | 103 |
| Figure 7-2: Exposed deposits in Area A | 103 |
| Figure 7-3: The larger of two trees exposed within Area A | 104 |
| Figure 7-4: The smaller of two trees exposed in Area A | 104 |
| Figure 7-5: Features exposed in December 2013 (PRN 123322) immediately west of Splash Point | 105 |
| Figure 7-6: The remains of a probable fish trap first recorded in 2013 and visible top centre in Figure 7-1 | 106 |
| Figure 7-7: Exposed deposits in Area C | 106 |
| Figure 7-8: The approximate location of the proposed access ramp, and Area B tidal flats deposits exposed beyond the groyne | 111 |
| Figure 7-9: Listed building 1510, Lookout tower in Boundary Wall, showing the view towards the western construction compound | 113 |
| Figure 7-10: The view towards the Royal Alexandra Hospital, looking across the proposed construction compound | 115 |
| Figure 7-11: The view along Marine Drive, looking towards Splash Point, with the proposed construction compound to the left | 115 |
| Figure 8-1: Population structures for Rhyl East ward and Denbighshire (female orange, male blue) | 122 |
| Figure 8-2: Health deprivation statistics for the area around the scheme. Most deprived means that population health is poor. Classes are relative to Wales | 123 |
| Figure 8-3: Employment deprivation statistics for the area around the scheme ⁶² . Most deprived means employment levels are low. Classes are relative to Wales | 125 |
| Figure 8-4: Holiday parks within 5km of the proposed site | 126 |
| Figure 8-5: Location of public car parking within 2km of the scheme (none were identified to the east) ⁶⁸ | 128 |
| Figure 8-6: Graph showing Welsh Language provision in Rhyl, Denbighshire and Wales | 130 |
| Figure 8-7: Diversion of the Wales Coast Path and National Cycle Network Route 5 proposed | 135 |
| Figure 10-1: Layout of the site during the construction period | 149 |
| Figure 11-1: Relative proportion of emissions resulting from the scheme arising from each stage | 172 |
| Figure 11-2: Graph showing Standard of Protection the proposed scheme will offer, when calculated using UKCP09 and FCDPAG3 (TAN15) climate projections | 174 |

List of Tables

| | |
|--|----|
| Table 1-1 ES structure | 5 |
| Table 2-1 Environmental constraints identified within 5km where relevant | 13 |
| Table 2-2: Wave return wall design options | 17 |
| Table 3-1 Summary of environmental issues screened in/out of EIA | 29 |
| Table 3-2 Summary comments raised in the EIA Scoping Opinion responses received from NRW and DCC, and where the comment is addressed in the ES | 31 |

| | |
|--|-----|
| Table 3-3 Requirement of Schedule 4/Schedule 3 of the EIA Regulations and where the requirements are addressed in the ES | 35 |
| Table 3-4 EIA team & qualifications. | 38 |
| Table 3-5 Matrix of significance of effect scoring terms | 41 |
| Table 4-1 Astronomical tide levels at Rhyl calculated through distance weighting | 44 |
| Table 4-2: Online sediment delivery from ridge dynamics | 47 |
| Table 4-3: Criteria for defining the magnitude of impacts on coastal processes assessed: | 54 |
| Table 4-4: Criteria for defining the sensitivity coastal processes operating: | 54 |
| Table 5-1: Relevant protected species records from Cofnod within 5km of study site | 65 |
| Table 5-2: Examples of sites at various levels of importance | 72 |
| Table 5-3: Considerations of effects on different Ecological Features | 73 |
| Table 5-4: Importance of key ecological receptors identified within the 5km of the site | 74 |
| Table 5-5: Summary of impacts on ecological features | 78 |
| Table 6-1 Description of viewpoints selected for appraisal | 89 |
| Table 6-2 Summary of impacts on receptors at specific viewpoints | 94 |
| Table 7-1 Designated and Registered Heritage Assets within 1km of the Development Area | 99 |
| Table 7-2: Listed buildings within 500m of the construction site | 99 |
| Table 7-3: Undesignated Heritage Assets within 1km of the construction site | 100 |
| Table 7-4: Undesignated Heritage Assets within the construction site | 101 |
| Table 7-5: Undesignated Heritage Assets within 500m of the construction site | 107 |
| Table 7-6: Definition of Value of Heritage Assets | 108 |
| Table 7-7: Definition of magnitude of effect | 109 |
| Table 7-8: Potential direct impacts on heritage assets | 112 |
| Table 7-9: Potential visual effects on listed buildings | 116 |
| Table 7-10: Summary of potential direct impacts and mitigation | 119 |
| Table 7-11: Summary of residual effects | 120 |
| Table 8-1: Large tourism receptors within 3km of the proposed scheme | 126 |
| Table 8-2: Small tourism-dependent businesses close to the scheme | 127 |
| Table 8-3: Educational institutions within Rhyl | 128 |
| Table 8-4: Health centres within 2km of the scheme | 130 |
| Table 8-5: Community facilities within 2km of the proposed scheme | 132 |
| Table 9-1 Summary of bus services | 141 |
| Table 9-2: Estimated Traffic Impacts at Key Links and Junctions | 144 |
| Table 9-3: Changes in Traffic Flow | 145 |
| Table 10-1: Criteria for assessing the sensitivity of the lighting environment | 154 |
| Table 10-2: Criteria for assessing the magnitude of lighting impacts | 155 |
| Table 10-3: Summary of significance of effect on receptors from compound lighting impacts. | 158 |
| Table 10-4: Summary of significance of residual construction effects | 161 |
| Table 11-1: Summary of projected climate change impacts to the coastal cell for East Rhyl from UKCP09 | 164 |
| Table 11-2: Regional net sea level allowances used in FCDPAG3 ¹⁶ . | 166 |
| Table 11-3: Estimated embodied carbon associated with the construction material for the proposed development | 170 |
| Table 11-4: Estimated CO ₂ emissions associated with the delivery of construction materials for the proposed development | 170 |
| Table 12-1: Committed developments that could combine with the proposed scheme to create a cumulative impact | 179 |
| Table 12-2: Interrelationship impact during construction on specific residential receptors where environmental effects have been assessed individually elsewhere in the ES | 186 |
| Table 13-1 Summary of significant effects, mitigation measures and residual effects | 188 |

Abbreviations

| | |
|-------------------|---|
| AADF | Average Annual Daily Flow |
| AOD | Above Ordnance Datum |
| AONB | Area of Outstanding Natural Beauty |
| BTO | British Trust for Ornithology |
| CCS | Considerate Constructors Scheme |
| CEFAS | The Centre for Environment, Fisheries and Aquaculture Science |
| CEMP | Construction Environmental Management Plan |
| CIEEM | Chartered Institute of Ecology and Environmental Management |
| CIfA | Chartered Institute for Archaeologists |
| CO ₂ e | Equivalent Carbon Dioxide |
| COSHH | Control of Substances that are Hazardous to Health |
| CPAT | Clwyd Powys Archaeological Trust |
| DCC | Denbighshire County Council |
| DMRB | Design Manual for Roads and Bridges |
| EA | Environment Agency |
| EC | European Commission |
| EcIA | Ecological Impact Assessment |
| ECW | Environmental Clerk of Works |
| EIA | Environmental Impact Assessment |
| ES | Environmental Statement |
| EU | European Union |
| FCDPAG3 | Flood and Coastal Defence Appraisal Guidance 3 |
| GES | Good Ecological Status |
| GLVIA | Guidelines for Landscape and Visual Impact Assessment |
| Ha | Hectare |
| HAT | Highest Astronomical Tide |
| HGV | Heavy Goods Vehicle |
| HER | Historic Environment Record |
| HMWB | Heavily Modified Water Body |
| HRA | Habitat Regulations Assessment |
| ICZM | Integrated Coastal Zone Management |
| IEMA | Institution of Environmental Management and Assessment |
| JBA | Jeremy Benn Associates |
| JNCC | Joint Nature Conservation Committee |
| kWh | Kilowatt Hours |
| LAT | Lowest Astronomical Tide |
| LFRMS | Local Flood Risk Management Strategy |
| LNR | Local Nature Reserve |
| LVIA | Landscape and Visual Impact Assessment |
| LWS | Local Wildlife Site |
| M | Metre |
| MAGIC | Multi-Agency Geographical Information for the Countryside |

| | |
|--------|---|
| MCA | Marine Character Area |
| MHWN | Mean High Water Neaps |
| MHWS | Mean High Water Spring |
| MLWN | Mean Low Water Neaps |
| MLWS | Mean Low Water Spring |
| MSL | Mean Sea Level |
| NAO | North Atlantic Oscillation |
| NMR | National Monument Record |
| NPRN | National Primary Record Number |
| NTS | Non-Technical Summary |
| NRW | Natural Resources Wales |
| PAR | Project Appraisal Report |
| PM | Particulate Matter |
| PRN | Primary Record Number |
| PRoW | Public Right of Way |
| RCAHWW | Royal Commission on the Ancient and Historical Monuments of Wales |
| RYA | Royal Yachting Association |
| SAC | Special Area of Conservation |
| SMP | Shoreline Management Plan |
| SPA | Special Protection Area |
| SSSI | Site of Special Scientific Interest |
| TAN | Technical Advice Note |
| TRO | Traffic Regulation Order |
| UKCP09 | United Kingdom Climate Change Projections 2009 |
| UWTSD | University of Wales Trinity St David |
| WAT | Welsh Archaeological Trust |
| WeBS | Wetland Bird Survey |
| WFD | Water Framework Directive |
| WIMD | Welsh Index for Multiple Deprivation |

1 Introduction

1.1 Background

- 1.1.1 JBA Consulting has been commissioned by Balfour Beatty, on behalf of Denbighshire County Council (DCC), to develop a scheme for improving the coastal defences at East Rhyl in Denbighshire, North Wales (Figure 1-1).
- 1.1.2 The proposals are subject to both planning consent and marine licensing. Being a major coastal infrastructure development, an Environmental Impact Assessment (EIA) is required to identify, predict and evaluate any impacts on the environment, so that the design development and consenting requirements of the proposals are undertaken in the full knowledge of any likely significant effects.
- 1.1.3 The findings of the EIA process are documented in this Environmental Statement (ES) report. The circumstances under which the development project has been subject to the EIA process and the way in which the ES has been prepared, are a statutory requirement. A non-technical summary of this report is available in both the English and Welsh Languages.

1.2 Cymraeg

- 1.2.1 Darperir crynodeb annhechnegol o'r adroddiad hwn a ysgrifennwyd yn yr iaith Gymraeg yn Atodiad A yng Nghyfrol 2.

1.3 Site description and history

- 1.3.1 Rhyl is a seaside resort town situated on the north coast of Wales and adjacent to the Liverpool Bay. The town has historically been protected from coastal flooding by a range of hard defence structures constructed in the 1950s. The coastal defences in the east of the town no longer meet acceptable performance standards. At East Rhyl, the existing defences have overtopped in recent years, causing significant damage and disruption residential properties and businesses.
- 1.3.2 In 2013 deep flooding of 130 residential properties led to 400 people being evacuated from their homes with some having to be rescued by boat. Since then flood modelling has shown that the risk of this happening again is set to increase with climate change projections for increased sea level rise and storminess. The effectiveness of the existing defences will therefore continue to reduce. Action is needed to protect East Rhyl now and in the future to sustain the local community and to continue to promote Rhyl as a tourist destination, which is important to the local economy.
- 1.3.3 The East Rhyl Coastal Defence Scheme has been designed to protect up to 472 properties from flooding caused by wave overtopping of the existing seawall during severe storm events. The new defences would provide protection of these properties over the next sixty years from a storm event of a magnitude only expected to occur once in a two hundred year period (a storm with a 0.5% probability of occurring each year).
- 1.3.4 The proposed development red line boundary and construction site extents (both pre- and post-mitigation) are provided in Appendix B.



Figure 1-1: Site Location

1.4 Legislative basis of the Environmental Statement

- 1.4.1 The requirement for assessment of the effects of certain public and private projects on the environment is set out in European and UK law. European Council (EC) Directive No. 85/337/EEC¹ as amended by EC Directive No. 97/11/EC², EC Directive No.

¹ EC Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, *Official Journal of the European Union* No. L 175, 05/07/1985.

² EC Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. *Official Journal of the European Union* No. L 073, 14/03/1997.

2011/92/EU³ and EC No. Directive 2014/52/EU⁴ (hereafter collectively referred to as 'the EIA Directive') under Article 5(1): *'Where an environmental impact assessment is required, the developer shall prepare and submit an environmental impact assessment report.'*

- 1.4.2 The EIA Directive is transposed into UK law through the EIA Regulations. These are a series of statutory instruments that set out regulations for implementing the EIA Directive through specific consenting regimes. The development proposals require consent under the Town & Country Planning Act 1990 and the Marine & Coastal Access Act 2009, and therefore fall within the requirements of both the Town & Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (W136), and the Marine Works (Environmental Impact Assessment) Regulations 2007 (SI 2007/1518) (as amended 2011, 2015, 2017). Regulation 5 of the 2017 Town & Country Planning EIA Regulations sets out the provisions relating to screening EIA Development, and Regulations 7 and 8 of the 2007 Marine Works EIA Regulations set out the requirement for screening of EIA Directive Annex I and Annex II Projects.
- 1.4.3 A combined EIA Screening and Scoping Opinion request was made on 23rd January 2018 to Natural Resources Wales Marine Licensing Team and DCC Planning Department. It was determined by NRW on 14th March 2018 that the proposed scheme falls within Schedule A2, paragraph 69 of the above regulations and therefore must be considered in terms of size, nature and location having regard to the relevant criteria set out in Schedule 1 of the Marine Works EIA Regulations. NRW determined that the project has the potential to have a significant effect on the environment, and therefore a statutory EIA would be required. It was determined by DCC on 26th March 2018 that the scheme also falls within development listed in Schedule 2 Paragraph 10(m) of Town and Country Planning EIA Regulations, and would also therefore require statutory EIA.

1.5 Scope and Content of the Environmental Statement

- 1.5.1 The combined EIA Screening and Scoping Report considered the likely significant effects of the emerging development proposals. A review of available baseline information was undertaken and consideration was given to an appropriate scope for assessing the likely significant effects. The Scoping Opinion request has provided an opportunity to seek the views of the Statutory Environmental Consultees. Under Regulation 17(4)(c)/12(2)(c) the ES must be based on the most recent scoping opinion. As well as EIA scope, the EIA Screening and Scoping Report set out an appropriate content and structure of the ES, which is summarised in the following sections. The full EIA Screening and Scoping Report, together with the responses received from DCC and NRW are provided in Appendix C and D. Further consideration of scope of the EIA in the context of the EIA Scoping responses are provided in Section 3.2.
- 1.5.2 In accordance with Regulation 17(3)/12(2) of the EIA Regulations, the ES is a statement which includes at least:
- (a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;

³ EC Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of effects of certain public and private projects on the environment. *Official Journal of the European Union* L 26, 28/1/2012.

⁴ EC Directive 2014/52/EU of 6 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, *Official Journal of the European Union* No. L 124/1, 25/04/2014.

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

- 1.5.3 The non-technical summary (NTS) is intended to inform those who have an interest in the development but who are not concerned with the detail of the technical assessment provided in the ES. It summarises the proposals, the likely significant environmental effects and any proposed mitigating measures in non-technical language (plain English). The NTS has been made available as a translation into the Welsh Language in Atodiad A (Appendix A). The NTS is provided at the beginning of the main text of the ES report, and is also available as a stand-alone document and in an electronic format.
- 1.5.4 The main text of the ES report is organised on an environmental topic basis as outlined in Regulation 4(2). For each environmental topic, a brief overview of the legislative and planning policy context is provided to set the context of the topic chapter. The topic-specific baseline conditions that are used to inform the assessment are described, and the potential impacts and likely significant effects of the proposals on the environment have been assessed for each of environmental topics. These have been assessed on the basis of the EIA Scoping plus any new relevant additional information that has come to light. Mitigation measures are proposed to reduce the significance of effects where appropriate, and the resulting residual effect is reported. The general approach to EIA is iterative, whereby the findings of assessment together with ongoing consultation with stakeholders, influence the design of the development proposals. Further detail on the EIA process is provided in section 3.1.
- 1.5.5 The structure of the ES is set out in Table 1-1. For consistency and ease of cross reference, each environmental topic chapter presented in the ES is structured with the following headings:
- 1 Introduction
 - 2 Legislative and Planning Policy Context
 - 3 Baseline Conditions
 - 4 Assessment Methodology
 - 5 Potential Impacts & Significant Effects
 - 6 Mitigation Measures
 - 7 Residual Effects

Table 1-1 ES structure

| | |
|---|--|
| Non-Technical Summary | |
| Chapter 1 Introduction | |
| 1.1 | Background |
| 1.2 | Cymraeg |
| 1.3 | Site Description and History |
| 1.4 | Legislative Basis of the Environmental Statement |
| 1.5 | Scope and Content of the ES |
| 1.6 | Related Technical Information |
| Chapter 2 The Proposed Development | |
| 2.1 | Planning Policy Context |
| 2.2 | Environmental Constraints |
| 2.3 | Alternatives and Design Evolution |
| 2.4 | Outline Design |
| 2.5 | Detailed Design Development |
| 2.6 | Detailed Design Proposals |
| 2.7 | Construction of the Scheme |
| 2.8 | Operation of the Scheme |
| 2.9 | Future Operation and Decommissioning |
| Chapter 3 Environmental Impact Assessment Methodology | |
| 3.1 | The EIA Process |
| 3.2 | EIA Screening & Scoping |
| 3.3 | EIA Method of Assessment |
| Chapter 4 Coastal Hydrology & Hydromorphology | |
| Chapter 5 Biodiversity & Nature Conservation | |
| Chapter 6 Landscape & Visual Impact | |
| Chapter 7 Cultural Heritage | |
| Chapter 8 Population, Human Health & Socio-economics | |
| Chapter 9 Traffic & Transport | |
| Chapter 10 Other Construction Effects | |
| Chapter 11 Sustainability & Climate Change | |
| Chapter 12 Cumulative Effects | |
| 12.1 | Interrelationship Effects Between Topics |
| 12.2 | Cumulative Effects with Other Committed Developments |
| Chapter 13 Summary | |

1.6 Related Technical Information

- 1.6.1 The following technical reports provided as appendices to the ES chapters in Volume 2 form part of the planning application and marine licence application for the proposed development and are referred to in the ES:
- Coastal Processes & Hydromorphology (Appendix H)
 - Coastal Processes Modelling Report
 - Water Framework Directive Assessment Report
 - Bathing Water Assessment Report
 - Biodiversity & Nature Conservation (Appendix I)
 - Overwintering Bird Survey Report
 - Habitats Regulations Assessment Screening Report
 - Landscape & Visual Impact (Appendix J)

- Landscape and Visual Impact Assessment Report
- Cultural Heritage (Appendix K)
 - Geoarchaeological Report
 - Curatorial Brief
- Traffic & Transport (Appendix L)
 - Traffic Assessment Report
- Other Construction Effects (Appendix M)
 - Ground Investigation Report & Addendum
 - Noise and Air Quality Assessment
 - Construction Environmental Management Plan
- Climate Change & Sustainability (Appendix N)
 - UKCP09 and FDCPAG3 Technical Note
 - Flood Consequences Assessment

2 The Proposed Development

2.1 Planning Policy Context

2.1.1 *Welsh National Marine Plan*

2.1.2 Consultation on the draft Welsh National Marine Plan (WNMP) produced by Welsh Government⁵ closed on 29th March 2018. The WNMP is directly informed by High Level Marine Objectives set out in the Marine Policy Statement (2011)⁶. These objectives align with Welsh Government's well-being goals and principles for sustainable development and also the direction provided in the EU Directive on Marine Spatial Planning 89/2014.

2.1.3 The plan objectives, related to supporting policy objectives (i.e. in the Marine Policy Statement), of particular relevance to the proposals include objectives relating to Ensuring a Strong, Healthy and Just society, and Living Within Environmental Limits:

- Plan Objective 5: Reduce poverty and support the development of vibrant, more equitable, culturally distinct, cohesive and resilient coastal communities.
- Plan Objective 6: Support enjoyment and stewardship of our coast and seas and their resources by encouraging equitable and safe access to the marine environment, whilst protecting and promoting valuable landscapes, seascapes and heritage assets.
- Plan Objective 7: Improve understanding and enable action supporting climate change adaptation and mitigation.
- Plan Objective 8: Support the achievement and maintenance of Good Environmental Status (GES).
- Plan Objective 9: Protect, conserve, restore and enhance marine biodiversity to halt and reverse its decline.
- Plan Objective 10: Maintain and enhance the resilience of marine ecosystems and the benefits they provide in order to meet the needs of present and future generations.

2.1.4 *Shoreline Management Plan*

2.1.5 The North West England and North Wales Shoreline Management Plan (SMP) ²⁷ covers the North Wales Coast, which lies in Sub-Cell 11a, between Great Orme's Head and Formby Point. The policy for the section of coast covering East Rhyl, between Clwyd Estuary to Rhyl Gold Links (11a.4.1) is "*Hold the Line*" over the next three epochs (0-20 years, 20-50 years, 50-100 years). The policy states that maintaining and improving/raising the existing defences is required. This is justified in the SMP due to the commercial, residential and amenity assets, infrastructure, cycle routes and footpaths that are vulnerable to flooding.

2.1.6 *National Strategy for Flood and Coastal Erosion Risk Management in Wales*

2.1.7 Under the Flood and Water Management Act 2010 the Welsh Government was required

⁵ Welsh Government, 2015. The Welsh National Marine Plan Initial Draft. [Online] Available at: <https://beta.gov.wales/sites/default/files/consultations/2018-02/draft-plan-en.pdf>

⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf

⁷ http://www.mycoastline.org.uk/info/1/shoreline_management/3/

to develop the National Strategy for Flood and Coastal Erosion Risk Management in Wales⁸. The Strategy sets out a framework to help communities, the public sector and other organisations work together to manage flood and coastal erosion risk. It supports local decision-making and engagement in flood and coastal erosion risk management, making sure that risks are managed in a co-ordinated way across Wales. This includes the development of Local Flood Risk Management Strategies by Local Flood Authorities.

2.1.8 The National Strategy sets out four main objectives for managing flood and coastal erosion risk:

- Reducing the consequences for individuals, communities, businesses and the environment from flooding and coastal erosion;
- Raising awareness of and engaging people in flood and coastal erosion risk;
- Providing an effective and sustained response to flood and coastal events; and
- Prioritising investment in the most at-risk communities.

2.1.9 *Denbighshire Local Flood Risk Management Strategy*

2.1.10 Denbighshire County Council is the Local Flood Authority for Denbighshire and has produced a Local Flood Risk Management Strategy (LFRMS)⁹ to support the objectives of the National Strategy. The LFRMS recognises the coastal flooding that took place at East Rhyl in 2013, and the residual risk to residents of overtopping or breaching of defences. The strategy also recognises the increased threat from climate change.

2.1.11 As part of the LRFMS a series of regional and local plans identify flood risk within Denbighshire. One of the plans, the *Rhyl – Prestatyn Coastal Defence Strategy Study Report*, details coastal flood risk for the Denbighshire towns of Rhyl and Prestatyn, within Sub-cell11a. The strategy outlines the means of establishing, justifying and prioritising the overall aims and objectives of flood and coastal defence policy for the areas concerned. It has been produced to ensure that the future flood and erosion risk management is compatible with and where appropriate contributes to the sustainable development of the Denbighshire coastline within the strategic Shoreline Management Plan.

2.1.12 *Planning Policy Wales*

2.1.13 Planning Policy Wales Edition 9¹⁰ (PPW) sets out the land use planning policies of the Welsh Government. It sets out the commitment to sustainable development under the Well-being of Future Generations (Wales) Act 2015 through the planning system so that it can play an appropriate role in moving towards sustainability.

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

⁸ Welsh Government (2011) *National Strategy for Flood and Coastal Erosion Risk Management in Wales*.

⁹<https://www.denbighshire.gov.uk/en/your-council/strategies-plans-and-policies/local-flood-risk-management-strategy-en.pdf>

¹⁰ <https://gov.wales/topics/planning/policy/ppw/?lang=en>

- putting people, and their quality of life now and in the future, at the centre of decision-making;
- engagement and involvement, ensuring that everyone has the chance to obtain information, see how decisions are made and take part in decision-making;
- taking a long-term perspective to safeguard the interests of future generations, whilst at the same time meeting needs of people today;
- respect for environmental limits, so that resources are not irrecoverably depleted or the environment irreversibly damaged. This means, for example, mitigating climate change, protecting and enhancing biodiversity, minimising harmful emissions, and promoting sustainable use of natural resources;
- tackling climate change by reducing the greenhouse gas emissions that cause climate change and ensuring that places are resilient to the consequences of climate change;
- applying the precautionary principle. Cost-effective measures to prevent possibly serious environmental damage should not be postponed just because of scientific uncertainty about how serious the risk is;
- using scientific knowledge to aid decision-making, and trying to work out in advance what knowledge will be needed so that appropriate research can be undertaken;
- while preventing pollution as far as possible, ensuring that the polluter pays for damage resulting from pollution. In general the Welsh Government will seek to ensure that costs are met by those whose actions incur them;
- applying the proximity principle, especially in managing waste and pollution. This means solving problems locally rather than passing them on to other places or to future generations;
- taking account of the full range of costs and benefits over the lifetime of a development, including those which cannot be easily valued in money terms when making plans and decisions and taking account of timing, risks and uncertainties. This also includes recognition of the climate a development is likely to experience over its intended lifetime; and
- working in collaboration with others to ensure that information and knowledge is shared to deliver outcomes with wider benefits.

2.1.15 Section 5.6 of PPW Chapter 5 is concerned with managing the coast. The European Union is promoting a coordinated policy for coastal regions and is calling for the implementation of strategies for Integrated Coastal Zone Management (ICZM)¹¹. ICZM is intended to integrate the policies influencing coastal regions, to ensure management of these areas is environmentally and economically sustainable, socially equitable and cohesive, including recognising the threat to coastal zones posed by climate change. The main principles of ICZM are embedded into relevant plans and projects, recognising the importance of the coast for:

- The conservation of the natural and historic environment;
- Urban and rural development, including housing, local industry and agriculture; and
- Tourism, leisure and recreation.

¹¹ Communication for the Commission to the Council and the European Parliament, 'Integrated Coastal Zone Management: A Strategy for Europe' (COM/547/2000) [Online] Available at: <http://ec.europa.eu/environment/iczm/comm2000.htm>

2.1.16 *Draft of Planning Policy Wales (PPW) Edition 10*

- 2.1.17 PPW has been restructured into policy themes around the well-being goals and policy updated to reflect new Welsh Government strategies and policies¹².
- 2.1.18 The Draft of Planning Policy Wales Edition 10 Section 2.1.16 sets out the Placemaking Policy. This policy aims to keep everyone engaged in the creation of Sustainable Places. The Placemaking chapter sets out the 5 key Planning Principles the Welsh Government has identified: To facilitate the right ways of working in the right place, Making best use of Resources, Facilitating Accessible and Healthy Environments, Creating and Sustaining Communities, and Maximising environmental protection and limiting environmental impact. In addition, PPW Edition 10 sets Sustainable Places as the goal of the land use planning system in Wales.
- 2.1.19 A suite of high-level National Sustainable Placemaking Outcomes have been developed to encapsulate the spirit of placemaking in one succinct place and to ensure that all developments make or contribute towards the creation of sustainable places.
- 2.1.20 The Managing Environmental Risks section has been changed to place environmental risks, such as land contamination and instability, in the context of 'de-risking'. This can be understood as unlocking the potential of places through managing risk and identifying opportunities.
- 2.1.21 The introduction of the Distinctive and Natural Places chapter highlights the connections that the policy topics in this chapter (Recognising the Special Characteristics of Places and Recognising the Environmental Quality of places) have with the placemaking outcomes. Linkages with the 7 Well-being Goals and 5 Ways of Working of the WFG Act are also made. The themes of the chapter can work together to achieve Sustainable Places.
- 2.1.22 The theme of Sustainable Places provides the context for understanding, recognising and identifying characteristics and qualities that are integral components of place, which should be protected for their beauty and intrinsic value as part of natural and built heritage. These characteristics should be considered in terms of their contribution towards health and well-being of people and the environment.
- 2.1.23 The introduction of the Productive and Enterprising Places chapter highlights the connections that the policy topics in this chapter (Economic Infrastructure, Energy and Circular Economy and Making Best Use of Material Resources) have with the placemaking outcomes, as well as making linkages with the 7 Well-being Goals and 5 Ways of Working of the WFG Act.
- 2.1.24 The key principles of the following, current, PPW policies remain, but they have been developed and elaborated as part of a more robust framework:
- Air Quality and Soundscape (Noise)
 - Community Facilities
 - Distinctive Coastal Characteristics
 - Landscape and Biodiversity

¹² <https://beta.gov.wales/planning-policy-wales-edition-10>

2.1.25 *Technical Advice Notes*

2.1.26 Technical Advice Notes (TAN) have been produced by the Welsh Government to provide advice to local planning authorities when they are preparing development plans and should be read alongside Planning Policy Wales when determining development applications. Particularly relevant Advice Notes which are specifically addressed to in the EIA topic chapters:

- TAN 5 – Nature Conservation and Planning;
- TAN 11 – Noise;
- TAN 12 – Design
- TAN 14 – Coastal Planning;
- TAN 15 – Development and Flood Risk;
- TAN 20 – Planning and the Welsh Language;
- TAN 23 – Economic Development; and
- TAN 24 – The Historic Environment.

2.1.27 TAN 15¹³ is of particular relevance to the East Rhyl coastal defence scheme. This recognises that sea level rise and increased storminess are some of the most likely effects of climate change to which Wales will need to adapt in the future. Policy Clarification Letter CL-03-16¹⁴ sets out the requirements of TAN 15 with regard to the climate change allowances for planning. Associated Flood Consequences Assessment guidance¹⁵ makes reference to the source of the new requirements in *FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities—Climate Change Impacts*¹⁶. This discusses in detail that the response to climate change requires appropriate decisions on whether to consider a managed adaptive approach or whether to adopt a more precautionary approach to coastal defence. The managed adaptive approach involves tracking the change in risk and managing this through multiple interventions. The precautionary approach involves a single long-term intervention, where future adaptation may be technically infeasible or too complex to administer over a period of up to 100 years.

2.1.28 *Local Planning Policy*

2.1.29 The adopted Denbighshire Local Development Plan¹⁷ (LDP) sets out the proposals and policies for future development and use of land in Denbighshire. Related to LDP are Supplementary Planning Guidance (SPG), which is additional advice provided by the Council, on a particular topic or policy areas and related to and expanding upon statutory policies.

2.1.30 The Local Development Plan vision sets out how Denbighshire will have developed by

¹³ Planning Policy Wales Technical Advice Note 15 (TAN15) Development and Flood Risk (2004) sets out that development should be designed to be flood free during the 0.5% tidal/coastal flood (i.e. 200 to 1 chance in any year event). <https://gov.wales/docs/desh/publications/040701tan15en.pdf>

¹⁴<https://gov.wales/topics/planning/policy/policyclarificationletters/2016/cl-03-16-climate-change-allowances-for-planning-purposes/?lang=en>

¹⁵<https://gov.wales/docs/desh/publications/160831guidance-for-flood-consequence-assessments-climate-change-allowances-en.pdf>

¹⁶ Defra (2006). *Flood and Coastal Defence Appraisal Guidance FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts*.

¹⁷<https://www.denbighshire.gov.uk/en/resident/planning-and-building-regulations/local-development-plan/ldp-adopted-ldp/ldp-adopted-ldp.aspx>

the year 2021 and states “*That Denbighshire, through sustainable development, will have a vibrant urban coast, with thriving market towns and rural areas. The housing and employment needs of the county will be met, the high quality of life maintained for all communities with full recognition that we have a strong Welsh language and culture that should be maintained and protected throughout the county*”

2.1.31 The Local Development Plan identifies a range of issues affecting the county, of which the following are particularly relevant:

- Rhyl is currently underperforming as a sub-regional retail centre, other market town and village centres are vulnerable to increased competition from other centres outside of the County.
- Some areas in the north of the County are experiencing high levels of multiple deprivation.
- There is a high quality built and natural environment in Denbighshire which should be protected and enhanced. The opportunities to enhance and develop environmental goods and services should also be explored;
- 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.

2.1.32 The issues have led to a list of objectives that plans and policies set out to achieve by 2021. Those particularly relevant to the scheme are outlined as follows:

- Welsh Language - the Local Development Plan will ensure that the impact of new development on the Welsh language and culture will be assessed in all parts of the county.
- Public Open Space - the Local Development Plan will seek to protect existing open space and ensure that new developments make an adequate contribution to public open space provision.
- Design - 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 - the Local Development Plan will seek to enhance and sustain sustainable tourism in the rural and coastal areas of the County.
- Areas of Protection - 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.

2.2 Environmental Constraints

2.2.1 Key environmental constraints identified within 5km of the project are summarised in Table 2-1. These were identified following a review of readily available environmental information for the purpose of EIA Screening and Scoping. The key environmental constraints are also illustrated in the Environmental Constraints Plan provided in Appendix B. Where relevant further consideration is given to these environmental constraints within the baseline section of each of the EIA topic chapters.

Table 2-1 Environmental constraints identified within 5km where relevant

| EIA Topic | Environmental Constraint | Qualifying features/Description | Distance from Site Boundary |
|--------------------------------------|---|---|------------------------------------|
| Biodiversity and nature conservation | Special Protection Areas (SPA) | Liverpool Bay SPA – designated for red-throated diver (<i>Gavia stellata</i>) and common scoter (<i>Melanitta nigra</i>) as well as other overwintering bird species. Extended in October 2017 to provide protection to foraging common tern (<i>Sterna hirundo</i>) and little tern (<i>Sterna albifrons</i>) (2.8km east). | 250m North |
| | | Dee Estuary SPA - supports internationally important populations of regularly occurring Annex I species including sandwich tern (<i>Sterna sandicensis</i>), little tern (<i>Sterna albifrons</i>), common tern (<i>Sterna hirundo</i>), and bar-tailed godwit (<i>Limosa lapponica</i>). It also supports an internationally important assemblage of waterbirds, providing feeding and roosting sites for ducks and waders in winter. | 4.1km East |
| | Special Area of Conservation (SAC) | Dee Estuary SAC - designated for estuaries, mudflats and sandflat, <i>Salicornia</i> and other annuals colonising mud and sand, Atlantic Salt Meadows, and annual vegetation of drift lines. Also designated for river lamprey (<i>Lampetra fluviatilis</i>) and sea lamprey (<i>Petromyzon marinus</i>). Other habitats include fixed dunes with herbaceous vegetation ('grey dunes'); shifting dunes along the shoreline with <i>Ammophila arenaria</i> ('white dunes'), embryonic shifting dunes, humid dune slacks, vegetated sea cliffs of the Atlantic and Baltic coasts. | 4.1km East |
| | Ramsar sites | Dee Estuary Ramsar site - regularly supports 20,000 or more waterbirds and 1% or more of the individuals in a population of one species or sub-species of waterbirds including redshank (<i>Tringa tetanus</i>), shelduck (<i>Tadorna tadorna</i>), teal (<i>Anas crecca</i>), pintail (<i>Anas acuta</i>), oystercatcher (<i>Haematopus ostralegus</i>), grey plover (<i>Pluvialis squatarola</i>). | 4.1km East |
| | Sites of Special Scientific Interest (SSSI) | Prestatyn Hillside SSSI – designated for botanical interest. Site supports a range of semi-natural plant communities including calcareous and acidic grassland, calcareous heath and scrub and broadleaved woodland. | 4.0km East |
| | | Dee Estuary SSSI - designated for special interest for its total populations of internationally important wintering waterfowl; its populations of individual waterfowl and tern species whose numbers reach national and in some cases, internationally important levels; its intertidal mud and sandflats, saltmarsh and transitional habitats; the hard rocky sandstone | 4.7km East |

| EIA Topic | Environmental Constraint | Qualifying features/Description | Distance from Site Boundary |
|-------------------|------------------------------------|---|-----------------------------|
| | | cliffs of Hilbre Island and Middle Eye with their cliff vegetation and maritime heathland and grassland; its assemblage of nationally scarce plants; and its populations of sandhill rustic moth (<i>Luperina nickerlii gueneei</i>), Red Data Book species. | |
| | | Gronant Dunes and Talacre Warren – designated for characteristic dune flora including dune slacks. The rare liverwort Petalwort <i>Petalophyllum ruffsii</i> is found and supports a rich invertebrate assemblage. The largest breeding colony in Wales, of the little tern <i>Sterna albifrons</i> which is present in nationally important numbers. Other bird species which occur in nationally important numbers are sanderling <i>Calidris alba</i> and cormorant <i>Phalacrocorax carbo</i> which roost on the foreshore in summer. Of additional interest are the high tide wader roost and winter gull roost at Gronant. The foreshore in summer is also an important roosting and loafing area for terns on passage. | 3.2km East |
| | Local Nature Reserves (LNR) | Gronant Dunes LNR | 4.1km East |
| | Wildlife Sites | Y Ffrith Wildlife Site (Denbighshire D011) - sand dune and herb-rich grassland. | 1.5km East |
| | Habitats | Range of sand dune habitats | 1.2km East |
| | | Intertidal rocky shore – rip-rap situated adjacent next to sea wall | Adjacent |
| | | Intertidal sandflats – contains marine benthic invertebrates, such as mussels, which birds may feed on | Within |
| | | Scrub and vegetation | Adjacent |
| | Species | Overwintering birds such as red-throated diver and common scoter likely to forage in the intertidal mud and sand flats adjacent to the site | Potentially adjacent |
| | | Breeding birds, particularly in scrub vegetation adjacent to promenade | Potentially adjacent |
| | | Ground nesting birds potentially in the adjacent golf course | Potentially adjacent |
| | | Potential fish spawning and nurse grounds | Potentially adjacent |
| Cultural heritage | Conservation Area | Rhyl Central Conservation Area - 19th century town planning based on rectilinear grid | 480m south west |
| | Listed buildings | Royal Alexandra Hospital – Grade II listed building | Adjacent |
| | | Multiple listed buildings within Rhyl Central Conservation Area and surroundings | 200m-1.1km south west |
| | Historic Environment Records (HER) | Rhyl foreshore submerged landscape - prehistoric submerged forest preserved in peat | Within |

| EIA Topic | Environmental Constraint | Qualifying features/Description | Distance from Site Boundary |
|--------------------------------|--|---|-----------------------------|
| | | dating to 4000-3000 BC (late Mesolithic/early Neolithic) – 17103 | |
| | | Rhyl foreshore causeway (post-medieval trackway) – 106402 | Adjacent |
| | | Rhyl foreshore (Splash point) structures (post-medieval coastal defence/fish trap/prehistoric occupation site) – 123322 | Within |
| | | Rhyl, Volunteers' rifle range – 37700 | Within |
| | | Rhyl, Mantelet Targets – 128935 | 280m east |
| | | St Olaf, Wreck Site – 271558 | 270m north |
| | HER find spots | Rhyl foreshore (Splash Point) antler mattock (Mesolithic find) – 33099 | Adjacent |
| | | Rhyl foreshore Neolithic axes (Neolithic find) – 101936 | Adjacent |
| | | Rhyl foreshore post medieval finds (bronze objects) – 58795 | Within |
| | | Rhyl foreshore macehead – 58796 | Within |
| | | Rhyl foreshore bronze chisel (Bronze Age find) – 101937 | Within |
| Landscape and visual | Area of Outstanding Natural Beauty (AONB) | Clwydian Range and Dee Valley AONB | 3.5km southeast |
| | Marine Character Area (MCA) | Colwyn Bay & Rhyl Flats MCA | Within |
| Water environment | Water Framework Directive (WFD) water body | North Wales coastal water body GB641011650000 (heavily modified water body) – moderate status (moderate ecological potential, fail mercury chemical status) | Within |
| | WFD higher sensitivity habitat | Mussels beds (<i>Mytilus edulis</i>) – note that the ecological surveys have been unable to locate this feature on the foreshore (may be ephemeral) | Adjacent |
| | WFD lower sensitivity habitat | Intertidal and soft sediments (sand, mud and mixed) | Within |
| | | Rocky shore (intertidal rock) | Adjacent |
| | Bathing water quality | Three designated bathing water areas lie near to the site: Rhyl, Rest East and Marine Lake, Rhyl | Adjacent |
| | Flood Risk | Flood Zone C2 | Within |
| Population and socio-economics | Local residents | Nearby residential properties along Eaton Avenue, Carlisle Avenue, Garford Road and Hilton Drive | Adjacent |
| | Local businesses | Rhyl Golf Club | Adjacent |
| | Traffic | Residential roads | Adjacent |
| | Recreation and amenity | Wales Coast Path | Within/adjacent |
| | | North Wales Coastal Route 5 (traffic free cycle route) | Within/adjacent |
| | | Public Rights of Way (PRoW) & local cycle routes and footpaths | Adjacent |
| | | Ffrith Beach – recreational and water sports use | Within |

2.3 Alternatives and Design Evolution

- 2.3.1 A Project Appraisal Report (PAR) was completed by JBA Consulting in May 2016, which identified several 'do something' options to manage flood risk now and in the future. The list of options considered was as follows:
- Option 1 – No active intervention (Do nothing);
 - Option 2 – Do minimum – Regular maintenance and beach recharge;
 - Option 3 – Do something – Beach recharge with a terminal groyne;
 - Option 4 – Do something – Offshore breakwater with a beach recharge;
 - Option 5 – Do something – Rock revetment with beach recharge;
 - Option 6 – Do something – Beach recharge scheme with a sand engine.
- 2.3.2 Due to uncertainties in the sediment transport regime and the resulting beach recharge costs, it was decided to undertake a sediment modelling stage before the preferred option was taken forward to detailed design. Following the modelling, the concept designs were developed further and costs updated by Balfour Beatty.
- 2.3.3 *Option stage modelling*
- 2.3.4 Coastal assessment and modelling identified key attributes of the Rhyl coastline, including onshore ridge-runnel dynamics and net eastward sediment transport along the beach face. An existing onshore sediment delivery of approximately 20,000m³/yr occurs through the migration of sand ridges, which is balanced by alongshore loss.
- 2.3.5 Modelling identified that an offshore breakwater option would need to be located further offshore and westward than the originally planned position, in order to operate effectively. The original position was likely to result in beach buildup attaching to the rock structure. This would effectively block onshore and longshore flow around splash point, functioning more like a groyne than a breakwater.
- 2.3.6 It was also identified that the existing rate of onshore supply is only capable of supporting a low beach. A higher beach, created through recharge, would be likely to experience rapid erosion. Secondary structures, such as groynes, would therefore be required to retain a recharge beach for a time scale in the order of 8-10 years.
- 2.3.7 Further details on the coastal processes baseline and modelling is provided in Chapter 4 Coastal Hydrology and Hydromorphology.
- 2.3.8 *PAR Addendum*
- 2.3.9 In August 2017 a PAR addendum was produced by JBA Consulting, with 5 revised options based on the sediment modelling results:
- Option 1 – No active intervention (Do nothing);
 - Option 2 – Do minimum – regular maintenance through beach recharge;
 - Option 3 – Offshore breakwater;
 - Option 4 – Rock revetment with minimal recharge for 'status quo' beach;
 - Option 5 – Rock revetment with rock groynes for enhanced amenity beach.
- 2.3.10 From these, Options 1 & 2 were omitted early, as it was decided that taking no or minimum action would be more expensive in the long-term and not provide any form

of improved standard of protection. It was determined that Option 3, an offshore breakwater, would cost significantly more than the two revetment options (Options 4 & 5), due to high capital costs. An enhanced amenity beach alongside a rock revetment (Option 5) would cost an additional £12.5 million over a 100-year lifespan than Option 4, which is not cost beneficial. Therefore Option 4 was identified as the preferred option on economic grounds.

- 2.3.11 Although the sediment modelling work indicated that none of the options were likely to give rise to significant changes in coastal processes at a scale that would directly affect environmental designations, it was considered that Option 3 had the greatest potential for direct impacts, given its proximity to the Liverpool Bay SPA. Similarly, there were concerns that the beach recharge elements could give rise to indirect effects on coastal processes (in particular Option 5).
- 2.3.12 The PAR addendum recommended Option 4, rock revetment with minimal recharge for 'status quo' beach, to be taken forward for detailed design on the basis of technical, economic and environmental grounds.
- 2.3.13 The Options Appraisal (PAR Addendum) report is provided in Appendix E.
- 2.3.14 *Wave return wall*
- 2.3.15 During the appraisal it was identified that the existing wave return wall at East Rhyl is not high enough and does not have a sufficient residual life to be relied upon for the full design life of the new structure. Three options for a new wave return wall were considered (Table 2-2) to address three primary requirements:
- Reduce wave overtopping to tolerable levels/volumes/rates (in combination with a rock armour revetment) during the design storm event;
 - Provide still water level flood protection during the design storm event; and
 - Have a design life of 100 years.

Table 2-2: Wave return wall design options

| Number | Name | Description | Outcome of appraisal |
|----------|--|---|--|
| Option 1 | Precast wave wall on existing retaining wall | Existing recurve wall would be trimmed at existing ground level with the surface prepared to receive a new precast concrete wave wall. New wall would have a higher crest level than the existing wall. The promenade would therefore also need to be raised to protect views out to sea. | Rejected: This option is unlikely to conform to the 100-year design life as it would be reliant on the existing wall to retain the soil below the new wall |
| Option 2 | Precast wave wall on new retaining wall | A new precast concrete wall would be placed in front of the existing retaining wall, reducing the requirements for excavation. New wall would be placed on concrete plinth | Rejected: This option would require a long construction period, requiring many different operations, adding time and cost |

| Number | Name | Description | Outcome of appraisal |
|----------|--|---|--|
| | | and backfilled behind. Rock armour placed over the heel of the retaining wall. | and greater potential for disruption. |
| Option 3 | Precast wave wall/retaining wall combination | A wave wall would be incorporated into the new retaining wall. A new concrete retaining wall would be placed on a concrete plinth, backfilled behind. New promenade would be placed over the top. | Recommended: This option would require more materials than options 1 or 2, but would be a simpler process that would potentially reduce time and cost, and disruption. |

2.4 Outline Design

- 2.4.1 Outline designs were developed for Option 4 rock revetment with minimal recharge for 'status quo' beach. This option would involve placement of rock armour over the existing concrete stepped structure, to dissipate wave energy arriving at the structure, a new upstand recurve seawall, and beach recharge of 20,000 cubic metres to maintain the beach at existing levels.
- 2.4.2 A worst-case scenario of a maximum total extent of 950m of rock armour revetment between the existing slipway in front of the golf course and the westernmost point of existing rock armour on Splash Point, was assumed for the purpose of EIA Screening and Scoping. The extension of rock armour around Splash Point was considered owing to concerns about the level of protection the existing rock armour is able to provide. In addition to this tie-in works to the adjacent sea defences, and entry points through the upstand sea wall with steps down to the beach, were included in the outline proposals.
- 2.4.3 In consultation with the construction contractor Balfour Beatty construction site area was devised including buildability information. This area included 18 ha of beach for access, excavation works and bulk materials storage. It was identified that for the duration of the construction works, public access would be restricted to this area of beach, to a 1.6 km section of the East Rhyll Promenade, to the public gardens east of Rhyll Pavilion and to an area at the end of Garford Road which will be used as a construction compound.
- 2.4.4 From the discussion with Balfour Beatty it was also identified that rock armour would be sourced from inland quarries, and beach recharge material would be supplied from the Liverpool Bay dredging area located approximately 10km to the north of Rhyll. Rock armour would be transported by road and beach material would likely to be transported to the beach by barge and deposited on the beach using 'rainbowing' (i.e. pumped with seawater onto the beach). It was identified that further consideration would need to be given to this and also to the particle size of the beach replenishment material, which would be specified on the basis of optimal beach stability with respect to coastal processes and impact on marine ecology.

2.5 Detailed Design Development

- 2.5.1 Detailed design proposals were developed from the outline designs on the basis of further, more detailed coastal process modelling. In order to demonstrate that the coastal defence proposals would provide a standard of protection acceptable to Denbighshire County Council (as the sponsor of the scheme), and Welsh Government (as the key funder of the scheme), it was necessary to model the performance of the scheme in detail.
- 2.5.2 As a result of the additional detailed coastal modelling work options to extend the coastal defences and changes to beach levels were investigated. However, these options were found to have cost-benefit implications on the viability of the scheme and were therefore discounted. Nevertheless, as a result of the additional modelling work, it was found that maintenance of an existing beach would not provide any significant benefit to coastal defence.
- 2.5.3 In addition, the EIA Scoping response received from Natural Resources Wales (provided in Appendix D) emphasised concerns that beach recharge could give rise to unforeseen impacts on coastal processes. Therefore in order to avoid impacts on the environment as a result of uncertainty surrounding the environmental effect of beach recharge, **it was decided to remove recharge from the scheme proposals as primary environmental mitigation.**
- 2.5.4 Iteration and development of the outline design proposals has included refinements to the design of the rock armour, including crest width, revetment toe and foundations, and the seawall and stepped access. These aspects of the proposals are described below.

2.6 Detailed Design Proposals

- 2.6.1 Detailed design drawings of the proposed scheme are provided in Appendix F.
- 2.6.2 *Rock armour*
- 2.6.3 The 225 m by 15 m extent of existing rock armour revetment at Splash Point would be dismantled and reused within the new larger rock armour revetment proposals where possible. The new rock armour would be approximately 600m in length and extend approximately 30m (34.5m maximum at Splash Point) from the existing sea wall. The crest width of the rock armour would be 11.5m at the widest point, and 7m at the narrowest point, which has been designed to achieve an optimal balance between wave overtopping protection, and minimising the mass of the revetment structure. The height of the rock armour would be constructed to 8.2m above Ordnance Datum (mAOD) at the highest point (Splash Point) but which has been designed to settle to 7.9 mAOD.
- 2.6.4 The rock armour has been designed to be an interlocking revetment. This will be formed of a double interlocking layer of 3-6 tonne rock armour, sloping from the crest for approximately 15.5m (17.5m at Splash Point) at a 1 in 3 gradient down to a 5.5m wide toe. The existing concrete stepped sea defences would be retained and a rock filter layer will be provided as a foundation below the primary rock armour.
- 2.6.5 *Seawall, Promenade & stepped access*
- 2.6.6 Approximately 550m of the existing upstand part of the recurved sea wall on Marine

Promenade would be demolished and replaced with a recurved upstand sea wall. The new sea wall would be constructed to 7.7 mAOD, which is approximately 0.5m higher than the existing sea wall. The replacement wall would be constructed of precast concrete units. Tie-in works would be undertaken to the adjacent sea-defences. Where possible demolition material will be reused as infill below the rock armour.

- 2.6.7 In order not to obscure views out to Liverpool Bay from Rhyl Promenade, the walkway would be raised by 500 mm. Entry points would also be provided through the upstand sea wall, with three sets of concrete access steps provided down through the rock armour revetment. One set will be opposite Tynwedd Road, one set will be at the end of Hilton Drive and one at the end of Garford Road. These will ensure that access to the beach will not be compromised by the proposed development. The access steps would be constructed of precast concrete units.

2.7 Construction of the Scheme

- 2.7.1 The Construction Strategy for the proposed scheme is provided in Appendix G.
- 2.7.2 The post-mitigation construction site area would temporarily occupy approximately 13 ha of the beach for access, excavation works and bulk materials storage (refer to the Post-mitigation Site Plan in Appendix B). This area has been reduced in size from 22ha as secondary mitigation to avoid archaeological constraints identified during the EIA process (for the original site boundary refer to the Pre-mitigation Site Plan Provided in Appendix B).
- 2.7.3 Within the site area approximately 5 hectares of the Promenade and public gardens adjacent to the Pavilion Theatre off the B5118 (East Parade/Marine Drive) would be used for compounds, including car parking, offices, welfare facilities and materials handling areas. This main materials compound would be used by the specialist construction staff and serve as an intermediate delivery area for rock into site. This will also be the main entrance onto site and there will be a small car park provision for the construction work force. An area at the end of Garford Road would be a secondary compound used by office staff and will have a limited amount of car parking space. It is envisaged pre-cast concrete would be stored here.
- 2.7.4 Initial site mobilisation and commencement of enabling works would take place in May 2019 (planned start), with construction expected to be completed in June 2022 (planned completion). Therefore in total the works outlined construction programme is expected to last approximately three years.
- 2.7.5 Given the duration of construction the compounds will be sustained by mains power, sewage and water. It is also envisaged that public access would be restricted in these areas for most of the construction period, including up to a 1.6km section of Marine Promenade. Consent applications for enabling works such as services would be made in advance of site mobilisation. A diversion route around Rhyl Golf Course has been proposed, which is detailed in Chapter 8 Population, Human Health & Socio-economics and Chapter 9 Traffic and Transport.
- 2.7.6 *Working Hours*
- 2.7.7 Given the local of the scheme in both tidal and non-tidal areas, two patterns of working hours will be required. All 'non-tidal work' comprising distinct activities outside of the intertidal zone, would take place between regular site working hours of 07:00 to 19:00 Monday to Friday. Any non-tidal working that is required outside of the regular site

working hours, would be notified 48 hours in advance to Denbighshire County Council Planning Department. The notification would be provided in writing, and contain an explanation of why the works cannot be undertaken during regular site working hours and with details of any measures that would be undertaken to mitigate any adverse effects.

- 2.7.8 Residents will also be kept informed of non-tidal working outside of regular working hours through a newsletter/website and/or social media. Residents will be provided with a contact phone number which is manned while the site is operating so complaints relating to the work on site can be logged and investigated as appropriate, with the log made available for inspection on request. The Denbighshire County Council Public Protection Officers will also be provided with site contact details so that a line of communication can be set up with the Construction Site Manager.
- 2.7.9 All 'tidal work' taking place within the intertidal zone and including any supporting activities in the non-tidal zone, would be undertaken according to the tidal cycle and conditions. Working shifts could therefore occur at any time of day or night depending on the tidal cycle forecast and weather conditions. Measures would be undertaken to mitigate adverse effects on residential properties as outlined in Chapter 10 Other Construction Effects and in the Construction Environmental Management Plan provided in Appendix M.

2.7.10 *Community engagement*

- 2.7.11 The project would be registered under the Considerate Constructors Scheme (CCS). This provides a commitment to the following objectives during construction:
- care about appearance;
 - respect the community;
 - protect the environment;
 - secure everyone's safety; and
 - value our workforce.
- 2.7.12 Members of the public will be kept informed through regular community engagement sessions. In addition, a project website has been created to provide local residents, businesses and interest groups with real-time news about the East Rhyl Coastal Defence Scheme, as well as project information and key contacts for the development. Recognising that there would be significant disturbance and disruption to local residents during the three year construction period, it is proposed to appoint a Community Liaison Officer as secondary mitigation to communicate and coordinate between the construction contractor and local residents (refer to Chapter 12 Cumulative Effects).

2.7.13 *Bulk materials transportation and access*

- 2.7.14 Only one primary bulk access transport route to the main construction compound is proposed to be used for the delivery of rock armour, concrete and precast concrete. This route from the A55 would exit at Junction 27 onto the A525, then left onto Ffordd Abergele and right onto St. Asaph Avenue. At Kinmel Bay a right turn onto Foryd Road (A548) forks left onto West Parade, which becomes East Parade and Marine Drive where the main site entrance is located. It is assumed that heavy goods vehicles would follow the same route in reverse for the return journey. Any bulk material transport between the main and secondary compound would be by tractor and trailer via and

internal haul route on Marine Promenade. Staff gaining access to the secondary compound would be via Garford Road. A full description of the transport arrangements for the proposals is provided in Chapter 9 Traffic and Transport.

- 2.7.15 It is estimated that the percentage split of bulk rock material from quarries in North Wales is 52% and from England is 48%. The rock armour and pre-cast concrete would be transported to the site by articulated lorry where it would be unloaded by tracked excavator fitted with a hydraulic grab and stockpiled. Advanced stockpiling would take place initially at the main materials compound off marine drive. Initial rock production and stockpiling is required for 6 months ahead of the revetment construction, 4 months of which would involve stockpiling at the main site compound, and which would continue throughout construction of the revetment (approximately 25 months) to ensure a constant supply.
- 2.7.16 Temporary sorting and storage of rock armour would also take place on the beach adjacent to where it would be placed as rock armour revetment. As such the rock armour stockpile will create a buffer to allow rock to be drawn from the stockpile to suit the production rate required for the main rock revetment construction works and will continue to be imported at a similar rate for the duration of the works.
- 2.7.17 Construction vehicle access down to the beach would be gained from Marine Promenade via a temporary slipway. The preferred location for this is immediately to the west of Splash Point, although subject to vehicle weight tolerances of Marine Promenade the slipway may need to be located closer to the primary site compound. The slipway would be constructed as a temporary structure, comprising gabion retained slope of fill material, capped with a concrete running surface.
- 2.7.18 The beach would be used by construction vehicles to gain access to the bottom of the slipway to the revetment working area. As such a haul route would be maintained on the beach by using beach won material to increase the sand depth for tracking. To gain access along the beach sections of existing timber groynes would also need to be removed to formation level of the revetment foundation and extend to 3m (or nearest king post) beyond the new design toe. The 3m gap would remain following completion of construction, so that future users of the beach have a rising tide escape route behind the groynes. Any additional groynes removed to gain construction access from the temporary would be reinstated following completion of construction.
- 2.7.19 *Rock armour revetment and seawall construction*
- 2.7.20 A concrete buttress for a new sea wall will be constructed ahead of the rock armour revetment works. Single pan formwork panels would be erected and filled by utilising a concrete skip or by pumping the concrete into place. A lip would be cast into the edge of the buttress to minimise the risk of marine pollution from future maintenance grouting activities.
- 2.7.21 The rock armour revetment would be constructed in approximately 10m bays per tidal cycle, but which could be larger depending on the duration of the tidal window. It has been assumed for the purpose of EIA that the likely worst-case scenario is that two 20m sections of rock armour revetment toes could be constructed per tidal cycle. All tidal work schedules would be assessed 2 weeks in advance with tidal working shifts decided also allowing for weather conditions. It is anticipated that tidal works would continue until 3 hours before high tide, dependant on which section of the structure is being worked on at the time (i.e. it may be possible to continue working on parts of the structure above the tide level).

- 2.7.22 In preparation for construction of rock armour revetment the beach levels would be lowered to 0mAOD at the location of the revetment toe. This will require a slope into the excavation from the existing beach level at an angle of 30 degrees (1 in 1.75).
- 2.7.23 Geotextile would then laid directly into the excavation. This is covered by a layer of filter stone, which is transported to the work area by dump trucks and tipped onto the beach and then placed using the excavator bucket. Graded armour stone is then moved from the stockpiles and placed one at a time onto the filter layer using an excavator with grab attachment or bucket. The toe profile will be constructed first, ensuring that the largest rock of at least 5.5t is placed at the front face.
- 2.7.24 Once the toe section of the rock armour revetment is complete, the previously excavated sand/shingle beach material will be used to cover the toe up to existing beach level. Once the armour has been covered by a minimum thickness of material, the excavator will be positioned onto the toe and will continue to place armour stone to the crest.
- 2.7.25 The foundation of access steps through the rock armour revetment would be formed from concrete inside a temporary sheet pile arrangement, or through the use of drag boxes. The former would comprise an open cofferdam to allow excavation inside the sheet piles to -1m AOD, and then concrete is placed to the desired profile of the step foundation. Piling would be undertaken with the use of an excavator mounted vibratory hammer, and the piles will be extracted once the concrete has sufficiently cured. Drag boxes would be used in a similar manner to contain the excavation and act as a temporary form for the concrete foundation. As noted above the access steps would be constructed of precast concrete units, and therefore craned onto the set concrete foundation.
- 2.7.26 Following completion of rock armour revetment works, the demolition of the existing sea wall would be undertaken as a new pre-cast wall is placed onto the new concrete buttress. This is to ensure that the rock armour is in place to provide wave overtopping protection, and that an overlap is maintained between the old wall and the new wall at the end of each shift (refer to the Flood Consequences Assessment in Appendix N for a description of maintaining coastal defence during construction).
- 2.7.27 Two methods have been identified for removal of the existing sea wall: diamond track saw cutting and by grinding or pinching excavator attachments, which would be used interchangeably. The resulting spoil would be temporarily stockpiled at the compound site to be used as backfill/hardstanding in the compound, maintenance, or transported away for disposal offsite.
- 2.7.28 The new concrete sea wall will be precast off-site and transported into site either to Garford Road compound or the main materials compound and transported along the internal site to the Garford road compound. A minimal number of pre-cast units will be stored on site to ensure at least a full week's production of units is available to place at any time. Pre-cast units would be installed by means of excavator or crawler crane with the use of a bespoke lifting frame which will be attached to the hook of the crane resource in use on the day.
- 2.7.29 The reinforced concrete wall base would be cast in situ behind the new sea wall. Steel reinforcement bar would be pre-fabricated on frames, but some in-situ steel fixing will also be required.
- 2.7.30 75mm diameter holes would be cored though the existing concrete pavement on

Marine Promenade, at centres of 750mm by means of diamond drilling. A minimum of 150mm of hydraulically bound subbase would be laid, upon which concrete slabs forming the new promenade surface would then be cast in situ.

2.7.31 *Completion of construction and site reinstatement*

- 2.7.32 The new slopes to the rear of the raised promenade level would be landscaped with topsoil and reseeded. Memorial benches relocated during construction would be sympathetically put back, with guidance on appropriate locations sought from Denbighshire County Council and Rhyl Town Council.
- 2.7.33 All areas of land within the site temporarily occupied during the construction phase would be reinstated to the pre-construction condition or that agreed with Denbighshire County Council. This would include reinstatement of Marine Promenade, the site compounds, the access ramp to the beach, and the site entrance from Marine Drive. Precondition surveys undertaken prior to commencement of works would be referred to as a record for reinstatement.
- 2.7.34 Beach levels would be reinstated to the pre-construction level as part of the construction works as described in paragraph 2.7.24. Any other restoration of the beach would utilise material excavated during construction, plus any excess beach material that has naturally accumulated in the works area during the construction period.

2.8 **Operation of the Scheme (60 years)**

- 2.8.1 The East Rhyl scheme has been designed to provide coastal defence from wave overtopping flooding over 60 years, for up to a 1 in 200 year Standard of Protection (SoP)¹³. The engineered design life of the scheme is up to 100 years, although it would not be cost beneficial (nor environmentally acceptable) to achieve a 1 in 200 year SoP over the next 100 years, as a significantly larger coastal defence than proposed would be required. This does not preclude that the current proposals could be extended or modified at a later date, depending on how realisation of the impacts of climate change affect the standard of protection provided by the coastal defences. A managed adaptive approach to climate change is considered to be in line with current planning policy (i.e. TAN15¹³).
- 2.8.2 The scheme proposals and its business case have been developed under the transitional arrangements of *Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales*¹⁸. Although the guidance advises the use of different climate change predictions for Flood Consequences Assessment contained in the FCDPAG3^{15 16}, the transitional arrangements do still allow for continued use of the UK Climate Projections (UKCP09) under circumstances where development of the proposals had commenced prior December 2017.
- 2.8.3 The business case for the scheme proposals has therefore been presented on the basis of UKCP09, however in the interest of providing an objective climate change assessment for the purpose of EIA, the proposals have also been assessed herein to the requirements of TAN15 using the sea level rise predictions advised in FCDPAG3¹⁶. These projections are for regional net sea level rise allowances and indicative sensitivity ranges over defined periods (epochs) based on higher emissions scenarios of the IPCC

¹⁸ Welsh Government (2017) *Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales* p3. <https://gov.wales/docs/desh/publications/180326-adapting-to-climate-change-guidance-for-flood-and-coastal-erosion-risk-management-authorities-in-wales-en.pdf>

Third Assessment Report. As advised in Welsh Government Guidance¹⁸ the TAN15 requirements are consistent with the latest global sea level rise predictions and the IPCC Fifth Assessment Report. A comparative assessment of how the proposals would perform in terms of the SoP under UKCP09 and FCDPAG3 (current TAN15) scenarios is provided in detail in Chapter 11 Sustainability and Climate Change.

2.9 Future operation and decommissioning (60 to 100 years and 100+ years)

- 2.9.1 Given the hard-engineered composition of the scheme it is considered that the structure would be low maintenance over the 100 year design life of the scheme. Apart from occasional patch repairs, re-grouting or resurfacing works to the Promenade, it is not considered likely that there would be any significant maintenance requirements during operation of the scheme.
- 2.9.2 Future operation of the scheme may involve extension of coastal defences beyond the 60 years SoP, or to adapt depending on how the impacts of climate change are realised. Alternatively, should the Shoreline Management Plan policy of Hold the Line change, or not be extended beyond 100 years, there could be a policy of managed retreat involving decommissioning of coastal defences. Given the uncertainty of future climate change scenarios and future shoreline management policy in this context, it is not considered possible to assess likely significant effects of the scheme beyond the 60 years SoP, nor over 100 years as a result of changes in shoreline management policy.
- 2.9.3 Any future coastal defence proposals, or changes to the proposals herein, would be subject to consenting requirements at the time, but as recommended herein should be informed by long term environmental monitoring to address uncertainty in future decision making. Further consideration of this is provided in Chapter 12 Cumulative Effects.

3 Environmental Impact Assessment Methodology

3.1 The EIA Process

- 3.1.1 Regulation 4 of the Town & Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 sets out that the environmental impact assessment is a process consisting of:

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

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

(a) population and human health;

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

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

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

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

- 3.1.2 EIA is defined as 'a systematic process to identify, predict and evaluate the environmental effects of proposed actions and projects'¹⁹. Online Government guidance² defines the aim of Environmental Impact Assessment 'to protect the environment by ensuring that a local planning authority, when deciding whether to grant planning permission for a project which is likely to have significant effects on the environment, does so in the full knowledge of the likely significant effects, and takes this into account in the decision-making process' and 'to ensure that the public are given early and effective opportunities to participate in the decision making procedures'.

- 3.1.3 The EIA process is closely aligned with the design process (Figure 3-1)¹⁹. This effectively begins with EIA Screening, whereby the developer makes the decision whether EIA is required for the project in question. Suitable environmental alternatives should be considered at this early stage, but if it is decided that the potential likely significant effects on the environment cannot be reasonably avoided, then an EIA Screening Opinion must be requested from the appropriate authority on behalf of the developer. As well as outline design information, some environmental information is required to undertake EIA Screening, and so baseline environmental surveys may be required to inform the EIA Screening Request.

- 3.1.4 Where EIA Screening is likely to confirm that statutory EIA is required, it is often appropriate to undertake EIA Scoping at the same time. This combined approach makes use of the environmental baseline information collated for the EIA Screening Opinion request, to consider the scope of further detailed environmental impact assessment work required. Through the submission of an EIA Scoping Report, the

¹⁹ IEMA (2016) *Environmental Impact Assessment Guide to Shaping Quality Development*. https://www.iema.net/assets/uploads/iema_guidance_documents_eia_guide_to_shaping_quality_development_v7.pdf

developer requests that the relevant authority provides an EIA Screening Opinion in order to seek confirmation from the Statutory Environmental Consultees on the scope of EIA required.

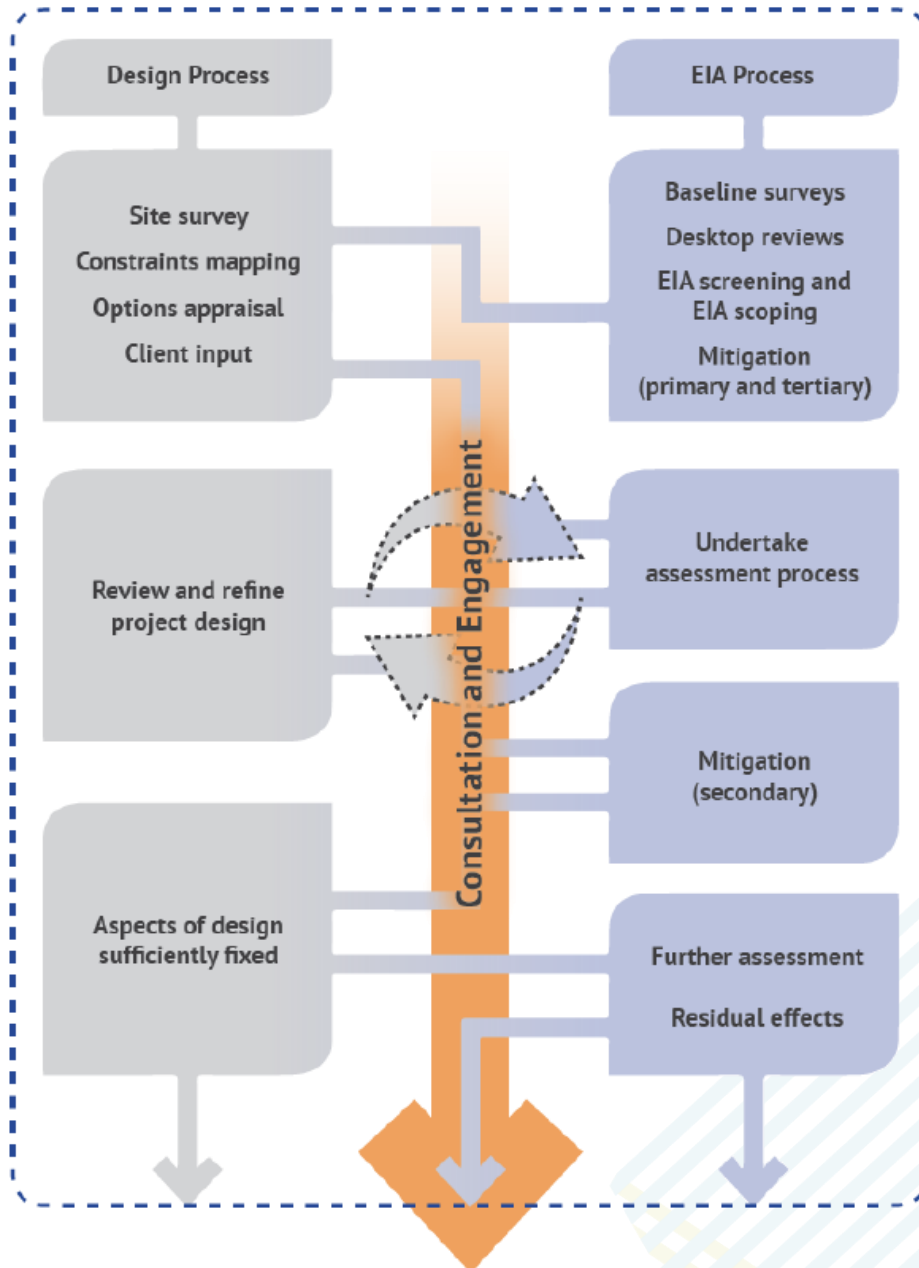


Figure 3-1: The interaction of design and EIA processes¹⁹

- 3.1.5 On the basis of the EIA Scoping Opinion response, further detailed baseline information is collected to inform the detailed impact assessments. The assessments involve firstly characterising the potential impacts and then the assessment of likely significant effects. At this stage Primary, Secondary and Tertiary Mitigation can be recommended to reduce or eliminate significant effects. This is an iterative process, whereby impact assessment process and design of the development process interact with one another to produce a mutually acceptable solution. This can also involve stakeholder engagement of the emerging design, to further minimise environmental effects. The

results of the EIA process are documented in the ES, which should be a well-structured, proportionate and concise document. The ES is supplemented with a Non-Technical Summary in printed and digital format, which intended to make the findings of EIA publicly accessible.

- 3.1.6 Secondary and Tertiary Mitigation recommendations and commitments reported in the ES topic chapters often require separate environmental management plans in order to achieve the desired outcome. These are usually prepared during discharge of planning conditions or during pre-construction stage of the approved development but can be prepared in draft at the planning stage to demonstrate that commitments in the ES will be delivered.
- 3.1.7 With reference to IEMA (2016) a summary of the steps involved in the EIA process is set out as follows:
- 1 Identify aspects of environment likely to be significantly affected (preliminary baseline)
 - 2 Propose primary mitigation (impact avoidance measures)
 - 3 Define impact assessment methodology
 - 4 Collect environmental baseline
 - 5 Assess likely significance of the effects
 - 6 Propose secondary mitigation (iterate design to reduce or eliminate effects)
 - 7 Report residual effects (in the relevant ES chapter)
 - 8 Set out follow up measures (tertiary measures and environmental management plan)

3.2 EIA Screening and Scoping

- 3.2.1 EIA Screening is a procedure used to determine whether a proposed project is likely to have significant effects on the environment and therefore whether an ES is required in order to be granted planning permission or a Marine Licence. If the development is considered Schedule 2, then the Local Planning Authority should consider whether an ES is required to accompany the planning application¹⁹.
- 3.2.2 EIA Screening for East Rhyl has been informed by the desk based review of environmental constraints summarised in Table 2-1. The key environmental constraints are illustrated on the Environmental Constraints Plan provided in Appendix B.
- 3.2.3 The scheme falls within Schedule 2 of the Town & Country Planning Environmental Impact Assessment Regulations (Wales) 2017 section 10(m) Coastal work to combat erosion and maritime works capable of altering the coast through the construction, for example, of dykes, moles, jetties and other sea defence works, excluding the maintenance and reconstruction of such works – All development. Under Regulation 5(8) of the EIA Regulations the proposals must therefore be screened for EIA development by the Local Planning Authority. Given that the proposals would affect an area below Mean High Water Spring (MHWS), the proposals also fall within Regulation 8(1) of the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).
- 3.2.4 Habitats Regulations Assessment (HRA) Screening is undertaken in coordination with the EIA, in accordance with Regulation 26 (1)/ 15A of the aforementioned EIA Regulations.

- 3.2.5 A combined EIA Screening and Scoping Opinion was requested to NRW and DCC on 23rd January 2017. The EIA Screening and Scoping Opinion request letters are provided in Appendix D.
- 3.2.6 *EIA Scoping Opinion Request*
- 3.2.7 The objective of EIA Scoping is to consider the scope of the information to be provided in the ES (Regulation 14(1)). The EIA Scoping Report sets out a proposed methodology for the assessment of likely significant effects on the basis of reasonably accessible environmental baseline information and proposes an appropriate structure for the ES. Although it is not a statutory requirement to undertake EIA Scoping, it allows agreement on approach to be sought from the statutory environmental consultees at an early stage in the EIA process. Early engagement through EIA Scoping also encourages an iterative approach to design development, whereby any environmental concerns raised during consultation can be used to inform the emerging design proposals and mitigate any significant environmental effects.
- 3.2.8 The EIA Scoping Report provides an overview of the potential for likely environmental impacts and effects of the proposed development. Based upon this, a professional judgement is made on which of these topics or particular aspects of them can be 'scoped in' and those that can be 'scoped out' of the EIA. A summary of the environmental issues which will comprise the technical scope of the EIA and reported in the ES are set out in Table 3-1.
- 3.2.9 Environmental issues identified as 'scoped in' within the EIA Scoping Report require further detailed technical studies undertaken to inform the ES. Where environmental issues are 'scoped out' these would not be considered further unless there is a material change in the outline scheme proposals, or where an EIA Scoping Opinion response needs to be addressed.
- 3.2.10 An EIA Screening and Scoping response was received on 14th March 2018 by NRW and 26th March 2018 by DCC. This confirmed that the proposals are considered EIA Development, requiring the preparation of an ES. A summary of the comments raised by the statutory environmental consultees is provided in Table 3-2, with the full responses provided in Appendix D.

Table 3-1 Summary of environmental issues screened in/out of EIA

| Environmental Topic | Likely Significant Effect | Construction | Operation |
|--|---|--------------|-----------|
| Key: Scoped In (✓), Scoped Out (✖) | | | |
| * impact assessment of this environmental issue now scoped in to address the EIA Scoping Opinion (see Table 3-2) | | | |
| † a statement is provided in the ES to address the EIA Scoping Opinion (see Table 3-2) | | | |
| Coastal Processes and Geomorphology | Sediment plumes from beach excavation and disturbance. | ✓* | ✖ |
| | Long term stability of beach levels and changes in sediment supply/transport down drift, in particular the environmentally sensitive areas of Gronant Dunes & Talacre Warren. | ✖† | ✖† |
| | Revaluation of ongoing modelling and long-term effects to coastal hydromorphology. | N/A | ✓* |
| | Biological WFD quality elements. | ✓ | ✖ |
| | Bathing water quality. | (✖)✓* | ✖ |

| Environmental Topic | Likely Significant Effect | Construction | Operation |
|------------------------------------|---|--------------|-----------|
| Biodiversity & Nature Conservation | Chemical WFD quality elements/marine pollution. | (x)✓* | N/A |
| | Hydromorphological WFD quality elements/marine pollution. | ✓* | x |
| | Physical disturbance to existing rock armour and associated rocky habitat. | ✓ | x |
| | Physical disturbance of scrub adjacent to site, and potentially inhabiting nesting birds. | ✓ | x |
| | Physical disturbance to vegetation and grassland and associated effects to potentially inhabiting reptile and invertebrate species. | ✓ | x |
| | Physical disturbance and loss of intertidal habitat and potentially inhabiting marine benthic invertebrates within footprint of proposed works during construction. | ✓ | x |
| | Non-physical disturbance to Liverpool Bay SPA and overwintering birds (e.g. from noise or visual presence) during construction. | ✓* | x |
| | Impacts to sand dune habitats and breeding tern populations, associated with the Liverpool Bay SPA, Dee Estuary SPA, SAC & Ramsar Site and Gronant Dunes & Talacre Warren SSSI. | x† | x† |
| | Impacts on bats and terrestrial and marine mammals. | x | x |
| | Impacts to fish and nursery habitat. | ✓* | x |
| Landscape & Visual | Introduction/spread of non-native invasive species. | ✓ | ✓ |
| | Landscape & visual effect on the local landscape character. | ✓ | ✓ |
| Cultural Heritage | Landscape & visual effects on the marine character area. | ✓ | ✓ |
| | Direct impacts on archaeological resource of the foreshore (buried peat and chance finds) | ✓ | x |
| | Direct impacts on wrecks. | x | x |
| | Indirect setting impacts on built heritage setting. | ✓* | ✓ |
| Socioeconomics & Human Health | Indirect impact on the wider archaeological resource of the foreshore. | (x)✓* | x |
| | Socioeconomic effect of the scheme on the local economy and employment. | ✓ | ✓ |
| Traffic & Transport | Population health as a result of access to public space, amenity, green spaces/ beach and recreational routes. | ✓ | ✓ |
| | Severance, driver delay & pedestrian delay. | ✓* | x |
| | Pedestrian amenity, fear & intimidation and accidents & safety. | ✓ | x |
| Other Construction Related Effects | Closure & redirection of PRow. | ✓* | x |
| | Fugitive dust emissions. | ✓* | N/A |
| | Nitrogen dioxide emissions. | ✓* | N/A |
| | Surface noise & vibration. | ✓ | N/A |
| | Underwater noise. | x | N/A |
| | Environmental impacts from land contamination & ground stability issues. | ✓* | N/A |
| | Marine pollution. | x† | N/A |

| Environmental Topic | Likely Significant Effect | Construction | Operation |
|---------------------------------|---|--------------|-------------|
| Sustainability & Climate Change | Sustainable use of resources & waste disposal. | ✓ | ✗ |
| | Greenhouse gas emissions. | ✓ | ✗ |
| | Climate change adaptation & resilience to natural disasters. | ✗† | ✓(positive) |
| Cumulative Effects | Cumulative from other proposed developments. | ✓ | ✓ |
| | Interrelationship effect on a single resource/receptor when combined with other effects of the proposed scheme. | ✓ | ✓ |

Table 3-2 Summary comments raised in the EIA Scoping Opinion responses received from NRW and DCC, and where the comment is addressed in the ES

| Summary of additional issue raised | How the issue is addressed this in the ES |
|---|---|
| Coastal hydrology and hydromorphology | |
| The report is not clear whether numerical sediment transport modelling has been carried out (or will be carried out) to assess the fate and impact of excavated sediment mobilised during construction works. | The final coastal modelling report is considered to contain sufficient information to address sediment mobilisation during construction. This is appended to the ES in Appendix H, with an explanation provided in the baseline and a statement provided in the impacts sections of Chapter 4. |
| The Environmental Statement must consider the quantity of Suspended Sediment Concentrations (SSC), fate of suspended sediment plume and volume of sediment deposition in the adjacent sublittoral, intertidal and nearshore zones, arising from the 'rainbowing' activity. | Consideration has been given to the necessity of inclusion of recharge in the proposals, given the limited benefits it would provide for coastal defence, and the risk it poses to the scheme through the complexity of evidence required to demonstrate derivation of impacts on the environment. As such it is considered that removal of beach recharge from the scheme proposals is primary environmental mitigation. A statement on this is provided in Chapter 4. |
| Consideration should be given to the potential alteration of the beach profile and to the rate of onshore/longshore sediment transport of the sand ridge and runnel systems in the event that sediment of a different size and type are introduced and settle out of suspension onto the intertidal and nearshore seabed during the beach recharge. | Beach recharge has been removed from the scheme proposals as primary environmental mitigation. A statement on recovery of the beach profile and ridge and runnel systems following construction is provided in Chapter 4. |
| Geotechnical investigations should be used to confirm and support the assumption that the sediment to be excavated is not contaminated. | A ground investigation was undertaken and is reported in Appendix M. Additional samples were also analysed for contamination as part of the existing ground investigation works. A statement on the results of this is provided in Chapter 10. |

| Summary of additional issue raised | How the issue is addressed this in the ES |
|---|---|
| The Environmental Statement must consider impact on Bathing Water quality, you will need to demonstrate how the effect of sediment disturbance will be minimised during the Bathing Water Season which runs between 1st May and 30th September. | Chapter 4 assesses the proposals against the bathing water regulations, existing hydrological conditions, and provides the results of additional bacterial testing of the aforementioned additional ground investigation samples. |
| Beach recharge material must be tested to ensure the material is of similar physical and chemical nature to the beach recharge area. | Beach recharge has been removed from the scheme proposals as primary environmental mitigation. A statement on this is provided in Chapter 4. |
| 'Chemical WFD quality elements' and 'hydromorphological WFD quality elements' should not be scoped out of the Environmental Statement. | A coastal WFD assessment has been undertaken, which is provided in Appendix H, and summarised in Chapter 4. |
| Biodiversity and nature conservation | |
| The Environmental Statement must consider potential impacts of beach recharge on benthic invertebrate communities and any secondary impact on predatory bird species. | Beach recharge has been removed from the scheme proposals as primary environmental mitigation. Nevertheless, a benthic marine invertebrate survey and a wintering bird survey was undertaken to inform the baseline and is provided in Appendix I. These, together with the coastal processes assessment provided in Chapter 4, have been used to inform an ecological impact assessment provided in Chapter 5. |
| The effects of increased turbidity should also be assessed in terms of the ability of fish-eating birds to catch their prey. Attention should be paid to the fish-eating features of the SPA – the little tern which feed just alongshore (May to August), red-throated diver and the water bird assemblage (cormorant and red-breasted merganser). | An assessment of construction impacts on fish (including migratory fish) has been undertaken in Chapter 5. This considers the baseline conditions, together with the coastal processes assessment to determine the primary effect of the proposals on fish, and any secondary effects on fish eating birds. |
| The Environmental Statement must consider impact on little tern colony at Gronant and carry out suitable assessment. | Consideration has been given to the effect of the proposals on coastal processes provided in Chapter 4, including the availability of sediment transport along the coastline. The effect of impacts on coastal processes on the Little Tern colony at Gronant Dunes has been assessed in Chapter 5. A Habitations Regulations Screening Assessment has been undertaken and is provided in Appendix I. |
| Non-physical disturbance that may occur from the use of a barge during the beach recharge activity. | Beach recharge has been removed from the scheme proposals as primary environmental mitigation, and therefore barge movements do not form part of the proposals. |
| Biosecurity risk of using barges for beach replenishment. | Beach recharge has been removed from the scheme proposals as primary environmental mitigation, and therefore barge movements do not form part of the proposals. |

| Summary of additional issue raised | How the issue is addressed this in the ES |
|--|---|
| Reference to historical mussel beds in the ES | A benthic marine invertebrate survey was undertaken to inform the baseline and is provided in Appendix I. |
| Discuss scope of HRA with DCC Biodiversity Officer | A meeting was held between Joel Walley Denbighshire County Council Ecology Officer and JBA to discuss the scope of the HRA. |
| Landscape and visual | |
| Sensitive receptors within 2km and impact on visual amenity. | This forms part of the LVIA methodology (LI GLVIA v3 informed by LANDMAP). The LVIA is provided in Appendix J and is summarised in Chapter 6 |
| Cultural heritage | |
| <p>A geo-archaeological report on the borehole that was provided to University of Wales, Lampeter.</p> <p>Advice to be sought from the University of Wales Lampeter geo-archaeological specialists (Dr Martin Bates or Dr Nigel Nayling) as to whether additional geo-archaeological sampling will be required to understand the beach deposits within the excavation zone of the new rock armour defence, or other areas of the beach affected by ground reduction.</p> <p>A field survey search of the whole development (red line) boundary area to determine whether any currently unrecorded surface archaeology is present on the beach.</p> <p>The potential for evaluative sampling of the excavation zone of the new rock armour defence should be assessed and a recommendation made on whether this will be informative and required.</p> <p>Other mitigation options may be more appropriate and these should be stated.</p> | <p>CPAT were directly appointed to prepared Chapter 7 of the ES which out the heritage impact assessment and summarises mitigation strategy provided as a Curatorial Brief in Appendix K. CPAT sub-appointed Lampeter University to undertake a geoarchaeology assessment which is also provided in Appendix K. Further archaeological supervision was also undertaken by CPAT on additional ground investigations undertaken to inform the detailed design of the revetment.</p> |
| An indirect visual impact survey which concentrates on the visual impacts to the nearby Conservation Area and Listed Buildings. The impact on the setting of the Royal Alexandra Hospital should be carried out in accordance with the Welsh Government's best-practice guidance Setting of Heritage Assets in Wales. | Indirect visual impacts on heritage setting of listed buildings and the conservation area has been addressed by CPAT in Chapter 7. |
| All resulting reports should be forwarded to Mark Walters (Development Control Officer, CPAT) for further comment and discussion as the scheme develops. | See above. CPAT have been commissioned directly to undertake heritage impact assessment. |
| All completed digital reports and the digital archive should also be sent to the Historic Environment Officer, Gary Duckers, via gary.duckers@cpat.org.uk The digital archive should also be sent to the NMR, RCAHMW, National Library of Wales, Aberystwyth. Any resulting artefact archive should be stored within the Denbighshire Museums Service's storage facility by prior arrangement. | See above. CPAT will address this as part of their commission. |
| Socio-economics and human health | |
| Baseline data is required to inform impact assessment on local businesses / tourism during the construction phase. Footfall data should be used to establish a baseline, to identify how person numbers are affected by | Baseline data has been collected from existing sources to inform the ES chapter in the first instance. Where business receptors are identified that have potential to be impacted by |

| Summary of additional issue raised | How the issue is addressed this in the ES |
|--|---|
| the proposed works. | the proposals, these have been investigated in more detail as part of the socioeconomic impact assessment in Chapter 8. |
| Flood Consequences Assessment (FCA) produced in accordance with TAN15: Development & Flood Risk | The FCA is provide in Appendix N and is cross-referred to Chapter 11. |
| Construction contractor to consider entering a local employment agreement | Commitments provided by Balfour Beatty relating to the use of the local workforce are set out in the construction strategy provided Appendix G and assessed in Chapter 8. |
| Traffic and transport | |
| TA in accordance with TAN18 and pedestrian access assessment. | A Traffic Assessment has been provided in Appendix L and is summarised in Chapter 9. |
| Impact on Wales Cast Path and Cycle Path would need to be assessed. | The impact of the proposals on the Wales Coast Path and National Cycle Network Route 5 has been addressed in Chapters 8 and 9. |
| Construction traffic management plan and access management plan required prior to construction | It is anticipated that this would be produced by Balfour Beatty as part of their construction management planning. |
| Other construction related effects | |
| The Environmental Statement must detail which groynes, (and their extents) are required to be removed to allow access to the construction site. We would also expect the Environmental Statement to detail mitigation e.g. strict boundaries for traffic, and remediation measures e.g. ensuring the beach profile is returned to pre-construction profile following cessation of works. | This is detailed in the construction strategy provided in Appendix G and is summarised in section 2.7. |
| Fugitive dust emissions should definitely be scoped in to the ES. | A construction air quality assessment is provided in Appendix M and is summarised in Chapter 10. |
| If HGV movements significantly exceed 20 movements per day, as a precautionary measure, Nitrogen Oxide Emissions should be scoped in. | As set out in the Traffic Assessment (TA) Scoping report, traffic noise and air quality issues have been scoped applying the widely-used Institute of Environmental Assessment (IEA) publication 'Guidelines on the Environmental Assessment of Road Traffic'. This provides various thresholds above which it is necessary to assess the environmental effects of traffic in more detail; in particular, where the increase in traffic flows (or number of HGVs) as a result of the development is less than 30% then no further assessment is necessary. Given the TA has identified that this threshold would be exceeded on a number of links, a traffic noise and air quality assessment has been undertaken and is provided in Appendix M and summarised in Chapter 10. |
| The CEMP should include measures to minimise risk of non-native invasive species. | The CEMP provided in Appendix M sets out the measures to minimise risk of non-native invasive species. |

| Summary of additional issue raised | How the issue is addressed this in the ES |
|--|--|
| Sustainability and climate change | |
| New guidance removes the use of UKCP09 data for future tidal predictions and utilises those based on FCDPAG3 data. This change could have significant implications on the design of the improved coastal defences, which has been based on UKCP09 data, and this could subsequently affect the anticipated standard of protection offered by the proposed improvements. We consider that this requires urgent consideration. | The scheme and its business case have been developed under the transitional arrangements of the FCDPAG3 guidelines (TAN 15), which permits design development under UKCP09 where this commenced before the new guidelines came into operation. Nevertheless, for the purpose of the EIA the proposal has been assessed using climate change predictions based on FCDPAG3, and the standard of protection for both sets of guideline is provided in Chapter 11. |
| Cumulative effects | |
| Names provided of new large minor / major planning applications to be included in cumulative assessment. | As required by the EIA Regulations, committed development at the time of submission of the planning application has been assessed with regards to cumulative effects in Chapter 12. |
| Other | |
| Provide the NTS in English and Welsh languages | The NTS is available in English in Volume 1 and in Welsh in Atodiad A in Volume 2. |
| The scheme would require a flood risk activity permit from NRW. NRW TE have advised that as a Risk Management Authority, Denbighshire County Council, will not require a bespoke Flood Risk Activity Permit for Flood Risk Activities (e) to (K), as set out in the Environmental Permitting Regulations (England & Wales, 2016). | A Flood Consequences Assessment is provided in Appendix N. |
| Have Regard for the draft of Planning Policy Wales Edition 10 | Regard has been given to the draft of Planning Policy Wales Edition 10 in Section 2.1. |

3.3 The Environmental Statement

- 3.3.1 With reference to Regulation 17(3) of the Town & Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017/ Regulation 12(2) Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), the ES must contain the information specified in Schedule 4/ Schedule 3 '*relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected*'. Table 3-3 sets out the sections of the ES in which this information is addressed.

Table 3-3 Requirement of Schedule 4/Schedule 3 of the EIA Regulations and where the requirements are addressed in the ES

| Paragraph No. | Requirement | Where addressed in the ES |
|---------------|---|---|
| 1 | A description of the development, including in particular: (a) A description of the location of the development; (b) A description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, | 1.3; Appendix B 2.7, 2.8; Appendix G |

| Paragraph No. | Requirement | Where addressed in the ES |
|---------------|--|--|
| | and the land-use requirements during the construction and operational phases; (c) A description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; (d) An estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases. | 2.7; Chapter 11 2.7, 2.8; Chapter 4, 10, 11; Appendix G, M |
| 2 | A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects. | 2.3, 2.4, 2.5 Chapter 4, 7, 11, Appendix H |
| 3 | A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge. | 2.2, section 2 in chapters 4 to 12 |
| 4 | A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: | |
| | population, human health | Chapters 8, 10 |
| | biodiversity (for example flora and fauna) | Chapter 5 |
| | land (for example land take), soil (for example organic matter, erosion, compaction, sealing), air, material assets | Chapters 4, 9, 10 |
| | water (for example hydromorphological changes, quantity and quality) | Chapter 4; Appendix H |
| | climate (for example greenhouse gas emissions, impacts relevant to adaptation) | Chapter 11 |
| | cultural heritage, including architectural and archaeological aspects | Chapter 7 |
| | landscape | Chapter 6; Appendix J |
| 5 | A description of the likely significant effects of the development on the environment resulting from, inter alia: (a) The construction and existence of the development, including, where relevant, demolition works; (b) The use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; (c) The emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; (d) The risks to human health, cultural heritage or the environment (for example due to accidents or disasters; (e) The cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; | Section 4 of chapters 4 to 12 Section 4 of chapters 4, 5, 10, 11 Section 4 of chapters 4, 10, 11 Section 4 of chapters 7, 8, 10, 11 Chapter 12 |

| Paragraph No. | Requirement | Where addressed in the ES |
|---------------|---|--|
| | <p>(f) The impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;</p> <p>(g) The technologies and substances used. The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term or long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(a) and Directive 2009/147/EC(b).</p> | <p>2.8, 2.9; Chapter 11</p> <p>2.5, 2.6, 2.7</p> <p>3.4; section 3 of chapters 4 to 12</p> |
| 6 | A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical difficulties or lack of knowledge) encountered compiling the required information and the main uncertainties involved. | Chapter 3; section 3 or chapters 4 to 12 |
| 7 | A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases. | 2.3, 2.5; section 5 & 6 of chapters 4 to 12 |
| 8 | A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned.* Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies. | 2.6; Chapter 11; Appendix N |
| | <i>*Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU(c) of the European Parliament and of the Council or Council directive 2009/71/Euratom(d) or UK environmental assessments may be used for the purpose provided that the requirements of this Directive are met.</i> | Not applicable |
| 9 | A non-technical summary of the information provided under paragraphs 1 to 8. | Non-technical summary |
| 10 | A reference list detailing the sources used for the description and assessments included in the environmental statement. | As footnotes throughout the ES |

3.4 EIA Method of Assessment

- 3.4.1 As noted above Regulation 17(4)(d) states that the ES must 'include the information reasonably required for reaching a reasoned conclusion on the significant effects of the development on the environment, taking into account current knowledge and methods of assessment'. Reference is made to the current EIA practice guidance, primarily:

- Online Government Guidelines.
- Guidelines for Environmental Impact Assessment (IEMA, 2004) & 2006 Updates²⁰.
- IEMA (2011) State of Environmental Impact Assessment Practice in the UK. Special Report²¹.
- IEMA (2016) Environmental Impact Assessment Guide to Shaping Quality Development¹⁹.
- IEMA (2016) Environmental Impact Assessment Guide to Delivering Quality Development²².

3.4.2 Other environmental topic-specific guidance is detailed in the methodology section of each ES chapter

3.4.3 *Statement on Competent Expertise*

3.4.4 As noted above Regulation 17(4)(b) requires that the ES must set out a '*statement by or on behalf of the applicant or appellant describing the expertise of the person who prepared the environmental statement*'.

3.4.5 The JBA Consulting EIA Policy Statement requires that the appropriately qualified and experiences competent experts have the authority to technically review and approve EIA deliverables forming part of statutory ES reports coordinated by JBA. The EIA has been prepared by a multi-disciplinary team of environmental specialists as set out in Table 3-4. Overall coordination of the ES was overseen and technically reviewed by Mark Cope BSc MSc FGS MIEMA CEnv REIA and Tim Carter BSc, MSc, CMLI, MIEMA, CEnv.

Table 3-4 EIA team & qualifications.

| EIA Topic Chapter | EIA Chapter Author | EIA Chapter Reviewer |
|---|--|--|
| NTS, Introduction, EIA Methodology, Concluding Chapter | Ben Sullivan MSci GradIEMA Mark Cope BSc MSc FGS MIEMA CEnv REIA | Tim Carter BSc MSc CMLI MIEMA CEnv |
| Description of Development, construction activities, option selection | Ben Sullivan MSci Mark Cope BSc MSc FGS MIEMA CEnv REIA | Samuel Wingfield BSc MRes MCIWEM C.WEM CEnv Graham Kenn BSc MSc CEng MICE CEnv MCIWEM C.WEM |
| Coastal Processes & Geomorphology | Paul Bowerman BSc MSc | Anne-Marie Moon BSc MSc CEng MICE |
| Bathing Water Directive & WFD | Ben Sullivan MSci GradIEMA | David Revill BSc MSc CEnv MIES |
| Biodiversity & Nature Conservation (including HRA) | Jonathan Harrison BSc MSc Jonathan Whitmore BSc MIFM | Chris Toop BSc MCIEEM Kieran Sheehan BSc MSc PGCE CEnv MCIEEM MIFL |
| Landscape & Visual | Christophe Watiez CMLI | Peter Harrison BA Grad Dip Larch |

²⁰ Institute of Environmental Management and Assessment (IEMA) (2004). Guidelines Environmental Impact Assessment. 2006 Updates.

²¹ Institute of Environmental Management and Assessment (IEMA) (2011). *State of Environmental Impact Assessment in the UK*. IEMA Special Report.

²² Institute of Environmental Management and Assessment (IEMA) (2016). *Environmental Impact Assessment Guide to Delivering Quality Development*.
<https://www.iema.net/assets/newbuild/documents/Delivering%20Quality%20Development.pdf>

| EIA Topic Chapter | EIA Chapter Author | EIA Chapter Reviewer |
|------------------------------------|---|-------------------------------------|
| | | Tim Carter BSc MSc CMLI MIEMA CEnv |
| Cultural Heritage | CPAT (Nigel Jones BA MCifA) & Lampeter University (Dr Nigel Nayling/ Dr Martin Bates) | |
| Socioeconomics & Human Health | Ben Sullivan MSci GradIEMA Tim Carter BSc MSc CMLI MIEMA CEnv | Rachel Brisley TRP MCD MBA AMBA |
| Traffic & Transport | Fore Consulting (Joel Perren BA MSc & Adam Smout BA Dip TP) | |
| Other Construction Related Effects | Ben Sullivan MSci GradIEMA Mark Cope BSc MSc FGS MIEMA CEnv REIA Hawkins Environmental (Will Totty MSc & Nick Hawkins MSc MIOA MIAQM) | Tim Carter BSc MSc CMLI, MIEMA CEnv |
| Sustainability & Climate Change | Ben Sullivan MSci GradIEMA Mark Cope BSc MSc FGS MIEMA CEnv REIA | Tim Carter BSc MSc CMLI MIEMA CEnv |
| Cumulative Effects | Ben Sullivan MSci GradIEMA Mark Cope BSc MSc FGS MIEMA CEnv REIA | Tim Carter BSc MSc CMLI MIEMA CEnv |

3.4.6 Defining the temporal & spatial scope of EIA

3.4.7 Regulation 17(3)/12(2) states that the ES includes at least (a) '*a description of the proposed development comprising information on the site, design, size and other relevant features of the development...*'

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

- existing conditions (2018 baseline unless otherwise stated);
- construction (May 2019 to June 2022);
- operation (including maintenance) of the development (60 years from baseline to 2078); and
- future decommissioning of the development (undefined).

3.4.9 For further details refer to sections 2.7, 2.8 and 2.9.

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

- the physical extent of the proposed works, as defined by the limits of land to be acquired or used (temporarily or permanently, refer to Appendix B);
- the nature of the existing baseline environment, including the location of sensitive receptors (refer to Table 2-1);
- the geographical extent of impacts beyond the site, e.g. effects on traffic, or watercourses that might extend some distance from the development site; and
- the geographical boundaries of the political and administrative institution and authorities, which provide the planning and policy context for the project.

3.4.11 *Defining impacts and effects*

- 3.4.12 Schedule 4 of the EIA Regulations sets out the requirement of Regulation 17(3)/12(2) that the ES provides both a description of the characteristics of the proposed development together with a description of the aspects of the environment likely to be significantly affected, including the following: *'population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape'*.
- 3.4.13 With reference to Schedule 3 which sets out the Regulation 5(8)/12(2) selection criteria for EIA screening, the requirement for EIA is set out on the basis of *1. the characteristics of the development; 2. the environmental sensitivity of geographical areas likely to be affected by development; and 3. the types and characteristics of the potential impact to identify the likely significant effects of the development on the environment*. The EIA should seek to identify the value, sensitivity or importance of the aspects of the environment, where they are likely to be affected by the development proposals, characterise the nature of any impacts on these aspects of the environment, and then assess the overall significance of the effect that would result if left unmitigated.
- 3.4.14 Distinction is drawn between characteristics of 'impacts' and the significance of 'effects', as not all impacts identified will necessarily have a likely 'significant' effect on the environment. Impacts and effects are defined in the ES as follows:
- *Impacts* are the predicted changes to the baseline environment attributable to the development;
 - *Effects* are consequences of impacts on environmental resources or receptors of a particular value, sensitivity or importance.

3.4.15 *Assessment of significance*

- 3.4.16 Schedule 4 of the EIA Regulations also requires a description of the factors likely to be significantly affected by the development using the following terms, which are defined for the purpose of this EIA thus:
- *Direct effects* – arise from the impact of activities that form an integral part of the project;
 - *Indirect or secondary effects* – arise from the impact of activities that do not form part of the project, but are a consequence of it;
 - *Cumulative effects* – result from multiple impacts or effects on a particular environmental resource or receptor, which would otherwise not occur or would be less severe
 - *Short-term, medium-term or long-term effects* – refer to the temporal scale of an effect;
 - *Permanent effects* – result from an irreversible change to the baseline environment or which persist for the foreseeable future;
 - *Temporary effects* – persist for only a limited period or which may disappear due to natural recovery of the environment or assimilation into it;
 - *Positive effects* – have a beneficial influence on environmental receptors and resources; and

- *Negative effects* – have an adverse influence on receptors or resources.

- 3.4.17 Consideration of transboundary effects are also a requirement of Schedule 4/ Schedule 3, which in the UK are considered with regard to the geographical boundaries of the political and administrative institution and authorities, which provide the planning and policy context for the project (refer to section 3.4.6).
- 3.4.18 Significance of environmental effects is assessed herein on the basis of the magnitude, intensity or irreversibility of impacts versus the value, sensitivity or importance of the impacted environmental resource or receptor. Where applicable Table 3-5 will be used to assist in the judgement of significance. This matrix-based approach helps to provide consistent significance terminology throughout the ES and improves the judgement of significance scoring by pre-defining the relationship between impacts and effects. For consistency the significance of environmental effects assessment scores will be described using these terms where possible, with topic specific terminology set out in individual ES chapters where guidelines deviate from the standard approach.

Table 3-5 Matrix of significance of effect scoring terms

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

3.4.19 *Mitigation, enhancement and reporting of residual effects*

- 3.4.20 Schedule 4/ Schedule 3 of the EIA Regulations sets out the requirement for inclusion in the ES: *'A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases'*.
- 3.4.21 Mitigation measures should be both reasonable and practicable, taking account of the following criteria:
- current best practice guidance;
 - precedents set by similar projects;
 - the effectiveness of different technical solutions;
 - their feasibility in construction and operational terms; and
 - their incremental costs.
- 3.4.22 When identifying the best possible design measures available to achieve the required mitigation within a scheme, the principles of the hierarchy of mitigation should be employed as follows (in order of preference):

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

3.4.23 Consideration to mitigation should be undertaken from the earliest possible design stage, after the baseline data has been collected, and throughout the EIA process, EIA mitigation can also therefore be characterised depending on the stage of the assessment when it is considered²¹.

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

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

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

3.4.26 *Limitations and Assumptions*

3.4.27 The following assumptions and limitations are relevant to the ES:

- Baseline environmental data has been obtained from a variety of sources, however it is recognised that environmental conditions can change during the construction and operation of the development. Generally, where uncertainty is identified the likely worst-case scenario has been assessed in accordance with the principles of the Rochdale Envelope EIA case law.
- The outline construction methodology information has been provided as the parameters for construction of the coastal defence proposals in order to provide a framework for environmental impact assessment. However, given the complexity of construction logistics in an urban area and dynamic tidal environment, it is recognised that a degree of flexibility is required in the methodology. Where such flexibility gives rise to uncertainty, the worst-case scenario has been assessed in accordance with the principles of the Rochdale Envelope EIA case law.
- Although three bulk material transport routes were initially evaluated as part of the Traffic Assessment (provided in Appendix L), on the advice of DCC Highways

only the primary route forms part of the published scheme proposals. Consequently as the worst case scenario, all traffic flows have been quantitatively assessed as using only the primary bulk materials transport route in the Traffic & Transport and Traffic Noise & Air Quality assessments presented herein.

- It has generally been assumed that the design and construction of the scheme will satisfy minimum environmental standards, consistent with contemporary legislation, practice and current scientific knowledge. Where this is the case it has generally been assessed as part of the scheme proposals (i.e. tertiary mitigation).
- Where any additional features or measures that would alter the scheme proposals are identified as part of the EIA process to avoid, reduce, prevent or offset likely significant effects on the environment, this is set out as mitigation in accordance with the requirements of the Regulation 17(3)(c) of the EIA Regulations (i.e. secondary mitigation).
- The site extent has primarily been assessed on the basis of that defined during EIA Screening and Scoping. However the construction site boundary has been reduced as part of the iterative design process from approximately 22 ha to 13 ha to minimise the impact of construction on known archaeology identified as part of the EIA processes (both pre- and post-mitigation site boundaries are provided in Appendix B). This is presented as secondary mitigation in Chapter 7 Cultural Heritage.
- Where alternative scheme proposals have been considered to avoid or prevent likely significant effects, this is set out as reasonable alternatives in accordance within the requirements of Regulation 17(3)(d) of the EIA Regulations (i.e. primary mitigation).
- The EIA Scoping response received from Natural Resources Wales Marine Licencing Team and Denbighshire County Council Planning emphasised concerns that beach recharge could give rise to unforeseen impacts on coastal processes. Therefore in order to avoid likely significant effects on the environment as a result of uncertainty surrounding the impact of beach recharge, it was decided to remove recharge from the scheme proposals as a reasonable alternative (primary mitigation).
- Impacts on single environmental receptors assessed in separate EIA topics are considered with regards to interrelationship impacts in Chapter 12 Cumulative Effects. This includes an assessment of the impact of mitigation proposals from one EIA topic on another (for example impact of archaeological investigations proposed on ecological receptors).

3.4.28 Where applicable other EIA topic chapter specific limitations and assumptions are set out in in the methodology section of the topic chapter.

4 Coastal Hydrology and Hydromorphology

4.1 Introduction

- 4.1.1 This assessment builds on the coastal processes assessments undertaken as part of design development of the coastal defence proposals and the preliminary considerations during EIA Scoping (provided in Appendix D). It considers additional coastal processes modelling work undertaken in detailed design of the proposals (since EIA Scoping), and EIA Scoping Opinion comments relating to coastal processes and hydromorphology. It must however be noted that many of the EIA Scoping comments received concerned potential impacts of beach recharge through the method of rainbowing. Given that beach recharge has been removed from the proposals as primary mitigation (refer to section 0), the scope of the assessment now focuses primarily on the short-term potential impact of other construction activities on suspended sediment concentrations, sediment transport and deposition are considered.
- 4.1.2 The Water Framework Directive (WFD) (2000/60/EC) is implemented in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, which revoke and replace the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The Regulations require that Environmental Objectives are set for all surface (including river, lake, coastal and transitional waters) and groundwaters in England and Wales to enable them to achieve a Good status by 2015. Where this is not possible and subject to the criteria set out in the Directive, the aim is to achieve Good status by 2021 or 2027. Mitigation measures have been developed for waterbodies to help them to achieve their Environmental Objectives, against which the development proposals have been assessed herein.

4.2 Baseline Conditions

4.2.1 Coastal Hydromorphology

- 4.2.2 East Rhyl is located on the North Wales coast, which is comprised on mostly low-lying land, formed from alluvial deposits (Welsby & Motyka, 1989²³). Its position determines the coastal oceanography, with tidal flows and ambient wave conditions controlled by the structure of the Irish Sea.
- 4.2.3 Table 4-1 provides the tidal levels for Rhyl, calculated using a distance weighted approach from the two closest secondary harmonic ports. The region experiences a macro-tidal climate, with an astronomic (mean spring) tidal range of 7.47m, and a highest astronomical tide of approximately 5.03mAOD.

Table 4-1 Astronomical tide levels at Rhyl calculated through distance weighting

| Parameter | Tide Level (mAOD) |
|---------------------------------|-------------------|
| Highest Astronomical Tide (HAT) | 5.03 |
| Mean High Water Springs (MHWS) | 3.97 |
| Mean High Water Neaps (MHWN) | 2.17 |
| Mean Sea Level (MSL) | 0.22 |
| Mean Low Water Neaps (MLWN) | -1.70 |

²³ Welsby, J & Motyka, J.M. (1989). A macro review of the coastline of England and Wales-volume 8: The North West-the Great Orme to the Solway Firth.

| Parameter | Tide Level (mAOD) |
|--------------------------------|-------------------|
| Mean Low Water Springs (MHWS) | -3.50 |
| Lowest Astronomical Tide (LAT) | -4.56 |

- 4.2.4 East Rhyl is protected against long-period oceanic swell waves, due to its location within the Irish Sea. Ambient waves resulting from the prevailing winds and available fetch lengths occur mainly from the north-west, resulting in predominantly high wave angle conditions along the north-facing coast. The combination of tide and wave conditions has resulted in formation of wide beaches, commonly sand overlying glacial till (clay), with occasional expressions of peat or shingle deposits.
- 4.2.5 The pattern of prevailing west to east sediment transport from Great Orme's Head towards the Dee Estuary has long been identified, through both the interpretation of morphology and observations of downdrift erosion to the east side of coastal and flood defences after they were installed (Welsby & Motyka, 1989). This transport pathway is the major attribute used to classify this section of coast as a regional sediment sub-cell, Sub-cell 11a (Cooper & Pontee, 2006²⁴), which implies a strong spatial coherence of coastal sediment transport.
- 4.2.6 Within Sub-cell 11a, the coastal morphology changes near Abergele (Figure 4-1). To the west, carboniferous limestone headlands occur at Great Orme, Little Orme, Rhos Point and the eastern end of Colwyn Bay, providing structural control to arcuate bays. These controls support clay scarp formation along the coast, fronted by sand and shingle beaches. To the east, there is a relative absence of rock formations, with coastal curvature developed near the mouth of the Clwyd River and large-scale spits at Gronant and Talacre (Figure 4-2), with associated dune fields. The continuity of the coastline is naturally disturbed at the Dee Estuary, which forms a large potential trap for sediments, including finer clays and silts.
- 4.2.7 The irregular arcuate coastal shape west of Abergele, provides an almost linear coast to Gronant. This and the presence of the spit features located at the Point of Ayr, are geomorphic indicators of a large scale 'conceptual model' for the North Wales coast. Simplistically, this structure suggests that the western section has (over millennia) supplied material to the alongshore littoral zone, transporting sediment eastward to be deposited in the dunes and spits near Gronant and Talacre (Figure 4-2: Coastal locations from Little Orme to Dee Estuary) This is evidenced at a beach scale by sediment deprivation on the coarse sediment beaches to the west, and the wider, fine sediment beaches to the east. Sedimentary analysis has suggested that this large-scale behaviour has occurred since the mouth of the Conwy River shifted to the west side of Great Orme Head, removing an external supply of littoral material (Welsby & Motyka, 1989²⁵).

²⁴ Cooper, N.J. and Pontee, N.I., (2006). Appraisal and evolution of the littoral 'sediment cell' concept in applied coastal management: experiences from England and Wales. *Ocean & coastal management*, 49(7), pp.498-510.

²⁵ Welsby J & Motyka JM. (1989) *A macro review of the coastline of England and Wales-volume 8: The North West-the Great Orme to the Solway Firth*.

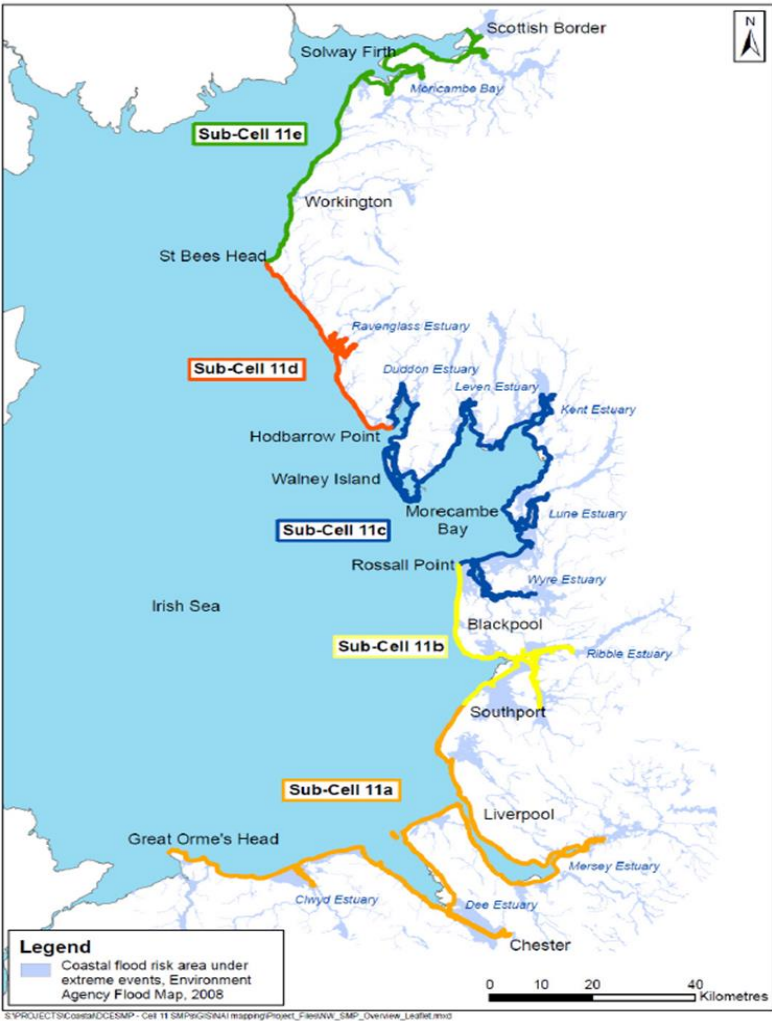


Figure 4-1: Sediment Sub-cells, defined in Halcrow (2010)



Figure 4-2: Coastal locations from Little Orme to Dee Estuary

- 4.2.8 This conceptual source-pathway-sink model is partly supported by the nature of irregularities in the coastal structure. To the west, convex forms are related to geological features, and suggest partial retention of sediment on the updrift side. The less pronounced convexities at Rhyl and Gronant, are hydraulic and related to the Clwyd River and tidal exchange from Prestatyn Gutter and support natural bypassing.
- 4.2.9 Most of the North Wales coast has been extensively modified through the installation of coastal defence structures: with 47 artificial structures being identified between Little Orme and the Point of Ayr, along with several points of recharge. The introduction of these structure has modified the natural processes and has resulted in beach lowering of the majority of the coast between Great Orme Head and the Point of Ayr during the 20th century. In addition, it has resulted in substantial narrowing of the intertidal zone between Rhyl and Prestatyn (Welsby & Motyka 1989, HR Wallingford 2008).
- 4.2.10 The physical evaluation of coastal change for East Rhyl has previously been derived using analysis of coastal profiles along the Denbighshire coast (CEUK, 2015²⁶; HR Wallingford, 2008²⁷). These analyses indicated that most variation is cyclic, related to nearshore movements of sand ridges and runnels. However, no clear spatial pattern was demonstrated, although net losses were inferred for East Rhyl and downdrift of the Prestatyn groyne field.
- 4.2.11 An analysis of semi-annual survey data obtained at 26 fixed profile locations between Rhyl and Gronant between 2002 and 2009, indicated relatively small rates of profile change. The evaluation of sequential profile surveys and aerial imagery confirmed that the coastal dynamics are mostly associated with the movement of ridges and runnels along the Rhyl-Gronant coast. The analysis also indicated that the ridge system develops in three distinctive sections: East Rhyl, Prestatyn and Gronant. The calculated onshore sediment delivery for representative profiles is provided in Table 4-2.

Table 4-2: Online sediment delivery from ridge dynamics

| Location | Ridge area – Cross-section (m ²) | Delivery time scale (years) | Annual Delivery (m ³ /m) | Length scale (m) | Transport rate (m ³ /yr) |
|---------------|--|-----------------------------|-------------------------------------|------------------|-------------------------------------|
| Rhyl | 150 | 4 | 38 | 675 | 25,000 |
| East Rhyl | 180 | 3 | 60 | 370 | 22,000 |
| East Rhyl | 200 | 7 | 29 | 550 | 16,000 |
| East Rhyl | 190 | 6 | 32 | 525 | 17,000 |
| Prestatyn | n/a | n/a | 0 | 3,300 | 0 |
| Gronant | 400 | 15 | 27 | 900 | 24,000 |
| Gronant Beach | 40 | 8 | 5 | 500 | 2,500 |

- 4.2.12 The relatively small rate of profile change occurring along the Rhyl-Gronant coast implies that, during the survey period, the onshore and alongshore sediment transport pathways approximately balanced. Therefore, material supplied onshore through the shoreward migration of the ridges was subject to an increased rate of alongshore sediment transport at the beach. This sediment moves downdrift (east) and supplies a

²⁶ CEUK(2015) North West Strategic Monitoring; Regional Sediment Analysis and Reporting 2015. Inter-tidal Report. Prepared for Sefton Council. CEUK Project 08/1410.

²⁷ HR Wallingford (2008) Coastal Processes Study: Rhyl to Prestatyn. v4.0. Martin Wright Associates. EX5690.

feed to the next (older) nearshore ridge, allowing it to maintain its presence. Further details of the above analysis are provided in Appendix H (JBA Coastal Modelling Report).

- 4.2.13 The ridges and runnels align in a direction that substantially reduces alongshore transport. Due to the low wave climate, which is comprised almost entirely of spilling breaker waves, these features are not characteristic of storm erosion-recovery cycles (i.e. storm bars) but behave more like coastal spits (Appendix H – coastal modelling report). The ridges are subject to frequent overwash, and therefore migrate landward and onshore, with a new spit being resolved each year, and taking 3-4 years to migrate onshore. There is some evidence of secondary geomorphic features developed through tidal flow within the runnels, particularly where they interact with coastal structures.
- 4.2.14 A regional sediment transport modelling study undertaken for this study (Appendix H – Coastal modelling report) derived a wide range of transport rates, from 2,500 m³/yr to 115,000 m³/yr. The highest estimated rate of transport was associated with the simplest bulk littoral transport rate, using the Coastal Engineering Research Centre (CERC) formula. Previous application of this formula, based on a wave climate from further offshore, gave transport estimates of 330,000 m³/yr to 465,000 m³/yr (Halcrow 2010²⁸).
- 4.2.15 The high rates of alongshore transport suggested by the simpler models are not supported by either the rates of erosion observed further updrift along the north Wales coast, or on the depositional features located further downdrift at Talacre and Gronant. The best estimate range for mean littoral transport is 30,000 to 45,000 m³/yr. This is based upon the 1D modelling that accounted for variation of the profile grade, and truncation of the profile due to the existing revetment. However, the modelling is not capable of resolving the difference between the shore aspect and alignment of the intertidal ridges, and therefore can be expected to provide an overestimate of the alongshore transport rate. In effect, the modelling was consistent with the observational estimate of approximately 20,000 m³/yr being delivered through onshore ridge migration, and subsequently removed by alongshore transport.
- 4.2.16 Ground level investigation works conducted on the upper part of the beach along the East Rhyl frontage found on the beach sands typically comprise of slightly gravelly to gravelly fine to coarse sand with shell fragments²⁹. Beneath the beach sands on the beach, the beach conditions typically comprise of:
- Tidal flat deposits comprising of variously very soft to firm sandy organic silty clays with subordinate peat and sand layers.
 - Fluvial-glacial deposits comprising of variously loose to medium dense gravelly to very gravelly sands or sandy to very sandy gravels with a subordinate silt content.
 - Glacial till deposits typically comprising 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.
- 4.2.17 An exception to the above was found at the western end of the site, at the base of Splash Point, where the tidal flat deposits were absent, and the beach sands directly overlay the fluvial-glacial deposits.

²⁸ Halcrow Group Ltd. (2010) *Cell 11 Regional Monitoring Strategy (CERMS). 2009 Baseline Reporting*.

²⁹ JBA Consulting, 2018. East Rhyl Coastal Defence Scheme. Ground Investigation Report. ER-JBA-04-00-RP-GT-0002-S4-PO2-GIR

- 4.2.18 The borehole at the eastern extent of the survey area, located in front of the slipway by Rhyl golf course, indicated that organic clay represented approximately 90% of the deposits down to 0m AOD.
- 4.2.19 The clay content of the deposits down to 0m AOD ranged between 0 and approximately 48% (average of 16%) across the Rhyl beach frontage.
- 4.2.20 Intertidal sediment analysis undertaken as part of the 2015 North West Regional Monitoring Programme³⁰ indicates that the underlying cohesive sediments within the intertidal zone are frequently exposed during the movement of the ridge and runnel system.
- 4.2.21 *Coastal hydrology*
- 4.2.22 The Environmental Objectives for all surface and groundwaters in England and Wales are listed as follows:
- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
 - Aim to achieve at least Good status for all waterbodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve Good status by 2021 or 2027;
 - Meet the requirements of WFD Protected Areas;
 - Promote sustainable use of water as a natural resource;
 - Conserve habitats and species that depend directly on water;
 - Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
 - Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
 - Contribute to mitigating the effects of floods and droughts.
- 4.2.23 Surface waterbody status is made up of its ecological status and its chemical status. Ecological status is defined by a series of biological 'quality elements' and physico-chemical, hydromorphological, and chemical 'supporting elements' (which support the biological elements). Chemical status comprises a series of priority substances and other pollutants (listed in the Environmental Quality Standards Directive (EQSD)). These quality elements are taken from Annex V of the Directive.
- 4.2.24 The status of all relevant quality elements is classified according to five categories: 'High', 'Good', 'Moderate', 'Poor' and 'Bad'. The overall status of a waterbody is determined by the lowest elements status e.g., if all biological quality elements and supporting elements are at 'Good' status, except for one, which is at 'Moderate' status, then the ecological status is at 'Moderate' and the overall status is 'Moderate'. Published guidance requires that all quality elements need to be considered as part of a WFD assessment.
- 4.2.25 Under the WFD, Heavily Modified Waterbodies (HMWB) are bodies of water that are substantially changed in character due to physical alterations by human activity and cannot meet 'Good Ecological Status' (GES). Therefore, mitigation measures are set

³⁰ Coastal Engineering UK Ltd, 2015. North West Strategic Monitoring Programme Regional Sediment Analysis and Reporting 2015 – Inter tidal Report. Sefton Council.

for the waterbody so that it achieves 'Good Ecological Potential' (GEP). This assessment therefore must consider whether the proposed scheme will conflict with the measures in place now or planned for the future, and whether this could affect the status of the hydromorphological quality elements (and ultimately the status of the waterbody).

- 4.2.26 The Water Watch Wales website shows that the proposed scheme lies within the 'North Wales coastal waterbody' (WFD Ref: GB641011650000) and the 'Clwyd Permo-Triassic Sandstone' groundwater waterbody (WFD Ref: GB41001G202100).
- 4.2.27 The North Wales coastal waterbody encompasses a 45km stretch of the North Wales coast from Great Ormes Head to the Wales/England border, equating to an area of 146.25km². The waterbody is designated as a Heavily Modified Waterbody (HMWB) due to modification associated with coastal protection. As such, the specific objective of the RBMP for this waterbody is to achieve GEP and good chemical status by 2021.
- 4.2.28 The waterbody is currently assessed as having an overall status of 'Moderate', with 'Moderate' ecological potential, whilst its chemical status is currently 'Fail'. The quality elements that are contributing to the failing status of the waterbody include mercury (and its compounds) from an unknown source and Dissolved Inorganic Nitrogen (DIN) from dairy and beef farming and non-mains domestic sewage.
- 4.2.29 For the North Wales coastal waterbody, a series of mitigation measures are identified. Many of these measures are related to the control of dredging activities and disposal of dredged materials; the proposed scheme will not affect these activities or decision-making relating to the control of these activities, and therefore these measures are not considered further. The following mitigation measures are relevant to the proposed scheme:
- Indirect mitigation
 - Reduce sediment resuspension
 - Manage disturbance
 - Retain habitats
 - Enhance ecology
 - Realign flood defence
 - Remove obsolete structure
 - Remove or soften hard bank
 - Preserve or restore habitats
 - Bank rehabilitation
- 4.2.30 Typically, for a waterbody to be able to achieve GEP all of the mitigation measures must be in place and functioning. An assessment of the mitigation measures for the North Wales coastal waterbody (see Water Watch Wales website) identifies that the status of these mitigation measures is 'Good' and that the measures listed are 'not currently applicable – not required in this waterbody'. This indicates that the hydromorphological characteristics of the waterbody are consistent with GEP and that implementation of further mitigation measures is not required at this time.
- 4.2.31 There are also protected areas within 2km of the proposed scheme. Within scheme area these comprise:
- Clwyd Permo-Triassic Sandstone Drinking Water Protected Area.
 - Rhyl East Bathing Water.

- 4.2.32 The Clwyd Triassic Sandstone groundwater body spans a broad area along the North Wales Coast, from Llanddulas to Prestatyn, and south to Llysfas. It encompasses an area of 237.32km² in size. The waterbody has a quantitative status of 'Good' and a chemical status of 'Good', giving it an overall status of 'Good'.
- 4.2.33 Within 500m of the scheme area these comprise:
- Liverpool Bay Special Protection Area (SPA).
 - Nitrate Vulnerable Zone (NVZ) 135.
- 4.2.34 Within 2km of the scheme area these comprise:
- Rhyl Bathing Water.
 - Marine Lake Bathing Water.
- 4.2.35 The following priority habitats (as defined by Section 7 of the Environment (Wales) Act 2016) are present within 500m of the proposed scheme:
- Sabellaria alveolata reef.
 - Subtidal sands and gravels located approximately 300m to the north of the scheme area.
- 4.2.36 Anecdotal evidence indicates that the reef forming honeycomb worm *Sabellaria alveolata* has been recorded on one or more of the timber groynes present along the foreshore, with the next nearest record located approximately 150m to the north of the scheme area. However, this *Sabellaria alveolata* was not recorded in either of these locations during marine biotope and benthic invertebrate surveys undertaken in March 2017 and June 2018 (Appendix I). A small amount of *Sabellaria alveolata* was found at the low tide mark during the survey carried out in June 2018. This had not been recorded before and had begun to form on a small area of cobbles. At the time of the survey it was badly damaged by storm action and it is likely that any Sabellaria reef here will be ephemeral.
- 4.2.37 The following WFD Higher Sensitivity Habitats are present within 500m of the proposed scheme:
- Mussel Beds (*Modiolus modiolus*, *Mytilus edulis* & others) (A1.22, A2.72, A5.62, A4.24, A3.361)
- 4.2.38 The ecology surveys of the scheme area undertaken in March 2017 and June 2018 did not identify the presence of this habitat and concluded that the habitat may be ephemeral, with the potential to return in the future.
- 4.2.39 The following WFD Lower Sensitivity Habitats are recorded within 500m of the proposed scheme:
- Intertidal Soft Sediment (Sand, Mud & Mixed A2.2, A2.3, A2.4) within and immediately adjacent to the scheme area.
 - Small amounts of Rocky shore (Intertidal rock A1) within and immediately adjacent to the scheme area.
- 4.2.40 There are no historic records of INNS within 5km of the development site (refer to Chapter 5 Biodiversity and Nature Conservation). However, the March 2017 survey of the scheme area identified the presence of the invasive barnacle *Austrominius modestus* on several of the timber groynes

4.3 Assessment Methodology

4.3.1 Coastal hydromorphology

4.3.2 This assessment considers the potential short-term (construction) and long-term (operational) impacts of the proposals on the local and regional coastal processes. This assessment was based on information largely obtained during the coastal modelling study and ground investigation works, but also on relevant coastal processes literature where available. Full details of the modelling study are provided in Appendix H. A summary of the coastal processes modelling undertaken as part of the design development of the coastal defence scheme and which has been used to inform this assessment is provided as follows:

- Two nested two-Dimensional (2D) Delft3D models were created to allow for an accurate representation of the hydrodynamic and morphological processes within the area surrounding the intervention. The extents of the models are shown in Figure 4 3.
- The larger Delft3D model was used to transform schematised annual wave conditions from the Met Office's hindcast wave model WaveWatch III (Point ID:1440) to the nearshore.
- The transformed waves were then used to derive the longshore sediment transport in the nearshore for 38 shoreline cross sections, from Llanddulas to Prestatyn drain. These cross sections were integrated into longshore transport calculations and 1-line modelling undertaken in a UNIBEST model.

4.3.3 The 2D, depth averaged modelling approach calculates the net sediment transport within a cell. This approach is not applicable where significant directional shear is experienced within the water column. Subsequently, an additional Delft3D hydrodynamic model was constructed to allow higher grid resolution within the area of interest. The model was nested within the larger 2D model, with the boundary conditions extracted for a 28-day simulation period and applied across the northern extent of the model. The adopted 3D grid resolution (Figure 4 4) allowed the accurate representation of wave breaking, and the associated return currents within the model and their impacts on sediment transport within the nearshore. To ensure modelling efficiencies, five grid layers were integrated into the model domain. These layers were not spread evenly throughout the water column, but with thinner layers being located at the base and top of the profile to better represent current and wave interactions at the bed and sea surface.

4.3.4 A number of sources of potential impacts on coastal processes have been identified from activities associated with the rock revetment construction, namely:

- stockpiling and storage of rock on the beach;
- excavation for rock revetment construction;
- excavation for groyne removal;
- tracked vehicle movements on the beach;
- construction of beach access ramp; and
- physical presence of the rock revetment.



Figure 4-3: Large Delft3D model grid with nested grid (red box), from Great Ormes head (west) to Point of Ayr (east)



Figure 4-4: Delft3D nested model grid

- 4.3.5 In accordance with the definitions of impacts provided in Table 4-3, these activities have been assessed with regards to their potential to impact on coastal processes, namely, changes to sediment entrainment operating as part of the ridge and runnel system, changes to sediment suspension or turbidity, and changes to patterns of sediment deposition.
- 4.3.6 The consequences of these impacts have been assessed with regards to scale at which they naturally operate in accordance with the sensitivity criteria provided in Table 4-4. Table 3-5 has then been used in order to determine the significance of the effect of the scheme proposals. Where the consequences of the changes in coastal processes would impact on specific environmental receptors of value (i.e. ecological receptors), these are addressed as secondary effects in the relevant chapter of the ES – Chapter 5.

Table 4-3: Criteria for defining the magnitude of impacts on coastal processes assessed:

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

Table 4-4: Criteria for defining the sensitivity coastal processes operating:

| Sensitivity score | Criteria |
|-------------------|---|
| High | Coastal processes operating at the scale of the Liverpool Bay Tidal Cell 11. |
| Medium | Coastal processes operating at the scale of Tidal Sub-Cell 11a. |
| Low | Coastal processes operating at the scale of the site or limited to the immediate nearshore zone |

4.3.7 *Coastal hydrology*

- 4.3.8 All new activities in the water environment need to take account of the requirements of the WFD. For a project or activity to be compliant with the WFD, it should demonstrate that:
- there is no risk of it causing a deterioration in the status of any element; in addition, for groundwater, it will limit or prevent the input of pollutants;
 - there is no risk of it preventing WFD protected areas from achieving their objectives;
 - it will not jeopardise any waterbody from achieving good status/potential; and
 - it will contribute to the protection, enhancement and restoration of waterbodies.
- 4.3.9 WFD assessment aims to determine whether a proposed development would have the potential to cause or contribute to the deterioration in status of a WFD waterbody or inhibit a waterbody from achieving its status objective. It also assesses the potential for the development to contribute to the objectives of the WFD.

- 4.3.10 A WFD Assessment has been undertaken and is provided and is provided in Appendix H. The assessment identifies all activities that will take place as part of the proposed development, during both construction and operation, and where risks of an impact on the WFD quality elements might arise due to these activities.
- 4.3.11 This assessment has followed published good practice guidance and has been undertaken following a staged approach:
- Stage 1: screening – to determine whether any activities associated with the proposed development do not require further consideration i.e., do not need to go through the scoping or impact assessment stages because there is no more than a low risk of a potential impact on a waterbody;
 - Stage 2: scoping – identifies the potential risks associated with the proposed activities and the WFD receptors that are at risk i.e., those risks that need impact assessment; and
 - Stage 3: impact assessment – a detailed assessment of the potential impacts of each activity, including consideration of ways to avoid or minimise impacts, and possible enhancement opportunities, to determine whether an activity may cause deterioration or jeopardise the waterbody from achieving good status.
- 4.3.12 This staged approach reproduces an assessment flow checklist taken from the Natural Resources Wales WFD guidance (2017). The NRW guidance also includes detailed screening criteria that can be used to determine whether a proposed activity is not likely to cause a deterioration in the status of a waterbody. This includes a list of activities that in general will not cause a deterioration, such as 'temporary' works that do not normally last more than six months and are not likely to have a residual impact on a waterbody. The guidance also lists other physical works and defines screening thresholds for each; these thresholds help to determine whether any activity presents a risk to a waterbody and any requirements for further assessment. However, these thresholds are for guidance only and expert judgement is required to determine if a proposed activity may have an impact on a waterbody.
- 4.3.13 A more detailed WFD assessment would be required if it cannot be concluded that the proposed development would not cause deterioration or inhibit the objective status of a waterbody. Further to this and in line with WFD requirements, there would be a need to apply the Article 4.7 test to seek approval for progression of the development if, after the full WFD assessment (including the implementation of mitigation measures), it cannot be determined that the development would not cause deterioration to a waterbody or prevent it from achieving its status objectives.

4.4 Potential Impacts & Significant Effects

4.4.1 Coastal hydromorphology

- 4.4.2 All works requiring beach access would be conducted under dry conditions (i.e. when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the astronomical tide. The outline construction methodology indicates that the rock revetment construction would be undertaken in 10m sections, however there is the potential for these sections to be up to 20m in length. There is also the potential for two sections to be constructed at the same time. Therefore, for the purpose of this assessment it has been assumed that the likely worst-case scenario is that two 20m sections of rock armour revetment toes would be constructed per tidal cycle.

- 4.4.3 In advance of and during construction, the rock will be temporarily stored and sorted on the beach near to the rock revetment section being constructed. The storage of this material on the beach is likely to cause small scale changes to the current flows over and around the rock piles. This increase in turbulence around the rock piles may result in increased localised sediment mobilisation/erosion on the lee side of the piles. The potential rate of erosion will depend on the current velocity and will therefore be dependent on the tidal state, the depth of water over the rock pile, the current velocity, the presence of waves and the duration that the piles remain on the beach. The turbulence created, and therefore the erosion potential, will also be influenced by the dimensions and shape of the pile. Following the removal of the rock pile, the beach profile will tend to return to its previous state. The rate at which this occurs will be dependent on the rate of the onshore sediment supply from the ridge and runnel system (Section 4.2). It is therefore considered that the temporary storage of rock material on the beach will have **No Significant Effect** on the local hydrodynamic and sediment regimes.
- 4.4.4 The ground investigation works indicated that the dominant beach sand is classified as gravelly sand; with the remaining areas comprising material classified as clay/silt or clay. This is consistent with the supply of beach material being through the onshore movement of the ridges and runnels; with the ridges consisting of gravelly sands and the runnels consisting of the exposed clay materials. The exception being for the material found at the western extent of the survey area, in the vicinity of Splash Point, where the beach material consists of sand material and the layer extends below the 0m AOD level.
- 4.4.5 The first stage of the rock revetment construction is the excavation of the beach material to formation level. Based on the construction of two 20m sections of rock armour revetment during a tidal cycle, approximately 1,220m³ of beach material could be excavated between tidal cycles and could therefore potentially be available for entrainment. Much of this material will be used to cover the toe to the existing beach levels on completion of that section (refer to construction strategy in Appendix G). Furthermore, the excavated material will be used to form a minimum 1m protection layer over the new rock toe to allow access for construction plant for the completion of the revetment slope. It is therefore unlikely that all of this material would be available for entrainment within the tidal cycle. Nevertheless, a worst-case scenario has been assumed with 1,220m³ of beach material being available to the tide for reworking.
- 4.4.6 Of this material the composition of material available for tidal reworking is likely to be (on the basis of the GI results down to the 0m AOD level, provided in Appendix M): 30% gravelly sand; 22% sand; 25% clay/silt; 12% clay; 7% silt/sandy organic clay and 3% clay/silt and sand. The cohesive and granular nature of the tidal flat material would inhibit the suspended transport loads in comparison to the beach sands. As such the volume of material readily available for entrainment would be approximately 619m³ of marine beach sands (typically consisting of gravelly sand and sands). This represents approximately 3% of the 20,000 m³/yr that is delivered through onshore ridge migration. The dominant source of beach replenishment in this area is cross shore bar migration, and as such the dominant transport pathway will be directly offshore. Therefore, the increased material availability is unlikely to have a significant effect on the onshore ridge migration and is considered to have **No Significant Effect**.
- 4.4.7 During high energy storm events there is greater likelihood that the excavated clay and silt material could become suspended. Once suspended it is likely to remain in suspension for longer periods than the larger sand and coarse silt particles discussed above. However, the high energy nature of storm events, would also mean that

sediment would be entrained by other sources (including material within ridges and runnels elsewhere). Of the excavated material made available within each tidal cycle, clay and fine silt would only comprise up to a maximum of 598m³ by volume. Although there is no local or regional baseline to compare to; the increased volume of this material being made available is likely to be negligible during a storm event in comparison to the volume of material mobilised across the tidal sub cell (medium sensitivity) and is therefore assessed to have **No Significant Effect** on turbidity.

- 4.4.8 The existing timber groyne system extends beyond the proposed footprint of the new revetment works, which would need to be removed prior to the commencement of the rock revetment works. As set out in the construction strategy (Appendix G) the affected sections of groynes will be exposed down to the formation level of the new revetment and a 3m gap would be left between the rock armour and the remaining groynes. It is planned that the excavated material will be re-instated to create a haul route on the beach, however, for the purposes of this assessment it has been assumed that all the excavated material will potentially be available for tidal reworking.
- 4.4.9 The excavation of the seven groynes would result in approximately 544m³ of beach material (based on 1m trench required and an average depth of 2.2m) would be made available for entrainment by the tide. This equates to approximately 2% of the approximately 20,000 m³/yr delivered through the onshore ridge migration, and so the quantities of material entrained by the localised disturbance of the beach during groyne excavation would have **No Significant Effect** in relation to the sediment regime.
- 4.4.10 A temporary beach access ramp will be constructed to the west of Splash Point to allow plant access. This will take the form of a gabion retained slipway capped with a concrete running surface. The access ramp will be orientated along the existing rock revetment. For the purposes of this assessment it has been assumed that the ramp will have a width of 4.5m; which has been based on an average dumper truck width and a 50% contingency, or approximately twice the width of a digger. It has also been assumed that the slope will have a 30° slope. Therefore, it has been estimated that the ramp will have a beach footprint of approximately 35m².
- 4.4.11 The beach material within the footprint of the slipway will be secured for the duration of the development and will not be available to beach processes. The slipway footprint will be small in relation to the available beach material in front of the promenade. In addition, the proposed location of the slipway in front of the existing rock revetment, means that it is within an area where the hydrodynamic and beach processes have already adapted to the presence of the rock revetment. It is therefore considered that the presence of the slipway will have **No Significant Effect** on the localised hydrodynamic and sediment regimes.
- 4.4.12 The required movement of both wheeled and tracked vehicles on the beach is likely to produce tracks with the beach sands. The findings of the site investigation work indicate that these tracks are unlikely to expose the underlying sediments layers. The beach levels will be periodically restored using a mixture of the displaced sands and the excavated material from rock revetment construction. The rate of beach material disturbance by the vehicles will be dependent on various factors, such as: vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion etc). The movement of the vehicles on the beach will be along designated routes, thereby limiting the potential impact area, and allowing continual visual monitoring. The track runnels will be reinstated using the displaced material and where necessary the mixed excavated material. For the

assessment it has been assumed that the track width will be 2.4m (accounting for 4x600m digger shoes) and the track will be indented by 1.21m (approximately 33% of a typical ground clearance) prior to reinstatement. Then a track running half the length of the proposed development will require approximately 828m³ of material for reinstatement, assuming that no displaced material is used for reinstatement; this represents approximately 4% of the indicated onshore supply rate of 20,000m³/yr. Based on the magnitude of the disturbance, and its localised nature, it is considered that it will have **No Significant Effect** on the sediment regime.

- 4.4.13 The coastal processes baseline has identified that the primary sediment supply mechanism along this section of coastline is through the onshore movement of sand ridges. In addition, aerial images suggest that the longshore transport of sediment along the Rhyl frontage extends offshore from Splash Point (Figure 4-5) and then subsequently moved onshore through wave action. Following completion of the development the main adverse impacts to the coastal processes will be to the sediment regime and current flows close to the rock revetment during high water levels. The presence of the rocks has the potential to retain sediment and thereby remove it from the longshore transport budget. Based on approximations of the intertidal area from aerial imagery; the 14,600m² increase in footprint due to the proposed development will occupy approximately 12% of the available intertidal area in front of the proposed development (approximately 110800m²). It is therefore considered that the impact magnitude will be negligible, and in conjunction with the sensitivity being limited to the immediate site, the development will **No Significant Effect** on either the tidal or sediment regimes.

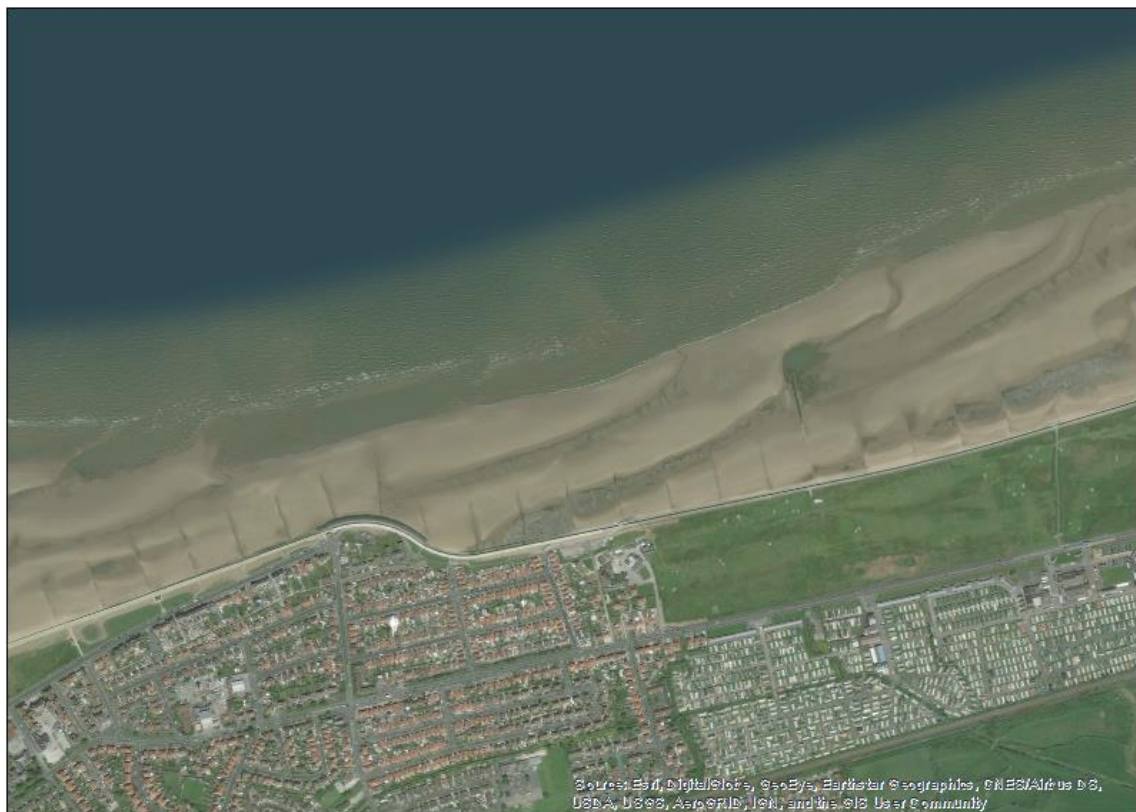


Figure 4-5: Formation of the ridges extending from Splash Point

4.4.14 *Coastal hydrology*

4.4.15 Hydromorphological elements of WFD

- 4.4.16 WFD Assessment undertaken at Stage 1 (screening) and Stage 2 (scoping) has identified that the proposed scheme is not likely to present a significant risk to hydromorphology of the North Wales coastal waterbody.
- 4.4.17 The temporary storage of rock material on the beach has the potential to create a layer of turbulent flows in the area around the rock pile, which could cause localised beach erosion. However, this is not likely to have more than a localised effect within the immediate vicinity of the rock pile. Following construction of the rock revetment the beach profile will be reinstated using excavated beach materials and no permanent effects are anticipated.
- 4.4.18 The primary sediment supply mechanism along the Rhyl coastline is the onshore movement of sand ridges, with sediment distributed along the coastline through longshore drift. The presence of the rock revetment has the potential to retain sediment and thereby remove it from the longshore transport budget. However, the total footprint of the rock revetment is very small in relation to the available intertidal area and therefore any impact on the sediment regime is likely to be very limited.
- 4.4.19 The Western Wales River Basin Management Plan identifies a series of mitigation measures for the North Wales coastal waterbody. Many of these measures focus on the management of dredging activities; however, a number are relevant to the proposed scheme, particularly those that seek to improve the ecological value of defence structures and preserve or enhance habitats.
- 4.4.20 The Water Watch Wales website confirms that the measures listed for this waterbody are 'not currently applicable – not required in this waterbody' and that the mitigation measures are at 'Good' status. This means that the hydromorphological characteristics of the waterbody are consistent with GEP and that implementation of further mitigation measures is not required. This conclusion is supported by the 'reasons for failure' data, which identifies that the waterbody is failing to achieve its status objectives due to issues with DIN and mercury (and its compounds).
- 4.4.21 Notwithstanding this, the proposed scheme is not likely to conflict with the identified mitigation measures (should they be required in the future). The scheme is consistent with the SMP2 HTL policy for the relevant Policy Units, and so realignment of flood defences is not appropriate in this location. The scheme does support implementation of measures that seek to improve the ecological value of coastal habitats. Ecological surveys of the scheme area show that the upper beach habitats are relatively species poor (with an abundance of similar habitat in the wider area) and the proposed rock revetment has the potential to provide new habitat opportunities for a range of (rocky shore) fauna and flora.
- 4.4.22 The impact on hydromorphological elements of WFD has been assessed as **not significant**.

4.4.23 Biological elements of WFD

- 4.4.24 The proposed scheme will cause both temporary and permanent impacts on beach habitat (these habitats are classified as a WFD Lower Sensitivity Habitat), flora and fauna. No impacts on designated sites (including the Liverpool Bay SPA, Section 7

Priority Habitats, or WFD Higher Sensitivity Habitats) are anticipated (refer to the HRA provided in Appendix I).

- 4.4.25 Construction of the rock armour revetment will require significant excavation of beach materials and the installation of rock armour; this will cause habitat damage and disturbance to the affected beach areas and the addition of a new habitat type (rock armour). Excavated beach material will be backfilled in the same area once the rock armour has been installed. The damage to this habitat will be largely temporary and no significant impacts on WFD Lower Sensitivity Habitat is anticipated, particularly given the abundance of this habitat type in the immediate vicinity of the scheme and likely rapid re-colonisation of the scheme area by marine fauna.
- 4.4.26 The addition of new rock armour habitat has the potential to provide an ecological benefit by providing opportunities for existing and new flora and fauna to colonise the scheme area, potentially increasing biodiversity. This includes providing new roosting opportunities for waterbirds and the rock armour may encourage establishment of WFD Higher Sensitivity Habitats, including mussel beds and polychaete reefs, which are already present in the wider area.
- 4.4.27 The impact on biological elements of WFD has been assessed as **not significant**.
- 4.4.28 Chemical water quality elements of WFD
- 4.4.29 Sediment sampling of beach material within the footprint of the rock revetment identified a single sample where the concentration of cadmium (0.45mg/kg) slightly exceeded Cefas Action Level 1 (0.40mg/kg) (refer to section 10.2.16). In all other samples taken, cadmium concentrations were below detectable limits (<0.10mg/kg). The waterbody is currently at 'Good' status for cadmium (and its compounds) and there are no reported issues with cadmium affecting the waterbody or adjacent/connected waterbodies.
- 4.4.30 The source of this cadmium is not known. Anthropogenic inputs of cadmium into the wider system may include fertiliser runoff from agricultural land or contaminated runoff from historic metal mining. Alternatively, cadmium may be the product of erosion of local/regional geology. The exceedance was recorded in a tidal flat deposit at a depth of 1.0mbgl, where sediment disturbance is relatively limited, indicating that the source of cadmium could be historic.
- 4.4.31 A slight exceedance in a single sample is not likely to present a significant risk to the marine environment or to the status of the North Wales coastal waterbody. Notwithstanding this, the risk of cadmium mobilisation (if present) is further reduced by the scheme design and proposed construction methodology. All construction works on the beach will be undertaken in dry conditions. Excavated beach material will be backfilled within the same area within a single tidal cycle, reducing the risk of sediment (and cadmium) entrainment, whilst the presence of cohesive clay material within the excavated tidal flat and fluvioglacial layers, further reduces the risk of sediment mobilisation.
- 4.4.32 The impact on chemical water elements of WFD has been assessed as **not significant**.
- 4.4.33 Protected Area elements of WFD
- 4.4.34 The proposed scheme is located within Rhyl East Bathing Waters, designated under the Bathing Water Regulations 2013 (2013/1675), and the Clwyd Permo-Triassic

Sandstone Drinking Water Protected Area (DrWPA), which encompasses the underlying groundwater body.

- 4.4.35 No impacts on the groundwater DrWPA are anticipated because the scheme does not include any significant abstraction of water or discharge to ground and does not require use of any hazardous chemicals.
- 4.4.36 No impacts on the designated bathing water are anticipated. There is no evidence of significant bacterial contamination of the beach and bathing water quality has been assessed as 'good' since 2014. The proposed scheme will not alter existing sewerage infrastructure or surface runoff patterns or result in the direct release of foul water/faecal matter into the bathing water (refer to the Bathing Water Assessment in Appendix H).
- 4.4.37 The impact on protected areas elements of WFD has been assessed as **not significant**.

4.5 Mitigation Measures

- 4.5.1 Potential coastal process impacts would be mitigated through the adoption of good construction practices. All work will be non-tidal (i.e. undertaken during periods that allow for dry working), with all works ceasing three hours prior to the anticipated high tide time. In addition, the rock revetment will be constructed in sections that can be completed during a single tidal period. These practices will eliminate the potential for excavation operations introducing beach material into the water column.
- 4.5.2 All tidal work schedules will be assessed two weeks in advance of the works. Works will also cease during storm events. These practices will again assist in reducing the amount of material available for entrainment within the water column.
- 4.5.3 There would be 17 weeks of initial stockpiling of rock at the primary compound as set out on the outline construction programme. As new rock from the quarries arrives at the primary compound, stockpiled rock would be transferred to the beach and temporarily stored ready for placement. Storage of rock on the beach would be limited by supply, which would reduce the potential impacts to the beach erosion and the hydrodynamic and sediment regimes. Nevertheless beach levels around the rock storage area will be visually monitored and reinstated if necessary. Any areas of erosion evident following the removal of the rock storage area will be reinstated using any excess excavated material.
- 4.5.4 Similarly construction traffic pathways on the beach will be periodically assessed and beach levels reinstated using the excavated material. This will assist in maintaining the natural profile of the beach.

4.6 Residual Effects

- 4.6.1 No significant effect on coastal processes is predicted, whilst any impacts on beach habitat, including damage and disturbance during construction, would be temporary in nature and therefore from a WFD perspective will also be not significant. Conversely however, the construction of the rock armour revetment may provide an ecological benefit from a WFD perspective.

5 Biodiversity and Nature Conservation

5.1 Introduction

- 5.1.1 This chapter assesses the impact of the development proposals on ecological systems and the conservation objectives of designated wildlife sites. It assesses direct impacts on ecological receptors as a result of the construction and physical existence of the proposals, and is supported by ecological baseline survey reports provided in Appendix I. An assessment has also been made of any indirect or secondary impact on ecological receptors from changes in coastal processes as reported in Chapter 4. Where the proposals have the potential to impact directly or indirectly on the conservation objectives of designated wildlife sites this is also considered, with reference to a Habitats Regulations Screening Assessment which is provided in Appendix I.
- 5.1.2 The biodiversity and nature conservation ES chapter has been prepared with reference to the Chartered Institute of Ecological and Environmental Management (CIEEM) guidelines on Ecological Impact Appraisal (EcIA)³¹.

5.2 Baseline Conditions

5.2.1 *Desk-based assessment*

- 5.2.2 A desk-based study was undertaken to collate information on statutory and non-statutory conservation sites within a 5km radius of the proposed scheme, along with records of species that are afforded legal protection or are otherwise of nature conservation importance within the area. Information has also been sought on Habitats and Species of Principal Importance and other notable species within the study area e.g. local Biodiversity Action Plan (BAP) habitats and species.
- 5.2.3 The relative proximity and/or accuracy and age of records for protected and notable species were taken into account during the appraisal to assist in determining the potential impact of the proposed works on these key ecological components. Whilst all records returned were acknowledged, most recent (i.e. post 2000) records were given greatest consideration in the assessment.
- 5.2.4 Data for the desk-based study were collected from the following sources:
- Multi-agency Geographical Information Centre (MAGIC) website;
 - Natural England's website;
 - Local Environmental Records Centre for North Wales (Cofnod); and
 - EMODnet - European Marine Observation Data Network (EMODnet) Seabed Habitats project.

5.2.5 *Extended Phase 1 Habitat Survey*

- 5.2.6 An Extended Phase 1 Habitat Survey was carried out at the site by a suitably experienced Ecologist on 30th September 2015. The methodology of the Phase 1 Habitat Survey, as detailed within the JNCC Handbook for Phase 1 Habitat Survey (JNCC, 2010), involves classifying and mapping parcels of land using specified habitat types. An Extended Phase 1 survey includes determining the suitability of these

³¹ CIEEM EcIA Guidelines (Terrestrial, Freshwater and Coastal) Second Edition and CIEEM EcIA Guidelines (Marine and Coastal)

habitats for supporting rare or legally protected species. As part of the survey, any evidence of protected species found on the site were recorded and assessment of the habitat's potential to support protected species was carried out.

5.2.7 This methodology is subject to a constraint in that it captures a snapshot of habitats and protected species at the time of the survey and transient species, or seasonal habitat indicators may have been missed.

5.2.8 More detailed surveys were undertaken for protected and notable species and habitats identified within the PEA or through consultation. The following detailed surveys were carried to ascertain the level of impact and mitigation:

- A wintering bird survey programme consisting of 12 vantage point surveys undertaken during the main overwintering and migratory period (August 2016 to April 2017 inclusive). The surveys utilised 2 vantage points positioned east and west of the proposed works location from which experienced bird surveyors recorded any bird species utilising the coastal area within the field of view. This approach is in-line with the BTO Common Bird Census (CBC) and Wetland Bird Survey (WeBS) techniques and the 'look-see' methodology³² where a surveyor familiar with the species of interest records all species present (including counts) within a set boundary. The aim of these surveys was to identify the species using the coastline at East Rhyl and provide sufficient information on species location, habitat usage and behaviour. This survey is included in Appendix I.
- A high-level marine biotope survey was carried out on the 24th March 2017 at low tide, to inform the options appraisal of the defence scheme. Methods used during this survey are based upon Procedural Guidelines outlined in the Marine Monitoring Handbook³⁴, which provides advice on monitoring marine Special Areas of Conservation to assess their condition in accordance with the requirements of the Habitats Directive and UK Common Standards for Monitoring. The aim of the biotope survey was to create maps showing the distribution of biotopes along with associated information, such as the occurrence of rare species, details of habitat, etc. All biotopes were recorded and classified according to Connor D.W et al 2004³³.
- A further coastal biotope survey and benthic invertebrate survey was carried out in June 2018. The survey was based on methodologies outlined in Procedural Guidelines No. 3-1 In situ intertidal biotope recording and No. 3-6: Quantitative sampling of intertidal sediment species using cores, from the Marine Monitoring Handbook³⁴.

5.2.9 *Designated sites*

5.2.10 Liverpool Bay Special Protection Area (SPA) (UK 9020294) is located approximately 400m seaward of the proposed scheme. It consists of an area combining both the English and Welsh Coastlines from Morecambe, past the Ribble and Dee estuaries in England, encompassing Conwy Bay up to Pont Lynas, Anglesey, in Wales. The site is designated for the international importance of its over-wintering bird assemblages, especially of red-throated diver *Gavia stellate* and common scoter *Melanitta nigra*,

³² Bibby, C.J., Burgess, N.D., Hill D.A. & Mustoe S.H. (2000). Bird Census Techniques

³³ Connor, D., Allen, J., Golding, N., Howell, K., Lieberknecht, L., Northen, K. & Reker, J. (2004), The Marine Habitat Classification for Britain and Ireland, Version 04.05. JNCC, Peterborough ISBN 1 861 07561 8 [Online], Available at: www.jncc.gov.uk/MarineHabitatClassification

³⁴ Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. and Vincent, M. 2001. Marine Monitoring Handbook, Joint Nature Conservation Committee.

summarised by JNCC³⁵. The area is also designated under Article 4.2 as supporting an internationally important assemblage of waterbirds by regularly supporting at least 20,000 waterfowl.

- 5.2.11 Liverpool Bay SPA has recently been extended further inshore at Prestatyn in order to provide protection to foraging common tern *Sterna hirundo* and little tern *Sterna albibrons*. The extension is located approximately 3.2km east of the proposed scheme. Following consultation, the extension to the SPA was formally classified on 31st October 2017.
- 5.2.12 The Dee Estuary Special Area of Conservation (SAC) (UK0030131) is representative of Atlantic salt meadows in the north-west of the UK, summarised by JNCC³⁶. It forms the most extensive type of saltmarsh in the Dee, and since the 1980s it has probably displaced very large quantities of the non-native common cord-grass *Spartina anglica*. It is located approximately 4.7km east of the proposed site. The Dee Estuary SAC is primarily designated for the following habitats:
- 1140: Mudflats and sandflats not covered by seawater at low tide
 - 1310: Salicornia and other annuals colonizing mud and sand
 - 1330: Atlantic Salt Meadows (*Glauco-Puccinellietalia maritimae*)

Other Annex I habitats and Annex II species present, for which the site is not primarily designated are:

- 1130: Estuaries
 - 1210: Annual vegetation of drift lines
 - 1230: Vegetated seas cliffs of Atlantic and Baltic coasts
 - 2110: Embryonic shifting dunes
 - 2120: Shifting dunes along the shoreline with *Ammophila arenaria* 'white dunes'
 - 2130: Fixed coastal dunes with herbaceous vegetation 'grey dunes'
 - 1095: Sea Lamprey *Petromyzon marinus*
 - 1099: River Lamprey *Lampetra fluviatilis*
 - 1395: Petalwort *Petalophyllum ralfsii*
- 5.2.13 The Dee Estuary is also designated as a SPA for European waterbirds, providing feeding and roosting sites for ducks and waders in winter, and supports common tern and little tern during the breeding season.
- 5.2.14 In addition to the SPA and SAC designation the Dee Estuary is also designated as a Ramsar site by meeting Ramsar criteria 1, 5 and 6 as follows: Extensive intertidal mud and sand flats (20 km by 9 km) with large expanses of saltmarsh towards the head of the estuary. Supporting an overall bird assemblage of international importance; and Supporting the following species at levels of international importance: shelduck, oystercatcher, curlew, redshank, teal, pintail, grey plover, red knot, dunlin, bar-tailed godwit, black-tailed godwit and turnstone.

³⁵ JNCC. 2015. Liverpool Bay Special Protection Area. [Online] Available at: <http://jncc.defra.gov.uk/pdf/SPA/UK9020294.pdf> SPA data form (Accessed 10th November 2015).

³⁶ JNCC. 2015. Dee Estuary Special Area Conservation. [Online] Available at: <http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCODE=UK0030131/>. (Accessed 10th November 2015).

5.2.15 The Gronant Dunes and Talacre Warren Site of Special Scientific Interest (SSSI) is located approximately 4.7km east of the proposed scheme. The SSSI supports a range of habitats associated with coastal dune systems including vegetated shingle, fixed and shifting dunes, saltmarshes and a number of protected species including the largest breeding colony of Little Tern *Sterna albifrons* in Wales, a population of Natterjack Toad *Bufo calamita*, and Sand Lizard *Lacerta agilis*. Several other SSSIs are located within 5km of the proposed scheme including Prestatyn Hillside SSSI, which is a limestone grassland and pavement, Graig Fawr SSSI which is a limestone hill with associated grasslands and heathlands, and Maes Hiraddug SSSI which is a neutral grassland, however, it is not considered that there is a pathway to impacts at these sites and they are not considered further in this assessment.

5.2.16 Species

5.2.17 Data obtained from Cofnod gave numerous results for protected species within the 5km search area surrounding the proposed development. Table 5-1 summarises the most recent (post 2000) and closest records for species that were scoped in as having the potential to be impacted by the works. The legislative protection they receive is also included.

Table 5-1: Relevant protected species records from Cofnod within 5km of study site

| Common Name | Scientific Name | Closest Distance to Site and record Date |
|----------------------|-------------------------------|--|
| <i>Birds</i> | | |
| Avocet | <i>Recurvirostra avosetta</i> | 1836m west 2011 |
| Black-tailed Godwit | <i>Limosa limosa</i> | 1300m east 2010 |
| Black Tern | <i>Chlidonias niger</i> | 3946m south-west 2011 |
| Cetti's Warbler | <i>Cettia cetti</i> | 1836m west 2013 |
| Common Scoter* | <i>Melanitta nigra</i> | 300m east 2008 |
| Garganey | <i>Anas querquedula</i> | 3220m west 2008 |
| Goldeneye | <i>Bucephala clangula</i> | 2484m south-west 2008 |
| Goshawk | <i>Accipiter gentilis</i> | 4393m south-east 2009 |
| Greylag Goose | <i>Anser anser</i> | 300m east 2008-2011 |
| Hoopoe | <i>Upupa epops</i> | 1836m west 2013 |
| Hobby | <i>Falco subbuteo</i> | 3912m south-west 2010-2013 |
| Leach's Petrel | <i>Oceanodroma leucorhoa</i> | 1836m west 2011 |
| Little Gull | <i>Hydrocoloeus minutus</i> | 2616m west 2013 |
| Little Ringed Plover | <i>Charadrius dubius</i> | 2484m west 2013 |
| Little Tern* | <i>Sternula albifrons</i> | 300m east 2005-2011 |
| Mediterranean Gull | <i>Larus melanocephalus</i> | 300m east 2005 |
| Merlin | <i>Falco columbarius</i> | 1836m west 2010 |
| Osprey | <i>Pandion haliaetus</i> | 4071m west 2013 |
| Peregrine | <i>Falco peregrinus</i> | 1836m west 2007 |
| Pintail | <i>Anas acuta</i> | 1992m south-west 2013 |
| Red Kite | <i>Milvus milvus</i> | 2484m west 2013 |
| Red-Throated Diver* | <i>Gavia stellata</i> | 2751m west 2007-2011 |
| Roseate Tern | <i>Sterna dougallii</i> | 1836m west 2013 |
| Ruff | <i>Calidris pugnax</i> | 1836m west 2011 |
| Scaup | <i>Aythya marila</i> | 300m east 2008 |
| Slavonian Grebe | <i>Podiceps auritus</i> | 3220m west 2008-2011 |

| Common Name | Scientific Name | Closest Distance to Site and record Date |
|--------------------------------|---|--|
| Spoonbill | <i>Platalea leucorodia</i> | 2484m west 2007 |
| Snow Bunting | <i>Plectrophenax nivalis</i> | 1992m west 2010 |
| Velvet Scoter | <i>Melanitta fusca</i> | 4071m west 2013 |
| Whimbrel | <i>Numerius phaeopus</i> | 300m east 2011-2013 |
| Whooper Swan | <i>Cygnus cygnus</i> | 2484m west 2007 |
| Wood Sandpiper | <i>Tringa glareola</i> | 3220m west 2005 |
| <i>Amphibians and Reptiles</i> | | |
| Common Lizard | <i>Zootoca vivipara</i> | 1.8km south 2014 |
| Smooth Newt | <i>Lissotriton vulgaris</i> | 1.3km south 2011 |
| Common Frog | <i>Rana temporaria</i> | 1.9km south 2001 |
| Sand Lizard | <i>Lacerta agilis</i> | 4.4km east 2008 |
| Great Crested Newt | <i>Triturus cristatus</i> | 1.4km south 2003 |
| <i>Invertebrates</i> | | |
| Silver-studded Blue | <i>Plebejus argus</i> (and subsp. <i>Caernensis</i>) | 4.4km south-east 2001 |

- 5.2.18 The desk-based assessment identified records of numerous Schedule 1 bird species within 5km of the site. There are numerous coastal bird species which have been recorded in the vicinity of the site including Roseate Tern, Little Tern, Black Tern, Black-headed Gull, Common Gull, Mediterranean Gull, Velvet Scoter, Garganey, and Pintail. There are also records for Red-throated Diver which is listed under Annex 1 of the Birds Directive and is part of the Liverpool Bay SPA designation.
- 5.2.19 The closest Little Tern or Common Tern nesting site is the Little Tern colony at Gronant Beach, located approximately 5km to the east of the proposed works. The Little Terns nest on a relatively small section of the shingle ridge on the beach in front of the dunes, rather than in the dunes themselves. They have very particular requirements about their nesting habitat, and as such, are vulnerable to even small changes in the structure and extent of the available shingle at Gronant. The Little Tern population at Gronant is one of the largest in the UK with 174 pairs recorded during the 2018 breeding season. The nesting site is carefully managed and a team of three wardens is employed each summer to best ensure the breeding success of the species.
- 5.2.20 There are also records of Schedule 5 Common Lizard present approximately 100m to the east of the works. There are also records of Schedule 5 Sand Lizard within 5km of the study site, however the closest record is located approximately 4km east of the study site where a reintroduction programme is ongoing.
- 5.2.21 Data obtained from Cofnod gave no results for non-native invasive species within the 5km search area surrounding the proposed development. The only fauna record returned was for Ruddy Shelduck *Tadorna ferruginea* within 5km of the site.
- 5.2.22 The site boundary is within 10km of nursery grounds³⁷ of the following fish species that are known to occasionally be associated with shallow (10m or less) nearshore waters³⁸: Herring *Clupea harengus*; Cod *Gadus morhua*; Sandeel *Ammodytidae*; Plaice *Pleuronectes platessa*; Sole *Solea solea*; Whiting *Merlangius merlangus*; Spotted ray *Raja montagui*;

³⁷ Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J. 2012. Spawning and nursery grounds of selected fish species in UK waters. Sci. Ser. Tech. Rep., Cefas, Lowestoft, 147: 56 pp.

³⁸ Ellis, J.R., Milligan, S., Readdy, L., South, A., Taylor, N., and Brown, M., (2010a) Mapping spawning and nursery areas of species to be considered in Marine Protected Areas (Marine Conservation Zones).

Thornback ray *Raja clavate*; Angler fish *Lophius piscatorius*. All these species are listed under Section 41 of the NERC Act.

- 5.2.23 Furthermore, the site boundary is within 10km of spawning grounds³⁹ of the following fish species that are known to occasionally be associated with shallow (10m or less) nearshore waters: Cod *Gadus morhua*; Mackerel *Scomber scombrus*; Sandeel *Ammodytidae*; Plaice *Pleuronectes platessa*; Sole *Solea solea*; Whiting *Merlangius merlangus*. All these species are listed under Section 41 of the NERC Act.
- 5.2.24 For the 2016 fishing season, a total of 388 Atlantic Salmon *Salmo salar* and 609 sea trout were caught from the Dee catchment, and 12 Atlantic salmon and 777 sea trout from the Clywd catchment⁴⁰; these species are listed under Section 41 of the NERC Act. Being diadromous and spending a proportion of their lives migrating through coastal waters between marine and freshwater environments, it is likely that individuals (adults migrating into freshwater and juvenile smolts migrating to sea) pass close to the site boundary during migration periods.
- 5.2.25 European eel *Anguilla anguilla* have been recorded in fish surveys undertaken since 2010 in tributaries of the Mersey, Dee, Clywd, Elwy and Conwy⁴¹. This species is listed under Section 41 of the NERC Act. Being diadromous and spending a proportion of their lives migrating through coastal waters between marine and freshwater environments, it is likely that individuals (adults migrating to sea and juvenile migrating into freshwater) pass close to the site boundary during migration periods.
- 5.2.26 Brook Lamprey *Lampetra planeri* and Sea Lamprey *Petromyzon marinus* have been recorded in fish surveys undertaken since 2010 in tributaries of the Clywd, Dee and Elwy⁴². Both species are listed under Section 41 of the NERC Act. As Sea Lamprey are anadromous, with adults spending a proportion of their life at sea parasitically feeding on other estuarine and marine fish species, it is possible that individuals may pass close to the site boundary⁴³.
- 5.2.27 Anecdotal evidence states that the following fish have been caught by rod and line off the beach at Rhyl: bass; mackerel; dogfish, codling, whiting, plaice⁴⁴.
- 5.2.28 Liverpool Bay supports various fish species of commercial importance including *Clupeidae* species such as herring *Clupea harengus* and sprat *Spratus spratus* which are known to have nursery grounds in the bay; other species such as plaice *Pleuronectes platessa* and sole *Solea solea* also use the bay for spawning and as a nursery area⁴⁵. Herring and sprat are amongst the most frequently recorded prey

³⁹ Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J. 2012. Spawning and nursery grounds of selected fish species in UK waters. Sci. Ser. Tech. Rep., Cefas, Lowestoft, 147: 56 pp.

⁴⁰ Environment Agency. 2017. Salmonid and Freshwater Fisheries Statistics for England and Wales, 2016 [online] Available at: <https://www.gov.uk/government/publications/salmonid-and-freshwater-fisheries-statistics> (Accessed 29th Sept 2018).

⁴¹ From Natural Resources Wales information. <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

⁴² From Natural Resources Wales information. <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

⁴³ Maitland PS (2003). *Ecology of the River, Brook and Sea Lamprey*. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

⁴⁴ Rhyl. Fishing in Wales, 2018 [viewed 29th Aug 2018]. Available from <http://fishingwales.net/rhyl/>.

⁴⁵ Natural England, Countryside Council for Wales. 2012. Liverpool Bay SPA Conservation Advice Package. [Online] Available at: <http://publications.naturalengland.org.uk/publication/3236717>. (Accessed 5th January 2016).

species of red-throated divers which is one of the primary reasons for the SPA designation, although this species is also considered to be an opportunistic feeder and can also feed on a broad range of fish species⁴⁶.

5.2.29 *Habitat Surveys*

5.2.30 A preliminary ecological walkover survey was carried out on the 30th September 2015, this was followed by a marine biotope survey carried out on the 24th March 2017, and latterly a benthic invertebrate survey carried out on the 20th June 2018, which, further identified the presence of the following habitats.

5.2.31 Intertidal Rock Habitat

5.2.32 Within the site of the proposed scheme there are numerous boulders along Splash Point which act as rock armour defences in front of the seawall at SJ 02106 82457. An intertidal biotope survey was carried out on the 20th June 2018 (included in Appendix E), this found that the majority of the existing rock armour consisted of the biotope LR.FLR.Eph.Ent Enteromorpha spp. on freshwater-influenced and/or unstable upper-eulittoral rock and was recorded along much of the existing sea wall and associated steps. The habitat is influenced by freshwater runoff and was dominated by a dense mat of Enteromorpha spp. No other species were recorded within this zone.

5.2.33 Towards the lower end of the existing rock defence wracks are present where larger boulders block some of the wave energy, these are predominantly Bladder Wrack *Fucus vesiculosus* and Spiral Wrack *Fucus spiralis*. Common Periwinkle *Littorina littorea* and Rough Periwinkle *Littorina saxatilis* were both recorded in low numbers along with Dog Whelk *Nucella lapillus*. Low numbers of Beadlet Anemone *Actinia equina* were recorded within damp areas between the cobbles.

5.2.34 Moderately exposed or vertical sheltered eulittoral rock, or structures in the form of groynes are present along the beach. These are characterised by characterised by dense barnacles *Semibalanus balanoides* and the non-native *Austrominius modestus* with occasional Common Limpet *Patella vulgata*. They also provide additional anchorage points for seaweeds such as Toothed Wrack *Fucus serratus*. It should be noted that anecdotal evidence suggests that the reef forming honeycomb worm *Sabellaria alveolata* has been recorded on one or more of the timber groynes present along the foreshore. This species was not recorded on the groynes during any of the surveys but was recorded towards the low tide mark in June 2018 as detailed below.

5.2.35 Two patches of moderately exposed eulittoral boulders and cobbles are present to the east and west of the proposed scheme upon the sand flat, containing marine invertebrates such as winkles, whelks, mussels, anemones, and seaweeds.

5.2.36 Intertidal Sand

5.2.37 Intertidal sand is an important habitat along the North Wales coastline and at low tide a large expanse of sand flat is exposed. This extensive area provides habitat for numerous invertebrates, bivalves and wading bird species. The benthic invertebrate survey carried out on 20th June 2018 identified low numbers of polychaete worms and amphipods. The foreshore in the area of the works is highly mobile and as a result supports few macrofaunal species with large areas consistent with the biotope

⁴⁶ Guse, N., Garthe, S. & Schirmeister, B. 2009. Diet of red-throated divers *Gavia stellata* reflects the seasonal availability of Atlantic herring *Clupea harengus* in the southwestern 34 Baltic sea. *Journal of Sea Research*, 62: 268-275.

LS.LSa.MoS - Barren or amphipod-dominated mobile sand shores. In a few more sheltered areas of the beach the biotope LS.LSa.FiSa - Polychaete/amphipod-dominated fine sand shores is present, however, the number of individuals recorded was low.

5.2.38 The sand also accommodates a strandline of decaying seaweeds with talitrid amphipods.

5.2.39 A mussel bed habitat is recorded on MAGIC, but this was not identified during the ecological surveys. It is possible that the mussel bed is ephemeral and therefore has the potential to return in the future.

5.2.40 Biogenic Reef

5.2.41 A small amount of *Sabellaria alveolata* was found at the low tide mark during the survey carried out in June 2018. This had not been recorded before and had begun to form on a small area of cobbles. At the time of the survey it was badly damaged by storm action and it is likely that any *Sabellaria* reef here will be ephemeral. The closest extent of the *Sabellaria* found during the survey was located approximately 150m north of the proposed works and was only uncovered by the tide for approximately 30 minutes.

5.2.42 Terrestrial Habitat

5.2.43 Amenity grassland is located within Rhyl Golf Club, just behind the sea wall defences approximately 300m east of the proposed site. This consists of species poor, intensively managed grassland. In addition, the Golf Club contains areas of scattered scrub. There is also a small marginal area between the golf course and the coastal path which contains a narrow strip of tall ruderal grassland with species such as tree mallow *Lavatera arborea*, curly-leaved dock *Rumex crispus* and teasel *Dipsacus fullonum* present.

5.2.44 There are numerous small areas of poor semi-improved grassland adjacent to the coastal path, which are species poor with perennial rye-grass *Lolium perenne* dominating. The areas were also noted to be heavily disturbed by dog-walkers.

5.2.45 An area of fixed dune grassland habitat is present to the east of proposed scheme, within Y Ffrith LWS. This area contains species typical of coastal dune systems and marram grass *Ammophila arenaria* in particular dominates with sand couch *Elytrigia juncea* and occasional mouse-ear hawkweed *Hieracium pilosella*. The dune system is fixed and is located above the strandline and is therefore cut off from the intertidal zone by the existing seawall defences and coastal path. This has resulted in a lack of deposition to the sand dune system. Grassland dune systems also support fauna such as reptile and amphibian species and some ground nesting birds. They also provide habitat for some nationally scarce invertebrate species.

5.2.46 There are areas of scattered scrub present within the grounds of Rhyl Golf Club and an area of dense scrub behind the fixed dune system located approximately 1.2km away from the proposed scheme. The areas of scrub recorded were all dominated by gorse *Ulex europaeus* and other species present included tree marrow, and traveller's joy *Clematis vitalba*.

5.2.47 *Species*

5.2.48 Wintering Birds

- 5.2.49 A wintering bird survey was carried out between October 2016 and April 2017 at the East Rhyl foreshore (provided in Appendix B). The survey programme consisted of 12 vantage point surveys undertaken during the main overwintering and migratory period (August to April inclusive). The foreshore at Rhyl was utilised predominantly by wading and gull species with a total of 36 species recorded during the survey. These were usually in low numbers and generally concentrated at the eastern extent of the study area, approximately 1000m from the proposed development. Peak numbers of birds were recorded on falling tides when the receding tide provided the best foraging opportunities. This was especially the case following storm surges when large numbers of food species such as starfish were revealed on the receding tide and heavily predated by gulls.
- 5.2.50 Flocks of 5 to 6 Common Scoter were recorded within 200m of the proposed works at high tide, foraging when the area was covered by water. Flocks of up to, and over, 1000 were recorded over 1000m offshore. Small numbers of red-throated diver were mostly recorded commuting past the site or occasionally foraging approximately 500m out to sea.
- 5.2.51 A total of 34 further species of wading, wildfowl and gull species were recorded during the survey with a number of these species forming part of the qualifying assemblage for which Liverpool Bay SPA is designated. A peak count of wader numbers was recorded on the 9th of December where approximately 500 Oystercatcher, 20 Sanderling, 70 Dunlin, 5 Curlew, 120 Redshank and 10 Turnstone were recorded over the survey area. These birds were subject to frequent disturbance from dogwalkers and were flushed into the air continually before settling on another part of the beach.
- 5.2.52 Use of the beach by large numbers of people exercising dogs or undertaking other leisure activities was recorded during the wintering bird surveys, this caused large amounts of temporary disturbance on the beach. In these events birds would be flushed from areas used for foraging or loafing but would generally fly less than 50m before re-settling.

5.2.53 Breeding Birds Species associated with SPA

- 5.2.54 The closest Little Tern or Common Tern nesting site is the Little Tern colony at Gronant Beach, located approximately 5km to the east of the proposed works. The Little Tern nests on a relatively small section of the shingle ridge on the beach in front of the dunes, rather than in the dunes themselves. They have very particular requirements about their nesting habitat, and as such, are vulnerable to even small changes in the structure and extent of the available shingle at Gronant.

5.2.55 Marine Invertebrates

- 5.2.56 The majority of the surveyed intertidal area consists of clean, medium to fine sand, with no coarse sand, gravel or mud present (includes the majority of the works area). It is considered likely that the sediments in this area support marine invertebrates and an assemblage of polychaetes and/or amphipod. Bivalves may also be present in varying numbers on the lower shore, and where sediments are stable. Marine invertebrates within the sediment are likely to be an important food source for wading birds.

5.2.57 Reptiles

- 5.2.58 No reptile species were observed during the preliminary ecological site walkover survey. However, the dune grassland provides both shelter and basking sites for reptiles, with records of common lizard present in this area. There are also records of sand lizard within 5km of the study site, however the closest record is located approximately 4km east of the proposed scheme site. The tall ruderal vegetation alongside the Golf Club and mosaic scrub habitats present to the east of the study area also provide potential for reptile species. The grassland habitat to the west of the site consists of amenity grassland and is considered sub-optimal for reptiles. This is the only area of grassland that has the potential to be impacted by the works, therefore, works are unlikely to impact upon reptiles and they are not considered further.

5.3 **Assessment Methodology**

- 5.3.1 The assessment of ecological impacts has been undertaken following current best practice provided by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016).
- 5.3.2 Ecological features include nature conservation sites, habitats, species assemblages/communities or populations or groups of species. The assessment of the significance of predicted impacts on ecological features is based on both the 'importance' of a feature and the nature and magnitude of the impact that the project will have on it. Impacts may be direct (e.g. the loss of species or habitats), or indirect (e.g. effects due to noise, dust or disturbance).
- 5.3.3 Impacts to a number of receptors were scoped in during the scoping stage based on the potential impacts of the construction of an offshore breakwater and beach recharge scheme (refer to section 3.2.6 and Appendix C). Partly because of the potential environmental impacts these options were removed from the scheme proposals as primary mitigation, and are therefore not assessed herein (refer to section 3.4.26).

5.3.4 *Important Ecological Features*

- 5.3.5 It is impractical for an assessment of the ecological impacts of a project to consider every ecological feature (species, habitat etc.) that may be affected; instead it should focus on those that are considered to be important. These are ecological features that are valued in some way and could be affected by the proposed project; other valued ecological features may occur on or in the vicinity of the proposed works area but do not need to be considered because there is no potential for them to be affected significantly.
- 5.3.6 Various characteristics contribute towards the importance of ecological features, for example, naturalness, rarity, diversity, and connectivity.
- 5.3.7 The importance of an ecological feature should be considered within a defined geographical context. For the purposes of this assessment the following frame of reference has been used:
- International and European
 - National
 - Regional/County
 - Local

- 5.3.8 Consideration of impacts at all scales is important, and essential if objectives for no net loss of biodiversity and maintenance of healthy ecosystems are to be achieved.
- 5.3.9 Ecological features have been valued using the scale set out in Table 5-2, with examples provided of criteria used when defining the level of importance.

Table 5-2: Examples of sites at various levels of importance

| Level of importance | Examples of Criteria |
|---------------------|---|
| International | An international important site e.g. SPA, SAC, Ramsar (or site considered worthy of such designation); A regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive) |
| National | A nationally designated site e.g. SSSI, or a site considered worthy of such a designation; a viable area of a habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; a regularly occurring substantial population of a nationally important species, e.g. listed on Schedules 5 & 8 of the Wildlife and Countryside Act 1987 (as amended); |
| Regional/County | Viable areas of S41 list or LBAP priority habitat, or smaller areas of such habitat which are essential to maintain the viability of a larger whole; A site designated as a non-statutory designated site e.g. Local Wildlife Site (LWS); A regularly occurring substantial population of a nationally scarce species, including species listed on the S41 list or local BAP |
| Local | Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration; A good example of a common or widespread habitat in the local area; Species of national or local importance, but which are only present very infrequently or in very low numbers within the site area. |

- 5.3.10 The approach of this assessment is to consider the value of the site for the species under consideration, rather than the nature conservation importance of the species itself. While the importance of the species present is taken into account, in order to assess nature conservation importance, the number of individuals of that species using the site, and the nature and level of this use, is also taken into account, and an assessment is made of the value of the site to that species.

5.3.11 *Legally Protected Species*

- 5.3.12 Notwithstanding what has been said above, there is also a need to identify all legally protected species that could be affected by the proposed works in order that measures can be taken to ensure that contravention of the legislation is avoided. Therefore, it is inappropriate to assess the significance of impacts within the context of species' legal protection, as impacts on such species must avoid contravention of the law, otherwise the scheme cannot go ahead.
- 5.3.13 Where a protected species is not considered to be an important ecological feature, for example Badger, which is protected for animal welfare reasons rather than nature conservation value, the measures that will be taken to ensure compliance with legislation are outlined within this chapter.

5.3.14 *Impact Assessment Process*

5.3.15 The impact assessment process involves:

- Identifying and characterising impacts;
- Incorporating measures to avoid and mitigate (reduce) these impacts;
- Assessing the significance of any residual effects after mitigation;
- Identifying appropriate compensation measures to offset residual effects; and
- Identifying opportunities for ecological enhancement

5.3.16 The assessment includes potential impacts (direct, indirect, secondary and cumulative) on each ecological feature determined as important from all phases of the project and describes in detail the impacts that are likely to be significant, making reference to the following characteristics:

- Positive or negative
- Extent
- Magnitude
- Duration
- Timing
- Frequency
- Reversibility

5.3.17 *Determining Ecologically Significant Effects*

5.3.18 For the purposes of this assessment, a significant effect is an effect that either supports or undermines biodiversity conservation objectives for important ecological features or for biodiversity in general (CIEEM, 2016). Effects can be considered significant at a wide range of scales from international to local.

5.3.19 Significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution). Table 5-3 details the factors that have been considered in the determination of significant effects on ecological features.

Table 5-3: Considerations of effects on different Ecological Features

| Ecological Feature | Consideration |
|--------------------|--|
| Designated Sites | Will the project undermine the site's conservation objectives? Will the project positively or negatively affect the conservation status of habitats or species for which the site is designated? Will the project have positive or negative effects on the condition of the site or its interest/qualifying features? Will the project remove or change any key characteristics? Will there be an effect on the nature, extent, structure and function of component habitats? Will there be an effect on the average population size and viability of component species? Will there be an impact on wider ecosystem functions and processes? |
| Habitats | Will the project positively or negatively affect the conservation status of the habitat? Will it affect its extent, structure and function as well as its distribution and its typical species within a given geographical area? |

| Ecological Feature | Consideration |
|--------------------|--|
| Species | Will the project positively or negatively affect the conservation? Ecological Feature Consideration status of the species? Will it affect its abundance and distribution within a given geographical area? |

5.3.20 *Precautionary Principle*

5.3.21 The evaluation of significant effects has been based on current scientific evidence and professional judgement. Where sufficient information is not available to allow a robustly justifiable conclusion of no significant effect, a significant effect is assumed and any uncertainty is acknowledged. The precautionary principle has been applied in this ecological impact assessment to ensure that there is coordination between EIA and the requirements for Habitat Regulations Assessment (HRA). A HRA Screening Assessment has been prepared and is provided in Appendix I. This considers the potential for Likely Significant Effects specific to the conservation objectives of European designated wildlife sites within 5km of the scheme proposals.

5.3.22 *Importance of receptors*

5.3.23 This section evaluates the nature conservation importance of the area of the works and its locality in terms of its relative importance in a geographical context.

5.3.24 The nature conservation sites, habitats and species that have been identified as important ecological features have been evaluated based on the criteria given in Table 5-2. The importance of the feature is defined with reference to the geographical context of the proposed works at East Rhyl.

5.3.25 Table 5-4 summarises the relative importance of the key ecological receptors identified in the baseline section.

Table 5-4: Importance of key ecological receptors identified within the 5km of the site

| Receptor | Importance |
|--|---------------|
| Liverpool Bay SPA | International |
| Dee Estuary SPA | International |
| Dee Estuary SAC | International |
| Dee Estuary Ramsar | International |
| Overwintering and migratory foraging birds | International |
| Common and Little Tern (breeding) | International |
| Gronant Dunes & Talacre Warren SSSI | National |
| Fish species listed under Section 41 of the NERC Act | National |
| <i>Sabellaria alveolata</i> | National |
| Intertidal habitats – Intertidal Mixed Sediments | Local |
| Intertidal habitats – Artificial rocky habitat | Local |
| Marine benthic invertebrates | Local |

5.4 Potential Impacts & Significant Effects

5.4.1 *Disturbance to bird species associated with European Protected Sites*

5.4.2 Bird species were not recorded in high densities in the area of the beach affected by the proposals during the overwintering bird surveys (Appendix I). Given that the majority of the works will be carried out at low tide (finishing three hours before and only commencing three hours after high tide), it is considered that there is ample alternative foraging and loafing habitat available nearby, without significantly affecting bird species using intertidal areas.

5.4.3 Common Scoter and Red-throated Diver were recorded during the surveys, but these species were generally seen to forage in open water at a minimum of 500m offshore or observed in flight, in low numbers. Any closer observations always coincided with peak high tide (between 50m and 500m offshore). The works will not take place within three hours of high tide and therefore this species will not be present during the works. Given the abundant adjacent habitat, there would be **No Significant Effect** from temporary disturbance to Common Scoter and Red-throated Diver.

5.4.4 The proposed construction works would partly be undertaken within the overwintering and migratory period for bird species associated with the Liverpool Bay SPA and Dee Estuary SPA qualifying assemblages. Species associated with the SPA were recorded within close proximity of the proposed works. There is therefore the potential to disturb these species. For this reason impacts to overwintering and migratory birds through noise and visual disturbance during the works were scoped in during the scoping stage so that impacts could be considered once detailed construction plans had been developed.

5.4.5 However as observed during the overwintering bird survey (Appendix I), overwintering and migratory wading and wildfowl species present at the site are well habituated to a significant level of disturbance, especially from exercising of free-running dogs on the beach. Given the availability of similar adjacent habitat, it is considered that the construction of the revetment would have **No Significant Effect** on the qualifying assemblage of the Liverpool SPA.

5.4.6 Chapter 4 concluded that the impact of new rock revetment on local tidal or sediment regimes would not be significant. As such there would be **No Significant Effect** from the existence of the coastal defences either short term or long term, direct or indirect, on the qualifying features of the Liverpool Bay SPA, Dee Estuary SPA, SAC and Ramsar (refer to the HRA Screening Report provided in Appendix I).

5.4.7 *Nesting Little Tern*

5.4.8 Concerns were raised in the EIA Scoping Opinion responses (Appendix D) that changes in coastal processes brought about by carrying out a beach recharge would have the potential to change the sediment regime to the shingle spit at Gronant Dunes & Talacre Warren SSSI where Little Tern nest. Although the beach recharge scheme no longer forms part of the proposals, consideration has been given to the impact of the proposals on coastal processes (provided in Chapter 4). The coastal processes assessment concluded that scale of the changes to coastal processes are too small scale to impact the wider tidal sub cell, and the longshore coastal processes operating are too weak to have any impact immediately beyond the immediate nearshore zone of the site. As such there would be **No Significant Effect** of the proposals on nesting little tern.

5.4.9 *Foraging Common and Little Tern*

- 5.4.10 The potential for increases in suspended sediments during the works to interfere with the ability of Little Tern and Common Tern to plunge dive for fish has been assessed. These species have been recorded foraging along the shoreline between Gronant Dunes and Rhyl in the area of the proposed works (DCC Ecology Officer, *Pers. Comm.*). However, as outlined in section 4.4.6 any increase in turbidity in the wider environment would not be significant as impacts would be restricted spatially to the immediate nearshore zone and temporarily to the tidal cycle. Given the extent of any impact would be localised, it is considered that this would have **No Significant Effect** on foraging tern species.
- 5.4.11 As noted above given that the majority of the works will be carried out at low tide (finishing three hours before and only commencing three hours after high tide), and there is ample alternative foraging and loafing habitat available near to the site, disturbance from the proposals would have **No Significant Effect** on foraging tern species.

5.4.12 *Fish species*

- 5.4.13 Although storage of rock on the foreshore during construction would make intertidal sand foraging habitat temporarily inaccessible to fish at high tide, the impact of this would be localised to the site extent and therefore negligible. The effect of storage of rock on the foreshore is assessed as **Not Significant**.
- 5.4.14 Fine sediment mobilisation has the potential to impact upon on fish species as a result of reduced foraging efficiency of visual predators and cause minor gill irritation. However, as outlined in section 4.4.6 any increase in turbidity in the wider environment would not be significant as impacts would be restricted spatially to the immediate nearshore zone and temporarily to the tidal cycle. Given the extent of any impact would be localised and negligible, it is considered that this would have **No Significant Effect** on fish. As such it is also highly unlikely these impacts would affect migration of any nationally important species and therefore the effects of this is also **Not Significant**.
- 5.4.15 As noted above given that the majority of the works will be carried out at low tide (finishing three hours before and only commencing three hours after high tide), and therefore the proposals would not cause any noise or vibration impacts to the marine environment. As such there would be **No Significant Effect** from noise or vibration on fish species.
- 5.4.16 As noted above Chapter 4 concluded that the impact of new rock revetment on local tidal or sediment regimes would not be significant. Similarly therefore there would be **No Significant Effect** from the existence of the proposed rock armour on fish species.

5.4.17 *Intertidal habitats*

- 5.4.18 Although not designated, intertidal habitats on the construction site are of value to a range of ecological species. There is the potential to damage intertidal habitats through pollution run-off and poor construction practices. However, the risk of this would be managed by implementing industry standard construction practices as detailed in the Construction Environmental Management Plan (provided in Appendix M). An Ecological Clerk of Works (ECoW) will be appointed to oversee this (refer to Chapter 10 for further information). It is therefore considered that there would be **No Significant Effect** on

intertidal habitats from pollution. Similarly the risk of pollution from construction activities impacting on fish species would be **Not Significant**.

- 5.4.19 Approximately 2ha of intertidal habitat will be excavated during the works to accommodate the toe of the rock revetment. In addition, disturbance from the movement of heavy construction vehicles would take place on the wider construction site, resulting in approximately 7 ha of temporary disturbance to intertidal habitat. This will result in the loss of any benthic invertebrate species within this footprint. Although not protected, benthic marine invertebrates are considered a valuable food source to other ecological species. Benthic invertebrate surveys carried out in this area demonstrated that it is particularly impoverished with only two amphipods being found within the footprint of the works (Appendix I). However given the abundance of adjacent similar habitat, it is considered likely that recruitment of similar species would be rapid were the conditions on the site more favourable for these species. It is therefore considered that the temporary disturbance to this habitat would be **Not Significant**.
- 5.4.20 *Sabellaria alveolata* was identified during the benthic marine invertebrates survey (Appendix I) as colonising exposed boulders and cobbles in and round the low tide mark approximately 300m to the north of the development site. The coastal processes assessment (provided in Chapter 4) concluded that any increased availability of beach material during construction would have no significant effect on the sediment regime and near shore turbidity. It should also be noted that *Sabellaria alveolata* is tolerant to burial under sand for up to several weeks but feeding and growth is curtailed. Depending on timing this may interfere with reproduction but recoverability is almost immediate (Wilson, 1971)⁴⁷. It is therefore considered that any impacts on *Sabellaria alveolata* from changes to the sediment regime and near shore turbidity during construction on the beach would have **No Significant Effect**.
- 5.4.21 Similarly the benthic marine survey identified a number other species of polychaete worms towards the low tide mark, although the number of individuals was low. Again, given the abundance of adjacent similar habitat, it is considered likely that recruitment of similar species would be rapid were the conditions more favourable. It is therefore considered that the temporary disturbance to this habitat would be **Not Significant**.
- 5.4.22 The works would result in the permanent loss of 1.7 ha of intertidal sediment habitats within the footprint of the rock revetment. Given the impoverished nature of this habitat in this area and the abundant similar habitat locally the small-scale loss of this habitat would be **Not Significant**.

5.4.23 *Non-native Invasive Species*

There is potential for construction works involving the use of materials, vehicles or equipment that have been used on other sites to increase the risk of introducing invasive non-native species to the development site. However, the risk of this occurring is considered negligible as only managed areas (hard surfacing, amenity grassland etc) would be used for these purposes, and, as all construction materials and vehicles/equipment would be brought from land, only terrestrial sources of invasive non-native species (INNS) are considered possible. Industry standard measures to ensure non-native invasive species are not brought to the site during construction are set out in the Construction Environmental Management Plan (provided in Appendix M).

⁴⁷ Wilson, D.P., 1971. *Sabellaria* colonies at Duckpool, North Cornwall 1961 - 1970 Journal of the Marine Biological Association of the United Kingdom, 54,

The potential to contribute to the spread of the invasive barnacle *Austrominius modestus*, which has been identified on some of the timber groynes within the site area, will be managed by storing any timber groynes that are removed above the high-water mark. It is therefore considered that there would be **No Significant Effect** from non-native invasive species.

5.4.24 Table 5-5 below summarises the impacts on ecological features of the proposals.

Table 5-5: Summary of impacts on ecological features

| Ecological Feature | Potential Impact | Significance of effect |
|-------------------------------------|--|---|
| Liverpool Bay SPA | Non-physical disturbance to Red-throated Diver and Common Scoter | No significant negative effect on conservation status of the site |
| | Non-physical disturbance to overwintering and migratory bird species | No significant negative effect on conservation status of the site |
| | Impact of localised turbidity on foraging Common and Little Tern | No significant negative effect on conservation status of the site |
| | Non-physical disturbance to foraging Common and Little Tern | No significant negative effect on conservation status of the site |
| | Impact of changes to local tidal or sediment regimes from the existence of the coastal defences on qualifying features of the SPA designation | No significant negative effect on conservation status of the site |
| Dee Estuary SPA | Non-physical disturbance to overwintering and migratory bird species | No significant negative effect on conservation status of the site |
| | Impact of changes to local tidal or sediment regimes on from the existence of the coastal defences qualifying features of the SPA designation | No significant negative effect on conservation status of the site |
| Dee Estuary SAC | Impact of changes to local tidal or sediment regimes from the existence of the coastal defences on qualifying features of the SAC designation | No significant negative effect on conservation status of the site |
| | Risk of direct damage to qualifying features of the SAC designation as a result of pollution during construction | No significant negative effect on conservation status of the site |
| Dee Estuary Ramsar | Impact of changes to local tidal or sediment regimes on qualifying features from the existence of the coastal defences of the Ramsar designation | No significant negative effect on conservation status of the site |
| | Risk of direct damage to qualifying features of the Ramsar designation as a result of pollution during construction | No significant negative effect on conservation status of the site |
| Gronant Dunes & Talacre Warren SSSI | Impact to nesting Little Tern from changes to coastal processes | No significant negative effect on conservation status of the site |

| Ecological Feature | Potential Impact | Significance of effect |
|---|---|---|
| Fish species | Reduced access to intertidal sand foraging habitat at high tide arising from storage of rock armour on the beach | No significant effect on fish of national or local importance |
| | Impact of localised turbidity on foraging fish | No significant effect on fish of national or local importance |
| | Impact of localised turbidity on migratory fish | No significant effect on fish of national or local importance |
| | Risk of direct damage to fish species as a result of pollution during construction | No significant effect on fish of national or local importance |
| | Direct damage to fish species from noise or vibration | No significant effect on fish of national or local importance |
| | Impact of changes to local tidal or sediment regimes from the existence of the coastal defences on fish species | No significant effect on fish of national or local importance |
| Intertidal habitats | Risk of direct damage to non-designated intertidal habitats as a result of pollution during construction | No significant negative effect on intertidal habitats. |
| | Direct loss of habitat through the placement of rock armour onto intertidal habitats | No significant negative effect on intertidal habitats |
| | Impact from changes to the sediment regime and near shore turbidity on <i>Sabellaria alveolata</i> | No significant effect on <i>Sabellaria alveolata</i> |
| | Impact from changes to the sediment regime and near shore turbidity on other polychaete worms | No significant effect on <i>Sabellaria alveolata</i> |
| | Impact of changes to local tidal or sediment regimes from the permanent loss of 1.7 ha of intertidal habitats | No significant negative effect on intertidal habitats. |
| Introduction/spread of non-native invasive species. | Risk of contributing to the spread of INNS including the invasive barnacle <i>Austrominius modestus</i> which has been identified on some of the timber groynes | No significant negative effect from INNS |

5.5 Mitigation Measures

5.5.1 Although the ecological impact assessment has not identified likely significant effects on ecological features of value, appropriate mitigation measures would be implemented to reduce the risk to and ensure that habitats within proximity of the works are not degraded as a result of pollution events during the construction phase. Mitigation would include:

- Abiding by relevant pollution prevention measures e.g. CIRIA Guidance: Control of water pollution from construction sites. Guidance for consultants and contractors (C532D) (Masters-Williams, 2001). Information useful for Toolbox Talks on working near water and pollution prevention can be found at: https://www.ciria.org/Resources/All_toolbox_talks/Env_toolbox_talks/Working_on_or_near_watercourses.aspx [site accessed: 4/1/17].

- Any chemical, fuel and oil stores should be located on impervious bases within a secured bund with a storage capacity 110% of the stored volume. Biodegradable oils and fuels should be used where possible. Drip trays should be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery should be carried out on an impermeable surface in one designated area well away from any watercourse or drainage (at least 10m).
- Emergency spill kits should be available on site and staff trained in their use.
- Operators should check their vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages should be reported immediately.
- Daily checks should be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded. Any items of plant machinery found to be defective should be removed from site immediately or positioned in a place of safety until such time that it can be removed.
- The application of good practice construction methodology, through the implementation of a CEMP to control the use and storage of potentially contaminating materials and litter, will further avoid any likely significant effects on coastal habitats during the construction phase.
- An Ecological Clerk of Works (ECoW) will be appointed to oversee this.
- The area of the works should be clearly demarcated in order to minimise disturbance to intertidal habitats.

5.5.2 All works requiring beach access will be conducted at low tide only (refer to the Construction Strategy provided in Appendix G). Revetment works will be undertaken in sections up to a maximum of 40m length, limiting the amount of excavated material and stockpiled rock armour, thereby limiting the sediment entrainment offshore and access to intertidal sand foraging habitats.

5.5.3 Formwork will be appropriately designed to ensure stability under the load from the proposed poured layer volumes, thereby reducing the risk of catastrophic failure and pollution incident. Risk of effects from pollution incidents will also be mitigated by storage of fuels/chemicals remote from waterbodies and implementation of an Environmental Incident Response Plan briefed to site staff.

5.5.4 Construction traffic routes on the beach will be periodically assessed and beach levels reinstated using any excess excavated material won. The beach profile will be returned to its pre-construction condition upon completion of the works (i.e. levelling of haul routes, removal of plant and equipment etc). This would reduce the risk of changes in habitat distribution / extents post construction.

5.6 Residual Effects

5.6.1 **No likely significant effects** on features of ecological value directly or indirectly are predicted as a result of the development proposals.

The construction works would result in the direct loss of intertidal sediment habitat. This habitat will be replaced by the new rock armour that will be placed within the footprint. During construction opportunities should be identified wherever possible to enhance the rocky shore habitat to maximise opportunities for native ecological species to colonise. Given that this habitat is unlikely to provide suitable habitat for marine benthic invertebrates due to the highly mobile nature of the substrate, it is not

considered that the small-scale loss of this habitat will have a significant impact upon the overall conservation objectives for the habitat or species associated with it.

6 Landscape and Visual Impact

6.1 Introduction

6.1.1 This section presents the Landscape and Visual Impact Assessment (LVIA) for the proposed scheme. The LVIA aims to assess the effects of the proposal on the landscape character and visual amenity. The assessment has involved the following key stages:

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

6.1.2 The process is supported by the use of viewpoints to illustrate and evaluate effects at key sites relevant to the proposal, but the assessment of effects is not confined to these viewpoints. The LVIA also includes a review of planning and other policy relevant to landscape and visual considerations in the area, which has helped inform the scope of the study and the assessments.

6.1.3 *Legislative & Planning Policy Context*

6.1.4 Planning Policy Wales

6.1.5 Planning Policy Wales (PPW) details the land use planning policies for Wales and is supported by Technical Advice Notes (TAN). It translates the Welsh Government's commitment to sustainable development into the planning system and notes that "The planning system manages the development and use of land in the public interest, contributing to improving the economic, social, environmental and cultural well-being of Wales...it should reconcile the needs of development and conservation, securing economy, efficiency and amenity in the use of land and protecting natural resources and the historic environment".

6.1.6 Chapter 5 outlines the objectives for the natural heritage of Wales which is not confined to statutorily designated sites but extend across all of Wales – to urban areas, the countryside and the coast. Paragraph 5.6.3, Managing the coast, states that Areas subject to constraints or considered unsuitable for development may include those where conservation or enhancement of the natural and historic environment requires development to be limited, where visual intrusion will need carefully to be considered and where there may be risks of erosion, flooding or land instability. In other areas the economic potential of the coast may be unlocked in a sustainable manner.

6.1.7 The key principles of the Landscape and Biodiversity policies contained within PPW 9 remain in the draft PPW 10 (issued for consultation in early 2018)

6.1.8 Technical Advice Note 14: Coastal Planning (1988)

6.1.9 It also notes that for land-use planning purposes the seaward limit of the coastal zone is generally mean low water mark, but between high and low water mark the planning system usually needs to operate in tandem with a range of sectoral controls over coastal and marine development.

6.1.10 Denbighshire County Council Local Development Plan

6.1.11 A number of policies have been 'saved' and continue to form the Local Development Plan, until they are replaced by the emerging New Local Plan in 2021. The Proposals Map is included within the report. The saved policies of relevance to the proposed development includes Policy RD1 - Sustainable development and good standard design, which states:

'Development proposals will be supported within development boundaries provided that all the following criteria are met:

- Respects the site and surroundings in terms of the siting, layout, scale, form, character, design, materials, aspect, micro-climate and intensity of use of land/buildings and spaces around and between buildings;*
- Protects and where possible enhances the local natural and historic environment;*
- Does not unacceptably affect prominent public views into, out of, or across any settlement or area of open countryside;*
- Incorporates existing landscape or other features, takes account of site contours and changes in levels and prominent skylines;*
- Does not unacceptably affect the amenity of local residents, other land and property users or characteristics of the locality by virtue of increased activity, disturbance, noise, dust, fumes, litter, drainage, light pollution etc., and provides satisfactory amenity standards itself...*
- Incorporates suitable landscaping measures, including where appropriate hard and soft landscaping treatment, the creation and/or protection of green and blue corridors, mature landscaping, and arrangements for subsequent maintenance. Landscaping should create a visually pleasant, sustainable and biodiversity rich environment that protects and enhances existing landscape features and also creates new features and areas of open space that reflect local character and sense of place'.*

6.1.12 Policy BSC 11 – Recreation and Open Space, which states:

- 'Existing recreation, public open space, allotments and amenity greenspace will be protected and where possible enhanced.'*

6.1.13 Draft Welsh National Marine Plan

6.1.14 Policy SOC 02: Well-being of coastal communities' states that proposals that contribute to the well-being of coastal communities are encouraged observing that the right development in the right place may aid adaptation or provide a regenerative boost. Policy SOC 07: Seascapes requires proposals to demonstrate how potential impacts on seascapes have been taken into consideration at an early stage and should, in order of preference:

- a. *avoid adverse impacts on seascapes; and/or*
- b. *minimise impacts where they cannot be avoided; and/or*
- c. *mitigate impacts where they cannot be minimised.*

6.1.15 If significant adverse impacts cannot be adequately addressed, proposals should present a clear and convincing justification for proceeding. Opportunities to enhance seascapes are encouraged. In the context of the plan, landscapes within coastal and marine areas are known as 'seascapes' and include '*landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and*

archaeological links with each other'

6.2 Baseline Conditions

6.2.1 The landscape character of the area under consideration can be assessed at a variety of different scales, from national to site-based. Desk-based and site-based studies considering these differing scales are outlined below. A number of existing published studies relate to the area under consideration and provide a basis for the assessment of the landscape character and impacts.

6.2.2 *National Landscape Character Areas (NLCA)*

6.2.3 Wales has been divided into 48 National Landscape Character Areas (NLCAs) with descriptive profiles for the individual character areas, highlighting what distinguishes one from another similar landscape character. Each NLCA is accompanied by a character description explaining the influences and features which determine the character of the area.

6.2.4 The site lies within NLCA 8, North Wales Coast. The key characteristics of the area which are considered relevant to the proposals are as follows:

- The mouth of the Vale of Clwyd – a broad flat coastal plain centred on Rhyl, including the small estuary of the River Clwyd, including a network of medium scale pastoral fields of regular pattern, with ditches and, to a lesser extent mixed, managed hedgerow, and occasionally interspersed with small stands of mixed farm woodland.
- A generally man-made coastal edge – promenades, sea walls, groynes, rock armour and other forms of protecting the coastal edge run for most of the length of the coastline.
- Seaside resort towns - urban development and arterial road and railway routes along coast, constricted in places by topography and rising hills. Much 19th century development with more recent suburbia. Some caravan parks and holiday camps between Llanddulas to Prestatyn coalesce settlements.

6.2.5 NLCAs are high-level, strategic assessments which cover a comparatively wide area. They would not normally be assessed in relation to a proposal of this scale and it is considered unlikely that the proposed development will have an influence on landscape character at this level. The study therefore focuses on the local character assessment described below.

6.2.6 *Local Landscape Character: LANDMAP*

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

6.2.8 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. Adjacent to the town of Prestatyn and Rhyl, it is a mostly naturally occurring coastal beach with a significant stretch of visually imposing sea wall, necessary for sea defence. There are attractive views looking out at large open expanses of often tempestuous seas. 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. Prestatyn and Rhyl are two distinct settlement centres, with Prestatyn maintaining much of its original small coastal town character with a fine display of stone fronted buildings and less developed tourist influenced atmosphere. 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 ships. The area includes the Fforyd Harbour and Marina at Rhyl and further downstream it is crossed by the Fforyd 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.

6.2.9 Historic:

- *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, Victorian and Edwardian. The area currently faces economic and cultural challenges and is vulnerable to further decline and sudden local social change.

6.2.10 Marine Character Areas (MCAs)

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

6.2.12 Rhyl is part of Marine Character Area Colwyn Bay and Rhyl Flats. Key characteristics relevant to the site are as follows:

- Low lying coastline backed by coastal levels associated with the broad mouth of the Vale of Clwyd to the eastern half of the area.
- Long sandy beaches and shingle storm beaches. All the soft coastline is protected by various coastal defences including groynes, rock armour, beach recharging, walls and traditional promenades.
- Extensive marine sediments of sand and gravel extending from the neighbouring Dee Estuary MCA and forming long, linear sandbanks running roughly parallel to the shore.
- Developed coastline with many seaside resort towns, notably Llandudno (and pier), Colwyn Bay (and pier), Rhyl and Prestatyn, the latter having many caravan

and chalet parks on their fringe. The coast serves as a traditional holiday destination.

- A popular cycleway runs the length of the coastline. Collectively, the A55, A548 and main Holyhead to Chester railway line follow close to the coastline.
- Rhyl Flats Offshore Wind Farm forms a dominating offshore feature. The moving turbines are supplemented by further turbines beyond (in MCA 29).

6.2.13 The assessment also states that the extensive coastal defences form a protective barrier to the coast that in the case of Rhyl provides a visual separation between the foreshore and the development behind. The presence of tall structures which are visible from the sea over the top of coastal defences is noted, including aerial masts, and Rhyl's iconic 240 feet high Sky Tower.

6.2.14 The seasonality of the coastline, the contrast between the busy summer season and the relatively empty beaches of the winter months, is highlighted.

6.2.15 *Landscape Designations, Landscape Policies and Heritage Designations*

6.2.16 The Clwydian Range and Dee Valley AONB is located more than 3km south-east of the development site. Given the distance from the site and the built-up area surrounding most of the site, is not considered to have an effect on the character or views to or from this landscape designation. The effect on the AONB is therefore not considered further. Areas that are covered by landscape policies are present to the eastern end of the site and are shown on the Landscape Designations drawing. These policies are as follows:

- Policy RD 2 – Green Barriers exists to “reinforce the separation of neighbouring settlements, and to preserve the character of historic towns”.
- Policy BSC11 – Recreation and Open Space exists to protect public open space from development which would result in a loss of land recreation or amenity value.

6.2.17 Impacts on the views and setting of designated cultural heritage assets including Listed Buildings, Scheduled Monuments, Registered Parks and Gardens and Conservation Areas are covered within a separate Archaeological Desk Based Assessment. This report is not an assessment of effects on designated or non-designated heritage assets. It also does not include an assessment of the significance of such assets. However, these designations may inform landscape and visual sensitivity. The presence or otherwise of designations described below is noted where appropriate in the assessment of landscape and visual impacts elsewhere in this report. The development site itself is not within or directly adjacent to any Conservation Areas, however there are a few located in surrounding areas.

6.2.18 *Rhyl Central Conservation Area* is situated slightly west from the centre of the modern settlement of Rhyl. Located around a small headland in the direction of the River Clwyd from the development site, at around 1.3km to the south-west. It covers an area of approximately 17ha and includes Parish Church of St Thomas 1861 (grade II*), as well as other listed buildings and historic areas. There are no views of the development site from the conservation area. The effect of the scheme on the Conservation Area is therefore not considered further.

6.2.19 The nearest Listed Building is Royal Alexandra Hospital which lies adjacent to the site. Impacts on the setting of this receptor is considered further in Chapter 7 Cultural Heritage. Other nearby listed buildings include the War Memorial (0.3km west) and

Lookout tower in Boundary Wall (0.3km west). The nearest Scheduled Monuments are Prestatyn Roman Site (3.4km east), Rhuddlan Town Banks 3.8km Dysert Castle (4.0km east). Due to the intervening distance and the scale of the development within the wider view, the effect of the scheme on the setting of these sites is not considered further.

6.2.20 *Visual Impact Baseline*

- 6.2.21 This section provides a description of the baseline conditions for the key visual receptors identified, along with an assessment of the potential effects of the proposed development. Where visual receptors are expected to have "effects judged unlikely to occur or so insignificant that it is not essential to consider them further" (GLVIA3), these are 'scoped out' of the assessment with reasons given.
- 6.2.22 The proposed development is located in the intertidal area to the immediate north of the existing seawall that runs in an east-west orientation along the coastline of Rhyl. The area is currently accessible to the public although only during low tide. The site consists of wide sandy beach set several metres below the seafront. Some areas of the beach around Splash Point already have stretches of rock armour to the seawall.
- 6.2.23 The proposed development site is visually contained at beach level, during low tide, with minimum visual intrusion from the promenade and revetment. There is no existing vegetation that may further filter the views to the east and naturally no vegetation along the shoreline. The most open views are from the beach itself, at low tide, looking west towards the main seafront at Rhyl or looking east towards Ffrith. Open views are experienced from the promenade adjacent to and looking over Rhyl Golf Links to the south and east. Marine Drive/East Parade also provides a long vista towards Rhyl town centre. Views into the town to the south are generally limited by the settlement edge although some can be gained down residential streets such as Tynewydd Rd and Molineaux Road.
- 6.2.24 No Zones of Theoretical Visibility (ZTVs) were carried out as part of this LVA as the extent of the proposed works are anticipated to be localised to the beach and adjacent areas. Views from further afield are deemed to be too distant to appreciate the change.
- 6.2.25 Visual receptors are people that may experience views of the landscape. These may include residents and visitors to settlements, roads, footpaths, promoted routes, visitor facilities or particular viewpoints. Desktop and site studies have been used to identify the key visual receptors likely to be affected by the proposal, to include the following:
- Public Rights of Way and other recreational receptors
 - Roads
 - Residential, individual properties and settlements
- 6.2.26 Observations made during the site visit coupled with the localised topography immediately around the proposed development site suggest it is highly unlikely any notable visual effects would occur outside the immediate vicinity of the site.
- #### 6.2.27 *Recreational receptors and Public Rights of Way (PRoW)*
- 6.2.28 *Rhyl East Beach:* This is a locally valued with likely users including locals and visitors, but the beach is not a designated landscape and is unlikely to be as well used as the beach adjacent to Rhyl's main seafront. The value is considered medium. The existing imposing concrete sea defences and perpendicular timber groynes already strongly

inform the character of the beach, therefore it is considered that the susceptibility is low and sensitivity is medium. Views from the beach along the coast and out to sea are panoramic and very wide ranging. Views inland are limited by the seawall.

- 6.2.29 *The Wales Coast Path*: This is an 882-mile long-distance footpath from Chepstow, Monmouthshire, all the way around the coast of Wales, including the Isle of Anglesey, finishing at Chester, Cheshire, England. It passes directly through the site, along the promenade, following an east-west route and diverting around Splash Point.
- 6.2.30 National Cycle Network Route 5: This long-distance route runs for 372 miles and connects Reading and Holyhead via Oxford, Stratford-upon-Avon, Bromsgrove Birmingham, Stoke-on-Trent, Chester, Colwyn Bay and Bangor. Where it passes through Rhyl it follows the same route as the Wales Coast Path. Sensitivity is considered to be medium.
- 6.2.31 Public Rights of Way within the locality of the site are limited. There are five footpaths within 2km of the site. These are located to the east of the site beyond Rhyll Golf Links, clustered around the western end of Victoria Road West. The nearest footpath is 0.7km from the edge of the site. It is considered that the sensitivity is medium.
- 6.2.32 *Rhyl Golf Links*: The golf course lies adjacent to the south of the site.
- 6.2.33 *Road and rail routes*
- 6.2.34 Rhyl is served by a railway station on the Crewe to Holyhead North Wales Coast Line. At its closest the railway runs within 0.5km of the site. Due to the low-lying nature of the topography and the presence of an uninterrupted band of development between the track and the site, visual effects are not anticipated by passengers and occupants of vehicles.
- 6.2.35 The local transport network comprises a mixture of primary and secondary roads that run through Rhyl and link it to other nearby settlements. A grid pattern of largely residential streets lies adjacent to the south. The western half of the site is bounded to the south by Marine Drive and East Parade and a number of short perpendicular residential streets.
- 6.2.36 Towards the eastern end of the site, several residential streets, Tynewydd Road, Molineaux Road and Garford Road, run north to south and terminate at the southern boundary.

6.3 Assessment Methodology

6.3.1 Selection of viewpoints

- 6.3.2 Potential viewpoints have been selected through desk and field-based research (Table 6-1). Seven of these views are represented as part of this report with descriptions and illustrated extents of the development as Figure 3a to g in Appendix C to the LVIA report provided in Appendix J of the ES,.

Table 6-1 Description of viewpoints selected for appraisal

| Name of viewpoint | Distance and direction from the proposed development | Reason | Viewpoint and figure number |
|--|--|---|------------------------------------|
| 1: Marine Drive Viewing Platform | VP is within site boundary. Proposals will affect beach immediately to the north, east and west. | Specific Viewpoint – View is from a prominent viewing area with seating, with panoramic views over the beach to the east and west. | Viewpoint 1 – Figure 3a |
| 2: Molineaux Road | Immediately to south of site boundary. 0.01Km from site boundary. | Representative Viewpoint – representative of views from residences along north end of Molineaux Road, north side of Eaton Road and east end of Hilton Drive. | Viewpoint 2 – Figure 3b |
| 3: Coast Path by Splash Point Apartments | VP is within site boundary. Proposals will affect seawall and beach immediately to the north, east and west. | Representative Viewpoint – representative of views gained by walkers along Wales coast path and by residents at Splash Point Apartments | Viewpoint 3 – Figure 3c |
| 4: Beach near to third groyne | Within site boundary. Rock revetment would be constructed nearby to the south. | Representative viewpoint – representative of views gained by visitors to the beach from the beach looking towards the seawall | Viewpoint 4 – Figure 3d |
| 5: Coast path by beach access ramp | Within site boundary. Changes to path and seawall would occur at this location. | Representative viewpoint – Representative of views gained by visitors at the beach access point and walkers along the section of coast path to the east of site | Viewpoint 5 – Figure 3e |
| 6: Rhyl Coast Road nr golf course | 0.4km south-east of proposals | Viewpoint – Showing visibility from close to key recreational receptor and illustrative of general lack of visibility of proposals from landward side. | Viewpoint 6 – Figure 3f |
| 7: Coast path by Pavillion Theatre | Within site near western boundary | Representative viewpoint – Representative of views gained by walkers along a section of the Coastal path from the west adjacent to main site compound. | Viewpoint 7 – Figure 3g |

6.3.3 A detailed Landscape and Visual Impact Methodology is provided in the LVIA report in Appendix J.

6.4 Potential Impacts & Significant Effects

6.4.1 The proposed changes to the landscape have been outlined in Section 6.2. These changes have the potential to impact the landscape fabric through the introduction of large rocks onto the beach and against the existing sea defence, and a change in height and alignment of the seawall. The placement of rock armour onto the beach will increase the overall extent of the sea defences and result in a loss of accessible beach area. The imposing stepped concrete seawalls will be largely covered by the rock armour. There will be a visible change from an extensive engineered manmade structure to one composed largely of natural rock material (refer to the representative viewpoints 3 and 4 provided in Figures 3c and d in the LVIA report Appendix C).

- 6.4.2 The new site character will be in the context of a sandy beach with existing large sea-defences and timber groynes within a wider built up context, noted in the local landscape character assessments. Susceptibility is considered to be low. Value is considered to be medium to account for the amenity and recreational value of the beach and seafront. Overall, sensitivity is considered to be medium.
- 6.4.3 Due to the localised topography and the height of the seawall and adjacent path, the influence of the development on the surrounding landscape is limited.
- 6.4.4 Greater effects on landscape character will occur during construction due to the presence of plant, vehicular traffic, material stockpiling and other associated activities. Access onto the site area which includes a substantial area of beach will be restricted during work hours, although connectivity between the promenade and lower areas of beach will be maintained by access points. The setting of the Royal Alexandra Hospital will be affected during construction by the presence of the main construction compound. The effect on landscape character is considered to be temporary **moderate** during construction and localised to the beach, seafront and immediate surroundings (Viewpoint 7 provided in Figure 3g in the LVIA report).
- 6.4.5 Landscape effects arise through the permanent change in the scale of and removal or change in landscape features. The proposals will represent a discernible but largely minor change in the qualities and characteristics of the site. The intertidal nature of the site means that changes will be most apparent at low tide. The magnitude of change is medium at a local scale, decreasing rapidly with distance (limited to around 0.5km of the site and often much less due to screening by built up areas).
- 6.4.6 Overall, the effect of the completed scheme on local landscape character is considered to be **slight** adverse.
- 6.4.7 *Landscape Policies*
- 6.4.8 *Policy RD 2 – Green Barriers* As the proposals will not have an impact on the openness of this designation it is considered that the impact will be **negligible**.
- 6.4.9 *Policy BSC11 - Recreation and Open Space* There are likely to be short-medium term impacts from closure of the promenade affecting access to the northern edge of the designation. Alternative access will be available to the southern boundary as well as across the site and normal functioning of the majority of the site will be maintained. In the long-term proposals will not reduce the extent or negatively affect the function of this designation. Views from the designation may be subject to minor changes. Overall the impact is considered to be **moderate** in the short term and medium term and **slight** adverse at most in the long-term.
- 6.4.10 *Recreational Receptors and Public Rights of Way (PRoW)*
- 6.4.11 The presence of construction operations on Rhyl East beach will result in restricted access during working hours. There will be an effect during construction from the presence of plant, vehicular traffic and material stockpiling and other associated activities. The hours of construction will however be limited due to tides and so will the visibility of stockpiled materials. During operation the proposals will represent a medium change from a concrete seawall to a bank of rock armour. Views along the coast will be affected to a lesser degree and views out to sea will be not be affected. The visual effect is considered to be **moderate** adverse during construction and **slight/ moderate** adverse during operation (Viewpoint 6 provided in Figure 3f in the

LVIA report).

- 6.4.12 From the Wales Coast Path, the development will be more visible at low tide although some of the rock armour is likely to be visible at high tide when the sea state is calm. Users will be slow moving through this section of footpath and will experience sequential views of the proposals. Locally, during operation, the magnitude of change is considered to be low due to variable visibility linked to the tide times as well as the relatively small extent of the route from which views are experienced. Effects during construction will be caused through construction access and operations leading to temporary diversion of the route along the promenade. Hoarding to construction boundaries may screen views of the beach in the short- term. Overall the effect during construction is **moderate** adverse. The effect during operation is considered to be **slight/ moderate** adverse although localised.
- 6.4.13 Effects upon National Cycle Network Route 5 will be largely temporary to medium-term at most. In the short- term the magnitude of change will be medium due to diversions of routes away from the seafront and presence of construction works. Overall the effect during construction is **moderate** adverse. The effect during operation is **slight/moderate** adverse although localised.
- 6.4.14 The replacement seawall parapet will be visible from some parts of footpaths in the area, but due to distance this will be a barely imperceptible change from the existing structure. The most extensive elements of the interventions will be hidden by landform. The effect on PRow therefore is considered to be **slight** adverse.
- 6.4.15 The golf course lies adjacent to the south of the site. The proposals represent a minor change in the views through changes to the seawall and coastal path to the west which will both be raised and slightly changed in alignment. Views of the beach and the majority of the proposals will not be a visible due to landform and the seawall. The course is located in a relatively built up area and is not reliant on borrowed views out from the course. The magnitude of change on the golf course is considered to be low and the effect **slight** adverse during construction reducing to **not significant** during operation.
- 6.4.16 *Road and rail routes*
- 6.4.17 Due to the low-lying nature of the topography and the presence of an uninterrupted band of development between the track and the site, visual effects are not anticipated by passengers and occupants of vehicles.
- 6.4.18 The A548 Rhyl Coast Road passes east-west approximately 200m from the site boundary at the nearest point. Where the road passes Rhyl Golf Links, views of the proposals would be experienced but limited to small changes to the seawall. These would be small changes seen at distance and would constitute a small proportion of the overall view (Viewpoint 6 provided in Figure 3f in the LVIA report). Elsewhere the road is screened by built form. The overall effect is considered to be locally **slight adverse** during construction reducing to **not significant** during operation.
- 6.4.19 The main site compound (compound 1) will be immediately north of East Parade/Marine Drive. Views of the compound are partially screened by a hedge along the northern side of the road. Views of the promenade and beach are limited by topography, including a low berm to the southern edge of the promenade. The lower extents of the beach are visible at low tide. Users are likely to include cyclists, motor traffic and pedestrians using the pavements possibly for recreational reasons. Sensitivity of East

Parade/Marine Drive to construction elements is considered to be to be medium. The majority of the proposals will be screened by landform. The presence of the compound area will result in a medium-term change to the views, primarily from the presence of hoarding and construction access routes. Impermeable hoarding will further screen views of the beach. This will be a medium magnitude of change. The effect is considered to be **moderate** adverse during construction. During Operation, changes to the view will consist of changes to the seawall parapet with limited visibility of the rock armour. The magnitude of change will be low and the sensitivity to change will be low. During operation, the effect will be **slight** adverse.

- 6.4.20 Tynewydd Road, Molineaux Road and Garford Road will experience limited views of the seawall parapet close to where they join the site boundary (Viewpoints 2 and 5 provided in Figure 3b and e in the LVIA report). Brynheddydd Bay and Garford Road will have views of the secondary compound hoarding during construction. Effects on Garford Road will be experienced during construction through a limited increase in activity on the road. The effect of these changes during construction are considered to be slight adverse but these will be medium-term and temporary. Overall views will be constrained and focused by adjacent housing and the raised sea defences. Built form is of medium-low quality with existing structures such as flood gates and ramps detracting from the visual qualities of the views. The sensitivity is low and the magnitude of change low. The effect is considered to be **slight** adverse during the construction phase and **not significant** during operation.
- 6.4.21 Beechwood Road, Alexandra Road, Grosvenor Road and Old Golf Road will experience medium-term views of the main site compound for the duration of the construction phase. It is expected that the long-term proposals will not be visible due to landform screening and distance. The sensitivity is low and the magnitude of change is low. The effect is considered to be **slight** adverse during the construction phase and **not significant** during operation.
- 6.4.22 Other streets in the area are expected to be sufficiently screened by built form to not experience visual effects.
- 6.4.23 *Residential receptors and settlements*
- 6.4.24 The following assessment provides an indication of potential visibility from residential properties only. It is not intended as a Residential Amenity Assessment. Assessments were made from publicly accessible locations and aerial mapping. Given that these were not from private properties or garden areas, it is not possible to ascertain the exact nature or use of a room, nor the value attributed to a view.
- 6.4.25 Property addresses are based on those indicated on opensource data; accuracy cannot be guaranteed. Distances are approximate and given from the edge of the property (or nearest property for groups) to the site boundary.
- 6.4.26 Residential receptors along East Parade and Marine Drive are orientated with their primary facades facing seaward. The primary living spaces of these buildings are likely to be on the ground floor facing the site. Existing sea views will be screened by the hoarding of the primary site compound during the construction phase only. Long term the views will remain unaffected by the proposal. The effect is considered to be **moderate** adverse in the short to medium-term and **not significant** in the long term.
- 6.4.27 Receptors along Eaton Avenue and Hilton Drive, the north end of Molineaux Road and Garford Road, may experience views of the proposals (Viewpoint 2 provided in Figure

3b in the LVIA report). These properties generally face away from the sea view and the site and are low lying bungalows with infrequent second story extensions. Primary frontages face the streets rather than the seafront. Clear views of the proposals are unlikely due to the presence of intervening built form, and where present will be seen in the context of nearby buildings and will be suburban in character. Views of changes to the seawall are likely to be visible however views of the beach interventions are not expected. Effects will arise from the placement of the secondary construction compound off Garford Road for those properties at the northern end of the road. These effects will be temporary and short to medium-term. The impact is considered to be **slight** adverse at most during construction and **not significant** during operation.

- 6.4.28 Residences to the north of Brynheddydd Bay are likely to experience views of the secondary construction compound. The permanent proposals will represent a small change in the views. The impact during construction is likely to be **moderate** adverse at most, and **not significant** during operation (Viewpoint 5 provided in Figure 3e in the LVIA report).
- 6.4.29 Views of the proposals will be experienced from Splash Point Apartments. Views of the rock revetment are likely to be primarily experienced from first floor windows and balconies on north and east facing facades, with some oblique views perhaps being present from other facades. Views from ground floor windows are likely to be limited to views of realigned sea wall and top of rock revetment with the majority of the proposals screened by topography and the seawall. Where the greatest changes in the views are experienced these will be seen in the context of panoramic views over the seascape, built up areas and coastline with associated defences. The permanent proposals will represent a relatively small change in the views when seen in this context, and the magnitude of change is small. Views may be obstructed or adversely impacted during construction due to close proximity of the works and associated traffic, hoarding etc. As residences with moderately scenic views the sensitivity is considered medium. The effect is considered to be **moderate** adverse during construction reducing to **slight** adverse during operation (Viewpoints 1 and 1 provided in Figure 3a and c in the LVIA report).

6.5 Mitigation Measures

- 6.5.1 The revetments and rock armour are visible from certain locations along the promenade as well as from the beach itself during low tide, however the proposed development will introduce additional rock armour. It will not be possible to introduce any form of vegetation to screen the view as this would be more incongruous than the development itself, particularly as the views across the bay form a large part of the appeal of Rhyl's seafront.
- 6.5.2 New concrete beach access steps will be constructed to extend from the existing seafront promenade/coastal path and through the new rock armour revetment.
- 6.5.3 To minimise the impacts of noise, dust and light spill, the compound perimeters will consist of secure solid faced hoarding as set out in the outline construction methodology (Appendix G). Elsewhere to mitigate against visual effects on Marine Drive/ East Parade and adjacent receptors, visually permeable construction site hoarding (i.e. Heras fencing) will be considered in key locations to prevent screening of sea-views.
- 6.5.4 The conclusions reached within the landscape and visual impact assessment are based on the assumption that disruption to existing hard and soft landscape areas would be

reinstated by the Contractor once works are complete so that impacts are temporary (noting that this is likely to be a phased completion, as areas become available). All areas of land within the site temporary occupied during the construction phase would be reinstated to the pre-construction condition or that agreed with Denbighshire County Council. This would include reinstatement of Marine Promenade, the site compounds, the access ramp to the beach, and the site entrance from Marine Drive.

- 6.5.5 For example the main compound area would be reinstated to amenity grassland and planting would be carried out to replace grass and planting removed (including appropriate establishment of maintenance). In areas where hard-landscape treatments are disturbed these would be reinstated using the same palette of materials as existing or similar. Where appropriate, existing materials would be stored for the duration of the contract to allow reinstatement.
- 6.5.6 Precondition surveys undertaken prior to commencement of works would be used as a record for reinstatement. The new slopes to the rear of the raised promenade level would be landscaped, soiled and reseeded. Memorial benches relocated during construction would be sympathetically put back, with guidance on appropriate locations sought from Denbighshire County Council and Rhyl Town Council.
- 6.5.7 Beach levels would be reinstated to the pre-construction level as part of the construction works as described in paragraph 2.7.24. Any other restoration of the beach would utilise material excavated during construction, plus any excess beach material that has naturally accumulated in the works area during the construction period.

6.6 Residual Effects

- 6.6.1 The proposals would cause significant impacts to landscape character and visual receptors, given the high visual and landscape sensitivity of the location. However, these would be very localised and restricted mainly to areas adjacent to the footprint of the scheme and certain focussed views.
- 6.6.2 The impacts on receptors at specific viewpoints are summarised Table 6-2, with full details and descriptions are provided in the LVIA viewpoint analysis in Appendix J.

Table 6-2 Summary of impacts on receptors at specific viewpoints

| Name of Viewpoint | Distance and direction from proposed development | Reason | Viewpoint and figure number | Assessment of Effect |
|----------------------------------|--|--|-----------------------------|--|
| 1: Marine Drive Viewing Platform | VP is within site boundary. Proposals will affect beach immediately to the north, east and west. | Specific Viewpoint – View is from a prominent viewing area with seating, with panoramic views over the beach to the east and west. | Viewpoint 1 – Figure 3a | Impact on landscape character: Moderate Adverse Impact on views: Slight/ Moderate Adverse |
| 2: Molineaux Road | Immediately to south of site boundary. | Representative Viewpoint – representative of views from residences | Viewpoint 2 – Figure 3b | Impact on landscape character: Slight Adverse |

| Name of Viewpoint | Distance and direction from proposed development | Reason | Viewpoint and figure number | Assessment of Effect |
|--|--|---|------------------------------------|--|
| | 0.01Km from site boundary. | along north end of Molineaux Road, north side of Eaton Road and east end of Hilton Drive. | | Impact on views: Not significant |
| 3: Coast Path by Splash Point Apartments | VP is within site boundary. Proposals will affect seawall and beach immediately to the north, east and west. | Representative Viewpoint – representative of views gained by walkers along Wales coast path and by residents at Splash Point Apartments | Viewpoint 3 – Figure 3c | Impact on landscape character: Moderate Adverse Impact on views: Slight/ moderate Adverse |
| 4: Beach near to third groyne | Within site boundary. Rock revetment would be constructed nearby to the south. | Representative viewpoint – representative of views gained by visitors to the beach from the beach looking towards the seawall | Viewpoint 4 – Figure 3d | Impact on landscape character: Moderate Adverse Impact on views: Slight/ moderate Adverse |
| 5: Coast path by beach access ramp | Within site boundary. Changes to path and seawall would occur at this location. | Representative viewpoint – Representative of views gained by visitors at the beach access point and walkers along the section of coast path to the east of site | Viewpoint 5 – Figure 3e | Impact on landscape character: Not significant (during operation) Impact on views: moderate adverse |
| 6: Rhyl Coast Road nr golf course | 0.4km south-east of proposals | Viewpoint – Showing visibility from close to key recreational receptor and illustrative of general lack of visibility of proposals from landward side. | Viewpoint 6 – Figure 3f | Impact on landscape character: Moderate Adverse Impact on views: Slight/ moderate Adverse |
| 7: Coast path by Pavillion Theatre | Within site near western boundary | Representative viewpoint – Representative of views gained by walkers along a section of the Coastal path from the west adjacent to main site compound. | Viewpoint 7 – Figure 3g | Impact on landscape character: Slight Adverse (during construction only) Impact on views: Not significant |

7 Cultural Heritage

7.1 Introduction

- 7.1.1 This chapter presents the cultural heritage assessment undertaken and prepared by the Clwyd-Powys Archaeological Trust (CPAT).
- 7.1.2 The assessment considers the direct effect that the proposals might have on the known cultural heritage within the construction site and also examines the indirect effect on statutorily designated and registered cultural heritage assets beyond the boundary of the Development Area.
- 7.1.3 The assessment covers the life of the development from construction, through operation and decommissioning as set out elsewhere in this ES. Where adverse cultural heritage effects are identified, it also puts forward mitigation measures to prevent, reduce, or offset them and then re-assesses the residual effects remaining after mitigation. The effects of decommissioning are described in the construction phase as the latter generally includes a similar range of activities and potential effects.
- 7.1.4 The assessment was commissioned in August 2018, and the desk-based study and fieldwork was undertaken immediately thereafter. This report was prepared in September 2018, following the completion of a separate study relating to the geo-archaeological potential of the area by University of Wales Trinity St David (UWTSD)⁴⁸.
- 7.1.5 The Cultural Heritage chapter has been technically reviewed and approved in its final version by Paul Belford, CPAT's Director, and Mark Walters, Development Control Officer, CPAT.
- 7.1.6 *Legislative & Planning Policy Context*
 - 7.1.1 Cultural heritage is deemed to include the complete range of man-made features that have been introduced into the landscape from the Palaeolithic, more than two hundred and fifty thousand years ago, up to and including the 20th century. Some of these features will be visible as upstanding remains on the ground; others will be buried and only become apparent during ground disturbance, whilst others may be objects that have been discarded, lost or deliberately deposited. Some will have an archaeological interest and importance; others will be more historical in their origin. In addition, some natural features will be relevant because of the information they contain; peat bogs, for instance, hold pollen that can throw light on past human activity in the area. Collectively, all these features are known as heritage assets.
 - 7.1.2 At a national level, it is Cadw, the historic environment service within Welsh Government, which holds the remit for the cultural heritage resource. Another national body, Natural Resources Wales, has a particular interest in historic landscapes.
 - 7.1.3 At a regional level, the cultural heritage resource is monitored by the Heritage Management Sections of the regional Welsh Archaeological Trusts. In this instance it is the Heritage Management Section of the CPAT who act as archaeological advisers to DCC.
 - 7.1.4 While the broad concern of all these bodies is with the preservation of the cultural

⁴⁸ Bates, M.R. and Bale, R., 2018. An evaluation of the foreshore deposits at Splash Point, Rhyl. Unpublished report. UWTSD.

heritage, there are inevitably differences in emphasis between regional and national organisations, and in the laws and regulations that govern the ways in which they operate.

- 7.1.5 The legislative framework for the historic environment in Wales was revised by The Historic Environment (Wales) Act 2016. The 2016 Act amended the Ancient Monuments and Archaeological Areas Act 1979 and the Planning (Listed Buildings and Conservation Areas) Act 1990. It extended the definition of scheduled monuments and enhanced their protection, as well as making changes to the process of scheduled monument consent. Changes were also made to the protection of listed buildings. The 2016 Act also provided for a statutory register of historic landscapes, a statutory list of place names, and imposed a statutory duty on Welsh Ministers to compile and maintain Historic Environment Records (HERs).
- 7.1.6 Chapter 6 of Planning Policy Wales was revised and re-issued in November 2016. Technical Advice Note 24: The Historic Environment (TAN 24) came into force on 31 May 2017 and replaced previous Welsh Office Circulars 60/96 Planning and the Historic Environment: Archaeology; 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas; and 1/98 Planning and the Historic Environment: Directions by the Secretary of State for Wales.
- 7.1.7 The revised Design Manual for Roads and Bridges (DMRB), Volume 11 Section 3 Part 2, HA 208/07 (August 2007), though not specifically focused on developments of this nature, provides a suitable, general framework for assessing the cultural heritage. The approach to the cultural heritage which it promotes, although designed for road developments, is relevant as a methodology for the proposed development and has been adopted here. The relevant sections relating to determining the value of assets and the magnitude and significance of potential impacts is reproduced in Appendix 1.
- 7.1.8 Welsh Government's (2017) *Heritage Impact Assessments in Wales* sets out the general principles to consider when planning changes to historic assets and applying for listed building, conservation area and scheduled monument consent. This document, together with Cadw's (2011) *Conservation Principles for the Sustainable Management of the Historic Environment in Wales*, provides guidance on understanding historic assets, their significance and assessing potential impacts on them. The results of a heritage impact assessment should be summarised in a heritage impact statement and this process must be adopted in all cases where your proposals require listed building consent or conservation area consent.
- 7.1.9 Planning Policy Wales (9th edition, 2016) identifies the desirability of preserving the setting of a World Heritage Site, a nationally important ancient monument (whether scheduled or unscheduled), a listed building, a Conservation Area and a site on the Register of Historic Parks and Gardens in Wales. This desirability will be a material consideration when assessing the potential impact of a development proposal on the historic environment. Recent guidance published by Welsh Government (2017) in *Setting of Historic Assets in Wales* defines the setting of a historic asset as including *'the surroundings in which it is understood, experienced and appreciated, embracing present and past relationships to the surrounding landscape. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive, negative or neutral contribution to the significance of an asset. Setting is not itself a historic asset, though land within a setting may contain other historic assets. The importance of setting lies in what it contributes to the significance of a historic asset. The setting of a historic asset can also include less-tangible elements. These may include function, sensory perceptions or historical, artistic, literary and scenic*

associations'.

- 7.1.10 At a local level the Denbighshire Local Development Plan 2006-2021 was adopted in 2013. The theme of 'Valuing Our Environment' is concerned with the protection and enhancement of those assets, both natural and man-made, that make up Denbighshire's unique environment. Policy VOE 1 states that *'The following areas will be protected from development that would adversely affect them. Development proposals should maintain and, wherever possible, enhance these areas for their characteristics, local distinctiveness, and value to local communities in Denbighshire: ... Sites of built heritage; and Historic Landscape, Parks and Gardens.'* Policy VOE 3 - Pontcysyllte Aqueduct and Canal World Heritage Site, states that *'development which would harm the attributes which justified the designation of the Pontcysyllte Aqueduct and Canal as a World Heritage Site and the site's Outstanding Universal Value will not be permitted.'*

7.2 Baseline Conditions

- 7.2.1 The baseline conditions were determined by means of the desk-based study, together with a field survey of the foreshore within the construction boundary, as defined in August 2018, but subsequently revised as part of the cultural heritage mitigation (Appendix K Figures 1-3).
- 7.2.2 The field survey was undertaken on 21 August 2018 and consisted of a systematic examination of the foreshore within the development boundary in order to identify any previously unrecorded heritage assets which might be visible on or above the level of the beach.
- 7.2.3 The following section presents a summary of the historical background for the development area, based on the results from a desk-based study, which was conducted with reference to the principles and methods laid out in the *Standard and Guidance for Archaeological Desk-based Assessments* (2014), produced by the Chartered Institute for Archaeologists (CIfA), the regulatory body for the profession.
- 7.2.4 Assets recorded in the regional HER are referred to by their Primary Record Number (PRN), while those recorded in the National Monument Record (NMR) are referred to by their National Primary Record Number (NPRN).
- 7.2.5 A desk-based study⁴⁹ had previously been conducted in 2017 to inform decisions regarding the various options under consideration as part of the scheme, and this was reviewed and updated as part of the present assessment. The desk-based study accessed readily available primary and secondary sources in order to provide a historical framework for any surviving archaeological remains. This included relevant records held at the following repositories:
- The regional HER, maintained by CPAT in Welshpool (HER Enquiry 6399)
 - The NMR maintained by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) in Aberystwyth
 - The National Library of Wales, Aberystwyth
 - Flintshire Record Office, Hawarden
 - Denbighshire Record Office, Ruthin

⁴⁹ Jones, N. W. and Watson, S., 2017. *East Rhyl Coastal Defence Scheme: Desk-based Assessment*. Unpublished report. CPAT Report No. 1505.

- Cadw, for designated and registered assets

Table 7-1 Designated and Registered Heritage Assets within 1km of the Development Area

| Designated/ Registered Asset | Within the construction site | Within 500m | Within 1km |
|---------------------------------------|---------------------------------|-------------|------------|
| World Heritage Site | 0 | 0 | 0 |
| Scheduled Ancient Monument | 0 | 0 | 0 |
| Listed Buildings | 0 | 5 | 74 |
| Registered historic parks and gardens | 0 | 0 | 0 |
| Registered battlefields | 0 | 0 | 0 |
| Designated wrecks | 0 | 0 | 0 |
| Aircraft crash sites | 0 | 0 | 2 |
| Conservation areas | 0 | 0 | 1 |

NB figures are cumulative

7.2.6 Listed Buildings

7.2.7 These are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990, as amended by the Historic Environment (Wales) Act 2016. All listed buildings are nationally important, but are graded in order of significance as Grade I, II* or II. Grade I buildings are considered to be of equal status to Scheduled Ancient Monuments. Local planning authorities must have special regard to the desirability of preserving the setting of a listed building regardless of its grade, and it also requires planning proposals to meet the test of determining the extent to which a development affects views to and from a listed building. Planning Policy Wales (9th edition, 2016) requires a 'general presumption in favour of the preservation of a listed building and its setting, which might extend beyond its curtilage' (6.5.10).

7.2.8 Of the 74 listed buildings within the study area, all are grade II apart from the Parish Church of St Thomas (No. 1422), which is grade II* (see Appendix K, Table 1). Sixty-six of the listed buildings lie within the Rhyl Conservation Area. Only five listed buildings lie within 500m of the development area, all at its western end Table 7-2).

Table 7-2: Listed buildings within 500m of the construction site

| List No. | Name | Distance |
|----------|--------------------------------|----------|
| 1510 | Lookout tower in boundary wall | 300m |
| 14276 | War Memorial | 360m |
| 14280 | Grafton Lodge | 450m |
| 14281 | Grafton Lodge | 450m |
| 14290 | The Royal Alexandria Hospital | 20m |

7.2.9 Conservation Areas

7.2.10 These are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990. This Act requires local planning authorities to have special regard to the desirability of preserving the setting of a Conservation Area, and it also requires planning proposals to meet the test of determining the extent to which a development

affects views to and from such an area. Planning Policy Wales (9th edition, 2016) states that there 'will be a strong presumption against the granting of planning permission for developments ... which damage the character or appearance of a conservation area or its setting to an unacceptable level' (6.5.19).

7.2.11 Rhyl is quintessentially a planned Victorian seaside town containing many Victorian and Edwardian buildings. The Rhyl Central Conservation Area encompassed the centre of the planned settlement, an area of 0.16km². Three character areas have been defined within its boundary, Rhyl's Interchange and Commercial Core, Crescent Road and St Thomas'. Rhyl has, however, been the subject of much alteration over the years in the form of inappropriate, low-quality alterations to historic buildings, replacement of others with buildings of an unsympathetic design. However, the conservation area retains significant built heritage value with good survival of Victorian buildings, including terraced properties and a number of high quality villas, the railway station, the Town Hall, the Art Deco Odeon Bingo Club and St Thomas' Church and Holy Trinity Church⁵⁰.

7.2.12 *Aircraft Crash Sites*

7.2.13 All military aircraft crash sites in the United Kingdom, its territorial waters, or British aircraft in international waters, are controlled by the Protection of Military Remains Act 1986. Under this act it is an offence to tamper with, damage, move, or unearth any remains without a licence from the Ministry of Defence.

7.2.14 There are two aircraft crash sites recorded within the study area. An Armstrong Whitworth Whitley V BD204 (PRN 130240) belly-landed on mudflats on 17 May 1943 and a Boulton Paul Defiant I N1770 (PRN 130258) crash landed on the beach at Rhyl on 31 August 1941. Given the nature of both crash landings it seems likely that any wreckage would have been recovered from the beach at the time of the incidents, leaving no significant remains at the site.

7.2.15 *Undesignated Heritage Assets*

7.2.16 The regional Historic Environment Record (HER) contains 32 records for undesignated heritage assets within the study area, while the National Monument Record (NMR) adds a further 30, which are summarised in Table 7-3 and Table 7-4 (see also Appendix K, Tables 2 and 3).

Table 7-3: Undesignated Heritage Assets within 1km of the construction site

| Undesignated Asset | Within the development area | Within 500m | Within 1km |
|---------------------------|-----------------------------|-------------|------------|
| Earthworks and structures | 3 | 14 | 48 |
| Wrecks | 0 | 2 | 4 |
| Find Spots | 7 | 8 | 10 |

NB figures are cumulative

⁵⁰ Purcell, 2017. Rhyl Central Conservation Area Appraisal Review.

Table 7-4: Undesignated Heritage Assets within the construction site

| PRN | Name | Period | Type | Value |
|--------|--|----------------------------|---|--------|
| 17103 | Rhyl foreshore submerged landscape | Prehistoric | Submerged landscape | High |
| 33099 | Rhyl foreshore (Splash Point) antler mattock | Mesolithic | Find | N/A |
| 37700 | Rhyl, volunteers' rifle range | Post-medieval | Firing Range | Low |
| 58795 | Rhyl foreshore post-medieval finds | Post-medieval | Find | N/A |
| 58796 | Rhyl foreshore macehead | Bronze Age; Neolithic | Find | N/A |
| 101903 | Rhyl foreshore bronze spearhead | Bronze Age | Find | N/A |
| 101936 | Rhyl foreshore Neolithic axes | Neolithic | Find | N/A |
| 101937 | Rhyl foreshore bronze chisel | Bronze Age | Find | N/A |
| 123322 | Rhyl foreshore (Splash Point) structures | Post-Medieval; prehistoric | Coastal defence; fish trap; occupation site | Medium |
| 141424 | Rhyl, wood and metal object | Unknown | Find | N/A |

- 7.2.17 The majority of the recorded undesignated assets within the construction site relate to a series of archaeologically and palaeoenvironmentally significant deposits representing sedimentation of tidal flats (PRN 17103) and resulting from fluctuations in and the gradual rise of sea levels after the last glaciation. While in places these deposits are currently buried beneath 1.2m to 1.8m of beach sand, there are limited exposures (see below), although this is an ever-changing situation.
- 7.2.18 As part of the current study an assessment was conducted by UWTSD⁵¹ to determine the potential and significance of these deposits, which is reproduced in full in Appendix K.
- 7.2.19 Exposures of peat and the remains of a submerged forest on the Rhyl foreshore have been documented since the late 19th century and in 1912 around 200 tree stumps were observed. The peat deposits have previously been considered to be of Neolithic or Bronze Age date, in accordance with which the earliest deposits have been dated to 4725±65 BP.
- 7.2.20 Despite numerous previous observations the nature of the deposits between Rhyl and eastwards towards Prestatyn remain only partially understood. The most recent study of the area is based on data gathered in 2005/06⁵², which identified the following stratigraphic sequence (from the latest to the oldest):
- vi) Estuarine sediments

⁵¹ Bates, M.R. and Bale, R., 2018. An evaluation of the foreshore deposits at Splash Point, Rhyl. Unpublished report. UWTSD.

⁵² Bell, M., 2007. Splash Point, in M. Bell *Prehistoric Coastal Communities: The Mesolithic in western Britain*, CBA Research Report 149. Council for British Archaeology, 306-308.

- v) Upper peat with submerged forest including oaks, deer and auroch prints
- iv) Estuarine sediments with human and deer prints, possible context of Mesolithic mattock and polished axes
- iii) Lower peat and submerged forest of willow, possible context of flint artefacts reported by Smith (1924)
- ii) Estuarine sediments
- i) Boulder Clay

- 7.2.21 The 2005/06 study identified the presence of a flint core fragment embedded in the old land surface beneath the clay-silts (Appendix K, Figure 03). The presence of two palaeochannels was also suggested, which is significant since these features often contain animal remains.
- 7.2.22 Archaeological material has been collected from the foreshore and occasionally from within the sediments associated with the peat/clay silts outcropping on the beach. These finds range in date from a Mesolithic antler mattock to a variety of finds of Neolithic or Bronze Age date and are summarised in Appendix K, Table 1. Significantly some of these finds have been made in the estuarine blue clay underlying the forest beds. These deposits have also produced mammal remains including red deer (including a full set of unshed antlers), roe deer, ox, horse, sheep, pig, badger, fox, wolf and whale.
- 7.2.23 While attention has often focused on the peat deposits and the submerged forest, it should be stressed that, as noted above, most of the archaeology and faunal remains come from the underlying clays, as do a lot of the recorded footprints, some of which are human, and to a certain extent it is those deposits that are perhaps most important rather than the overlying peats. These deposits have the potential to contribute significantly to acknowledged national research objectives and are therefore considered to be of high value in accordance with Table 7-6.
- 7.2.24 Four boreholes and four test pits have been drilled as part of the geotechnical works associated with the current proposals, all located within the operational site boundary. The position of these works is shown in Appendix K, Figure 2 and a profile through the sequences is presented in Appendix K, Figure 3. One borehole was selected for the recovery of samples suitable for palaeoenvironmental examination (BH 104). Peat was encountered in each test pit and in borehole 104, varying in thickness and in all cases lying at 0m AOD, or above.
- 7.2.25 Recent field survey has identified three areas where significant deposits are currently exposed within the construction site (Appendix K Figure 3), of which the most significant is Area A, which is considered to be of high value. This lies within a runnel some 125m seaward of the MHWS (Figure 7-1). Deposits of clay-silt with peaty lenses extend over an area around 160m long and up to 28m across, the deposits being up to 0.2m in thickness (Figure 7-2). The remains of two large trees were visible protruding from the deposits, each around 6m in length, with one 0.5m in diameter and the other 0.3m in diameter (Figures 7-3 and 7-4). The deposits clearly continued up the beach, where they are buried beneath beach sand.



Figure 7-1: The location of exposed deposits in Area A (arrowed), lying on the landward side of a runnel



Figure 7-2: Exposed deposits in Area A



Figure 7-3: The larger of two trees exposed within Area A



Figure 7-4: The smaller of two trees exposed in Area A

- 7.2.26 The other two areas were close to MHWS and at a significantly higher level, suggesting that they are more recent. Area B lies immediately west of the proposed beach access ramp and extends over an area of at least 55m by 20m. Within it are the remains of a number of structures which were first recorded in 2013 (PRN 123322; Figures 7-5 and 7-6). Two parallel rows of stakes, each row around 4m in length, are set 2.9m apart. The stakes within each row are offset, suggesting the former presence of wattling woven between them and indicating that they are probably part of fish traps of unknown date. A single, shorter row was also noted further to the east. Four closely-set, vertical planks were also noted, as well as a number of concrete and wooden posts likely to be associated with former groynes. Although these structures are mostly just outside the construction site, the deposit itself extends within the boundary and potentially as far of the site of the proposed ramp, although it is buried by beach sand at this point. While the deposits themselves have been assessed as being of low value, the structures within this area are considered to be of medium value.



Figure 7-5: Features exposed in December 2013 (PRN 123322) immediately west of Splash Point

- 7.2.27 Towards the eastern end of the construction site a 0.4m-thick deposit of clay-silt (Area C) was identified at the base of the existing sea defences. This extended over a visible area of 150m by 14m and contained a mass of roots (Figure 7-7). Organic material within the beach sand further to the east suggests that this deposit may survive beneath beach sand to within 30m of the slipway. These deposits are considered to be of high value.
- 7.2.28 A rifle range (PRN 17103) is recorded by the Ordnance Survey in 1871, although no traces now survive.



Figure 7-6: The remains of a probable fish trap first recorded in 2013 and visible top centre in Figure 7-1



Figure 7-7: Exposed deposits in Area C

Table 7-5: Undesignated Heritage Assets within 500m of the construction site

| PRN/NPRN | Name | Period | Type |
|-------------|--|---------------|---------------------------|
| PRN 106402 | Rhyl foreshore causeway | Post-medieval | Trackway |
| PRN 120560 | Rhyl, Axehead | Neolithic | Find |
| PRN 142079 | Rhyl Prisoner of War camp | Modern | Prisoner of war camp |
| NPRN 8124 | Ambrose Evans Memorial Congregational Church | Post-medieval | Chapel |
| NPRN 12454 | Christian Science Society Church | Post-medieval | Chapel |
| NPRN 266250 | Bryntirion, Garden | Post-medieval | Country House Garden |
| NPRN 271558 | The St Olaf | Post-medieval | Wreck |
| NPRN 300221 | Lyons Holiday Camp | Modern | Holiday Centre |
| NPRN 407247 | Claremont Hydro, Brighton Road | Post-medieval | Infirmiry |
| NPRN 408337 | The Grange Hotel, 41-42 East Parade | Post-medieval | Hotel |
| NPRN 409773 | Bryntirion Hall; St Mary's Convent | 19th Century | House, School |
| NPRN 416369 | Earthworks of farms and fields, Rhyl Sea Front | Post-medieval | Deserted Rural Settlement |
| NPRN 525228 | The Mayflower | Post-medieval | Wreck |

7.2.29 While there are four ship wrecks recorded within the study area none are designated under the Protection of Wrecks Act 1973 and only two lie within 500m of the construction site, the closest being the St Olaf (NPRN 271558), which is thought to lie around 280m to the north, although its position has not been confirmed.

7.2.30 A possible causeway (PRN 106402), comprising a band of stones with a length in excess of 15m and a width of 5m-8m, has a recorded grid reference which places the asset just outside the construction site, although it is not well located and could extend within the boundary. Although recorded as being of post-medieval date, no dating evidence was apparent.

7.2.31 *Future Changes to the baseline*

7.2.32 The numerous artefacts which have been recovered from the beach in the area of Splash Point, together with the periodic exposure of significant deposits of peat and clay-silts, and the remains of a submerged forest, demonstrate the continuing erosion of archaeological and geo-archaeological deposits as a result of natural erosion.

7.2.33 Historic mapping demonstrates the retreat of the high-water mark from 1871 (Appendix K Figure 3), a process which has gradually led to the exposure and erosion of the deposits. A study⁵³ of the coastal processes in this area has shown that 'East Rhyl ... has been subject to progressive beach lowering over the 20th century. Coastal sediment transport is strongly modified by the formation of ridges and runnels in the intertidal zone', which are 'not characteristic of storm erosion-recovery cycles (i.e. storm bars), but behave more like coastal spits. The ridges are subject to frequent overwash, and therefore migrate landward and onshore, with a new spit being resolved each year, and taking 3-4 years to migrate onshore ... Analysis of coastal profiles from East Rhyl has indicated that the sandy material comprising the migratory ridges moves over a stable planar bed, including the occasionally exposed clay under-layer' (ie tidal

⁵³ JBA Consulting, 2017. 2016s5126 - East Rhyl coastal defence scheme - coastal processes assessment and modelling, p 57-8

flat deposits).

- 7.2.34 The continual formation and migration of the ridges and runnels suggest that geo-archaeological deposits are likely to have been subject to episodic erosion across the whole of the foreshore and it is reasonable to assume that this process will continue irrespective of the current proposals.

7.3 Assessment Methodology

- 7.3.1 The revised DMRB, Volume 11 Section 3 Part 2, HA 208/07 (August 2007), though not specifically focused on developments of this nature, provides a suitable, general framework for assessing cultural heritage. The approach to the cultural heritage which it promotes, although designed for road developments, is relevant as a methodology for the proposed development and would be adopted in line with the methodology provided above in Section 2.4 Proposed Approach to EIA. The value of each heritage asset has been determined following the DMRB guidance, although modified for consistency across the ES, further information on which is provided in Table 7.6.

Table 7-6: Definition of Value of Heritage Assets

| Value | Asset Type |
|--------|---|
| High | World Heritage Sites (including those nominated) Assets of acknowledged international importance Assets that can contribute significantly to acknowledged international research objectives |
| | Scheduled Ancient Monuments (including those proposed) Undesignated monuments which could potentially be worthy of scheduling Listed buildings – Grade I, II* and II Registered Historic Landscapes, Parks and Gardens Undesignated assets that can contribute significantly to acknowledged national research objectives |
| Medium | Conservation Areas Undesignated assets that contribute to regional research objectives |
| Low | Undesignated assets of local importance Assets compromised by poor preservation and/or poor survival of contextual associations Assets of limited value, but with the potential to contribute to local research objectives |
| | Assets with very little or no surviving cultural heritage interest |

- 7.3.2 The assessment of the magnitude of effect considers the extent to which a heritage asset may be changed or affected by the proposed development. The thresholds for assessing magnitude of effect are set out in Table 7.7, which is derived from the DMRB Volume 11 Section 3 Part 2, Annex 5/13, although modified for consistency across the ES.

Table 7-7: Definition of magnitude of effect

| Magnitude of Effect | Definition |
|---------------------|--|
| Major | Changes to most or all of the key cultural heritage elements such that the asset is totally altered Comprehensive changes to setting Extreme visual effects |
| Moderate | Changes to many key cultural heritage elements such that the asset is clearly modified Considerable changes to setting which affect the character of the asset Visual changes to many key elements |
| Minor | Changes to key cultural heritage elements such that the asset is slightly altered or different Sight changes to setting Slight visual changes to a few key elements |
| No change | Very minor changes to cultural heritage elements, or setting Virtually unchanged visual effects |

- 7.3.3 While the DMRB does provide guidance on the extrapolating the degree of significance from the predictions of impact, the current assessment is based on the matrix of significance of effect scoring terms provide in Table 3-5.
- 7.3.4 Only limited geotechnical data was available to assist with an assessment of the archaeological and geo-archaeological significance of known deposits on the Rhyl foreshore, based solely on a small number of boreholes and test pits, all located within the operational site boundary. No data was available for the wider construction site.
- 7.3.5 The timescale within which this chapter has been produced was insufficient to allow any further sampling to be undertaken. Under normal circumstances the EIA process would also require archaeological evaluation through trial trenching prior to construction. However, as the scheme is located within the tidal zone this has not proved to be possible owing to health and safety concerns over trial trench stability and tidal cycles.
- 7.3.6 Archaeological monitoring was conducted during test pitting in April 2018⁵⁴, which produced limited information, but did allow the recovery of a bulk sample and wood sample from peat within the tidal flat deposits.
- 7.3.7 *Assessment of Effects*
- 7.3.8 The project has the potential for both direct and indirect effects to heritage assets which may occur during the construction period, the operational life of the structures and their decommissioning. In practical terms any operational and decommissioning effects are likely to be similar to those during construction and are considered collectively under direct effects in this assessment.
- 7.3.9 Potential visual effects were assessed through fieldwork in August 2018 to determine the intervisibility of heritage assets with the construction site, their setting, and principal views to and from the assets. In line with the EIA Scoping comments, this

⁵⁴ Grant, I., 2018. East Rhyl Coastal Defence Scheme: Archaeological Watching Brief. Unpublished report. CPAT Report No. 1582.

focused on listed buildings within 1km and the Rhyl Conservation Area. The impact on the setting of the Royal Alexandra Hospital and other listed buildings in the immediate area was conducted in accordance with the Welsh Government's best-practice guidance Setting of Heritage Assets in Wales.

- 7.3.10 A field survey was conducted on 21 August 2018 for the whole of the construction site to prospect for visible, surface heritage features. This was undertaken at low tide, in 30m-wide transects. Significant features were located using a hand-held GPS and recorded by photography and written description.
- 7.3.11 Also in line with the EIA Scoping comments an assessment of the geo-archaeological potential of the construction site was completed by Dr Martin Bates, UWTSd, in order to assist in determining potential impacts on the buried landsurface, as well as formulating appropriate mitigation. The assessment included an analysis of a single core taken in October 2017 as part of a programme of ground investigation, as well as a bulk sample and wood sample recovered from tidal flat deposits during the excavation of test pits in April 2018.⁵⁵

7.4 Potential Impacts & Significant Effects

7.4.1 Direct Effects

- 7.4.2 The following aspects of the scheme are considered to have the potential for direct physical impacts on heritage assets:
- Construction of the beach access ramp at Splash Point
 - Excavation of beach sand for use as in plant travelling platforms elsewhere within the construction site
 - Vehicular movement on the foreshore
 - Storage and sorting of materials
 - Construction of the rock armour
 - Construction of beach access steps
- 7.4.3 It is considered that groundworks associated with the formation of the two construction compounds would be too shallow to impact on any buried assets.
- 7.4.4 While the assessment has identified 11 heritage assets recorded within the construction site, seven are artefacts which are assumed to be associated with the submerged landscape (PRN 1710) and are therefore indicative of the archaeological potential of this asset.
- 7.4.5 The Rhyl Volunteers' Rifle Range (PRN 37700) has no surviving trace and would therefore not be subject to a direct impact.
- 7.4.6 A possible causeway (PRN 106402) has a recorded grid reference which places the asset just outside the construction site, although it is not well located and could therefore be subject to an impact.
- 7.4.7 The proposed beach access ramp would be located west of Splash Point in the vicinity of exposed peat and clay deposits in Area B, which are thought likely to extend as far

⁵⁵ Bates, M.R. and Bale, R., 2018. *An evaluation of the foreshore deposits at Splash Point, Rhyl*. Unpublished report. UWTSd.

as the site of the ramp (Figure 7-8).

- 7.4.8 The excavation of beach sand has the potential to result in a direct impact on important archaeological and palaeoenvironmental remains associated with both the peat and the estuarine clays deposits which are exposed in Areas A, B and C, as well as those currently buried beneath beach sand, while vehicular movement and the storage of materials also has the potential to affect the same deposits.



Figure 7-8: The approximate location of the proposed access ramp, and Area B tidal flats deposits exposed beyond the groyne

- 7.4.9 The results from a programme of ground investigations indicates that towards the toe of the rock armour the top of the archaeologically significant deposits is between 1.91m AoD and 0.26m AoD, lying beneath up to 1.8m of beach sand and extending to a thickness of between 0.2m in the west to 0.7m in the east. The design of the rock armour is such that the toe of the armouring will be founded at a depth of between -0.5m AoD and 0.0m AoD, indicating that potentially significant deposits will be subject to an impact, perhaps resulting in the removal of the full depth of the deposits along much of the rock armour. On the basis of available information a strip around 9.2m wide will be excavated to the formation level at the toe of the rock armour, although the excavation profile is such that there is the potential for impacts to extend to either side⁵⁶. Similarly, the construction of new beach access steps is also likely to impact directly on buried deposits.

⁵⁶ Balfour Beatty, *Outline Construction Methodology*, figs 15 and 20

Table 7-8: Potential direct impacts on heritage assets

| Asset | Value | Nature of potential impact | Magnitude of potential impact | Significance of potential impact |
|--|--------|---|-------------------------------|----------------------------------|
| Area A deposits | high | Excavation of beach sand Vehicular movement Storage of materials | major | Large |
| Area B deposits and structures – PRN 123322 | medium | Access ramp Vehicular movement | major | Moderate/ large |
| Area C deposits | high | Excavation of beach sand Vehicular movement Storage of materials | major | Large |
| PRN 17103 Rhyl foreshore submerged landscape | high | Excavation of beach sand Vehicular movement Storage of materials Construction of rock armour Beach access steps | major | Large |
| PRN 106402 causeway | low | Excavation of beach sand Vehicular movement Access ramp | major | Moderate |

7.4.10 Indirect effects

- 7.4.11 The proposals have the potential to result in indirect effects as a result of both physical impacts and visual impacts.
- 7.4.12 Vehicular movement and the storage of materials has the potential to affect important archaeological and palaeoenvironmental deposits through compaction.
- 7.4.13 While coastal modelling has determined that there will be no long-term impacts to the baseline coastal hydrology, the temporary storage of rock material on the beach has the potential to create a layer of turbulent flows in the around of the pile. This may result in increased beach erosion around the piles in the lee of the predominant current flow directions. This has the potential to result in a physical impact on the archaeological and palaeoenvironmental deposits both within the construction site and further along the coast, although the likelihood and significance of such an impact cannot be determined.
- 7.4.14 Field assessment has determined that for the vast majority of heritage assets recorded within the study area the construction site plays no part in their setting and will result in no visual impacts, either during construction or during the operational life of the new sea defences. The Rhyl Conservation Area, for example, contains 66 listed buildings and lies 530m south-west of the construction site at its closest point. The intervening urban structures will, however, prevent any ground level intervisibility between the construction site and the Conservation Area.
- 7.4.15 Only those listed buildings within 500m of the construction site were thought likely to be subject to potential visual impacts and these are considered below.
- 7.4.16 1510 Lookout tower in Boundary Wall
- 7.4.17 The circular, two-storey lookout tower lies near the junction with Chester Street, partly projecting through the boundary wall on the pavement-edge. It is said to have been

built by Mr John Tarleton as a semaphore signalling station for the paddle steamers which operated between the Foryd Harbour, Rhyl and Liverpool. It was probably built after 1831 - a pier was built at the Foryd in that year, and a regular steam packet was operating between Rhyl and Liverpool in 1834. It seems likely that the building was later used as a summer house for one of the large houses in whose grounds it was partially set.

- 7.4.18 Given its original function, views from the building were focused towards and along the coast in either direction, including towards the western construction compound. The building is best appreciated from Marine Drive, although its setting has been affected significantly by the recent construction of new buildings on the opposite side of the road.
- 7.4.19 The assessment has determined that there will be no long-term visual impact resulting from the construction of the new coastal defences, at a distance of over 1km. Although the western construction compound will be visible in certain views (Figure 7-9), at a distance of 300m, this is not considered to impact on the asset or its setting. The potential visual impact is therefore considered to be no change and the significance of effect would be **Not Significant**.



Figure 7-9: Listed building 1510, Lookout tower in Boundary Wall, showing the view towards the western construction compound

7.4.20 14276 War Memorial

- 7.4.21 The war memorial was originally erected to commemorate those who died in the Boer War, and unveiled in 1904 at a site further west on the promenade, near High Street. It was moved to its present site, and the Garden of Remembrance opened, in 1948. The surrounding garden provides the setting for the memorial and permits no views beyond its boundaries. The potential visual impact is therefore no change and the significance of effect would be **Not Significant**.

14280/14281 Grafton Lodge

- 7.4.22 Grafton Lodge is one of the few buildings to survive from the earliest phase of Rhyl's development, a phase characterised by the construction of private villas in large plots. It probably dates from c.1820-30. The building is set within a large, walled garden, which provides its setting and enhances the value of the listed building. There is no intervisibility between construction site and the house and its setting and the potential visual impact is therefore no change and the significance of effect would be **Not Significant**.

14290 Royal Alexandra Hospital

- 7.4.23 The Royal Alexandra Hospital was built as a children's hospital and convalescent home, and was a new building for an already-established institution. The first hospital had been opened in a building on East Parade in 1872 and expanded piecemeal thereafter before acquiring a site for a new building. Funded by voluntary subscription, with financial assistance from Rhyl Urban District Council and the Duke of Westminster, the new hospital was designed by Alfred Waterhouse, architect of Manchester, and probably finished by his son, Paul Waterhouse. The west wing and central block are dated 1899 and 1900, and opened in 1902 - these are the work of Alfred Waterhouse. The east wing was completed 1908-10, and is possibly by Paul Waterhouse. The chapel had originally been built for an earlier hospital building on another site in c.1874 but was incorporated in Waterhouse's plans from the outset. It was designed by John Douglas, a Chester-based architect well-known for his ecclesiastical buildings.
- 7.4.24 The hospital's siting on the sea-front is a key aspect of its setting and reflects the importance then attached to fresh-air treatment. The open space lying between Marine Drive and the promenade is therefore not only the principal view from the hospital, but also one which enhances its setting. The hospital is best appreciated from Marine Drive, Grosvenor Road and Alexandra Road. The proposed new coastal defences would have no long-term impact on the setting or appreciation of the hospital.
- 7.4.25 The western construction compound would be sited directly opposite the hospital, within its setting (Figures 7-10 and 7-11). The presence of the compound and its structures, together with the increased traffic associated with deliveries, would introduce a short-term, temporary visual impact. The construction works on the foreshore are mostly to the east of Splash Point and the assessment has concluded that these would not impact on the setting of the hospital. The overall short-term, temporary visual impact is therefore considered to be moderate and its significance **Moderate/ Large**. The effect would be reversible on completion of the construction programme. Only the western end of the new coastal defences would have any intervisibility with the hospital, at a distance of around 600m. At this distance the proposed changes would not be readily apparent and the long-term impact is considered to be no change and the significance of effect would be **Not Significant**.



Figure 7-10: The view towards the Royal Alexandra Hospital, looking across the proposed construction compound



Figure 7-11: The view along Marine Drive, looking towards Splash Point, with the proposed construction compound to the left

Table 7-9: Potential visual effects on listed buildings

| Listing No. | Name | Value | Distance | Magnitude of temporary, short-term impact | Magnitude of long-term impact |
|-------------|--------------------------------|-------|----------|---|-------------------------------|
| 1510 | Lookout tower in Boundary Wall | High | 300m | No change | No change |
| 14276 | War Memorial | High | 360m | No change | No change |
| 14280/1 | Grafton Lodge | High | 450m | No change | No change |
| 14290 | Royal Alexandra Hospital | High | 20m | Moderate | No change |

7.5 Mitigation Measures

- 7.5.1 The principles of the hierarchy of mitigation have been employed with the primary mitigation being that of avoidance. The assessment identified three areas where significant palaeoenvironmental deposits are currently exposed on the beach (see Appendix K Figure 3, Areas A, B and C), within the original construction site boundary. The scheme was subsequently revised to exclude Areas A and C from the construction site as mitigation.
- 7.5.2 In the case of most developments the most appropriate form of archaeological mitigation is often seen as a strip, map and excavate approach, whereby the removal of overburden from an area exposes the archaeology, which is then subject to sample excavation and recording. The location of the present development in the intertidal zone makes this traditional approach to mitigation impractical and alternatives are therefore required.
- 7.5.3 The results from archaeological mitigation associated with a programme of coastal defence works at Borth, Ceredigion⁵⁷, provide useful information in relation to the development of a mitigation strategy for the present scheme. Like East Rhyl, Borth also has significant archaeological and palaeoenvironmental deposits, including a submerged forest, which are exposed along the foreshore and also buried beneath beach sand. However, the new defences at Borth comprised the construction of rock breakwaters, rock groynes and an offshore reef, rather than rock armouring of the seafront. Nevertheless, the construction methodology was sufficiently similar to be informative with regard to the current scheme.
- 7.5.4 The conclusions from the work at Borth were that *'the method of construction for the coastal defence structures was not one that was ideal for archaeological recording. The excavation of the footings of the structures was undertaken using a number of large machines to enable rapid excavation and laying of foundations between the receding and incoming tides. This window of opportunity was smaller depending on the height of the tides and reduced the further to the west the works were undertaken. The excavated areas were also often unstable and filled with water.'* The situation at East Rhyl is likely to be very similar.
- 7.5.5 Following on from the work at Borth discussions were held with the Archaeological Coastal Forum Group, which included representation from Cadw, the National Trust, RCAHMS, the four Welsh Archaeological Trusts and UWTSO, which resulted in

⁵⁷ Meek, J., 2012. *Borth Coastal Defence Scheme, Phase 1, Borth, Ceredigion: Archaeological Watching Brief*. Dyfed Archaeological Trust Report 2012/13

suggestions as to how archaeological mitigation might be implemented on similar intertidal developments on areas of peat beds and submerged forests in the future. It was recognised, however, that in some cases this methodology for mitigation may not be possible.

- The presence of peat beds and submerged forests should be identified at the outset of the project;
- Coastal monitoring should be undertaken over a period of at least 6 months to observe and define possible extents of peat beds and submerged forests, with the results feeding in to the design of the development or coastal defences scheme;
- In all cases where intertidal development is proposed, it is recommended that some form of detailed geophysical survey of the sea bed is carried out at the early design stage of identify wreck sites or the presence of fish traps.
- Where possible, structures to be constructed on the foreshore should be designed to avoid impacting upon these deposits, or minimising any impacts;
- Prior to the commencement of development a scheme of archaeological evaluation of the deposits should be undertaken. This could include observation of the exposed surfaces of any peat beds and initial assessment of tree stumps (identification of species and assessment for suitability for dendrochronology dating). A number of test pits should be excavated through the peats, where they will be impacted upon, to obtain palaeoenvironmental evidence for assessment. Radiocarbon dates should be obtained at this stage;
- Should significant remains be identified, such as artefacts or footprints, a scheme of detailed recording should then be implemented. This would include further palaeoenvironmental sampling. Alternatively this information may indicate that redesign of the proposals would be appropriate;
- If few or no significant remains are identified then a scheme of intermittent watching brief may be appropriate;
- Full assessment of the palaeoenvironmental and dendrochronology samples should then be undertaken, preferably before or during the construction phase in order that if highly significant information is revealed, further sampling can be undertaken; and
- Full reporting and archiving of all results.

7.5.6 The presence of significant, high value deposits associated with the submerged landscape (PRN 17103) has already been demonstrated at East Rhyl, while the timescale for the project precludes coastal monitoring to assist with the project design. The design of the rock armour and associated construction works is such that in this instance it will not be possible to mitigate through design alone. While avoidance provides appropriate mitigation for deposits which are currently exposed their presence is indicative of the potential for similar deposits to extend within the revised construction site, where adverse effects are considered to be unavoidable. The mitigation proposed below has therefore been developed to both reduce and offset adverse impacts.

7.5.7 Predicted direct effects are most likely during the construction phase, although it is recognised that any significant repairs undertaken during the operational life of the new coastal defences, as well as any subsequent decommissioning works also have the potential for similar physical impacts, albeit on a smaller scale.

7.5.8 It has already been recognised that the conditions under which a watching brief would

be conducted are unlikely to be appropriate for the recovery of sufficient information to ensure the preservation by record of deposits which would be damaged or lost as a result of the scheme. While a watching brief during construction remains valid mitigation to reduce the adverse effects through the identification and recording of significant features and deposits, as well as the recovery of artefacts, the potential extent of impacts is such that a broader spectrum of mitigation measures is required to offset the physical loss of deposits and the evidence for human activity, faunal remains and palaeoenvironmental evidence which they contain.

7.5.9 A phased programme of mitigation is therefore proposed with the objective of creating an interpretation of the archaeology, vegetation and landscape evolution of the site through time, thus offsetting the physical impacts and reducing the residual effects. The aims of the works should then be:

- to record and understand the evidence for the past environmental conditions of the site;
- to record and understand the evidence for human activity at the site;
- to collect samples to assess the potential for off-site analysis/assessment;
- to interpret archaeological site formation processes;
- to report on the findings of the surveys;
- to archive and disseminate the results of the work.

7.5.10 The phased investigation should include the following:

7.5.11 *Phase 1 mitigation – prior to construction mobilisation*

- Walkover survey and trial augering where exposures of sediment permit such works. Such a rapid survey would set some baseline expectations for the nature of sequences likely to be encountered in subsequent phases.
- Any submerged forest tree stumps/trunks, or wooden structural remains, which are currently exposed within the construction area should be recorded in situ, prior to construction, noting location, stratigraphic information, dimensions and descriptive record. Samples should be taken for dendrochronological dating and species identification. All recording and sampling must be conducted by an appropriately qualified specialist.
- Geophysical survey to map out buried topography and identify the position of potential palaeochannels. This would be a two-stage process that would include electromagnetic surveys at low tide to map the geoelectrical differences across the beach (these would reflect the nature of the underlying geology) and a shallow seismic survey at high tide to model the distribution of seismic units across the site. The outcome of these surveys would be a series of topographic interpretations and subsequent targets for test pitting/drilling.
- Survey, recording and sampling following any exposure of significant deposits as a result of storms.
- Test pitting/boreholes to recover samples from the buried sequences for palaeoenvironmental analysis. These works would also examine the subsurface for archaeological and/or biological remains.
- Full excavation, recording and sampling of timber structures and deposits in Area B to ensure their preservation by record.

7.5.12 Phase 2 mitigation – construction phase

- Avoidance of exposed deposits in Areas A and C, with appropriate demarcation during construction if necessary.
- Watching brief during groundworks associated with the following: construction of beach access ramp; excavation of beach sand; construction of rock armour; construction of beach access steps. The watching brief will also monitor the wider foreshore throughout the construction phase to identify anything revealed as a result of turbulent flows around stockpiled materials. Sufficient time must be allowed for an appropriate level of investigation, recording and sample retrieval where significant deposits are revealed. Any significant discoveries to be demarcated by temporary barrier fencing until investigations are completed. The implementation of the watching brief will, however, be dependent on the construction programme and methods, the weather, tides and health and safety considerations. The use of temporary shoring and a pump should be considered where appropriate and practicable, although confined spaces working may not be possible on the grounds of health and safety given the high water table on the beach, high instability of exposures and the tidal exposure of the site.
- Any trees or wooden structural remains encountered during the construction phase should be recorded in situ, with some hand excavation around the remains, sufficient to facilitate sampling and recording by an appropriately qualified specialist. The implementation of the recording would be subject to the same health and safety constraints as those during the watching brief.
- Survey, recording and sampling following any exposure of significant deposits as a result of storms for the duration of the project.

7.5.13 Phase 3 mitigation – on completion of phase 2 mitigation

- Assessment and analysis of recovered materials.
- Dendrochronological samples will need to be assessed for suitability for dating and the species type and age of the trees/timbers will be determined. Where cross-matching with existing tree ring data cannot be determined, it may be necessary to undertake radio-carbon dating of some of the material to provide dating evidence.

7.5.14 The mitigation outlined above is outlined in Table 7-10 with respect to the individual heritage assets where direct impacts have been predicted.

Table 7-10: Summary of potential direct impacts and mitigation

| Asset | Value | Mitigation |
|--|--------|--|
| Area A deposits | High | Avoidance |
| Area B deposits and structures – PRN 123322 | Medium | Excavation: Preservation by record |
| Area C deposits | High | Avoidance |
| PRN 17103 Rhyl foreshore submerged landscape | High | a) Walkover survey b) Geophysical survey c) Recording after storm exposures d) Test pits/ boreholes e) Watching brief, recording and sampling f) Analysis and reporting |
| PRN 106402 causeway | Low | Watching brief |

7.6 Residual Effects

- 7.6.1 The proposed mitigation of avoidance through modifications to the boundary of the construction site would remove impacts in three areas of the foreshore where important archaeological and palaeoenvironmental deposits are currently exposed (Areas A and C), such that they would be subject to no residual effects (**not significant**). While it has not been possible to also exclude Area B from the construction site, the proposed mitigation of preservation by record would reduce the magnitude of the residual impact from major to **Moderate**.
- 7.6.2 However, these deposits are associated with the Rhyl foreshore submerged landscape (PRN 17103), elements of which extend over a wide area. The nature of deposits currently exposed suggest strongly their continuation within the construction site. It has been recognised that physical impacts on these deposits cannot be reduced further through changes to the project design and a range of mitigation measures have therefore been developed to reduce and offset the significance of effects, while accepting that the loss of some deposits as a result of the construction works is unavoidable. The programme of pre-construction surveys and sampling is intended to recover data from these deposits in a controlled manner, prior to their partial loss, while the watching brief has the potential to add further information. The effect of this mitigation would therefore be to preserve by record a sample of the evidence contained within the deposits, thus reducing the magnitude of the effect from major to moderate, the significance of which would be reduced from large to **Moderate**.
- 7.6.3 In the case of a causeway (PRN 106402) which may extend within the construction site a watching brief would provide sufficient mitigation, reducing the magnitude of the residual effect to **slight**.
- 7.6.4 The setting impact on the Lookout Tower in Boundary Wall, the War Memorial and on Grafton Lodge would all be **Not Significant**. The setting impact on Royal Alexandria Hospital would be temporary **Moderate/ Large** during construction. The effect would be reversible on completion reducing to **No Significant Effect**.

Table 7-11: Summary of residual effects

| Asset | Value | Magnitude of impact | Residual effect | Significance of residual effect after mitigation |
|--|--------|---------------------|-----------------|--|
| Area A deposits | High | Major | Not significant | Not significant |
| Area B deposits and structures – PRN 123322 | Medium | Major | Moderate | Moderate |
| Area C deposits | High | Major | Not significant | Not significant |
| PRN 17103 Rhyl foreshore submerged landscape | High | Major | Moderate | Moderate |
| PRN 106402 causeway | Low | Major | Slight | Slight |

8 Population, Human Health & Socio-economics

8.1 Introduction

- 8.1.1 This chapter assesses the potential for the development to result in likely significant effects on the health and wellbeing of the population and the local economy of Rhyl.

8.2 Baseline Conditions

8.2.1 Population

- 8.2.2 Rhyl is within the county of Denbighshire in North Wales. Denbighshire had an estimated population of 94,805 in late 2017⁵⁸. The population of Denbighshire is stable, increasing less than 1% in four years. The most recent population estimates for Wales (October 2017) state Rhyl has a population of 25,122, 26.4% of the Denbighshire population⁵⁸.

- 8.2.3 The wards of Rhyl East and Rhyl South East are those closest to the scheme, which had a combined population of 11,441 in 2017. The areas have a broadly similar age structure to Denbighshire as a whole; East Rhyl has a higher proportion of individuals over 65 than the Denbighshire average, and a lower proportion of individuals under the age of 25 (Figure 8-1)⁵⁹.



⁵⁸ Wales population estimates by Lower Super Output Area and age group (2017) Online [Available at: <https://stats.wales.gov.wales/Catalogue/Population-and-Migration/Population/Estimates/Small-Area/populationestimates-by-lowersuperoutputarea-agegroup>]

⁵⁹

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/wardlevelmidyearpopulationestimatesexperimental>

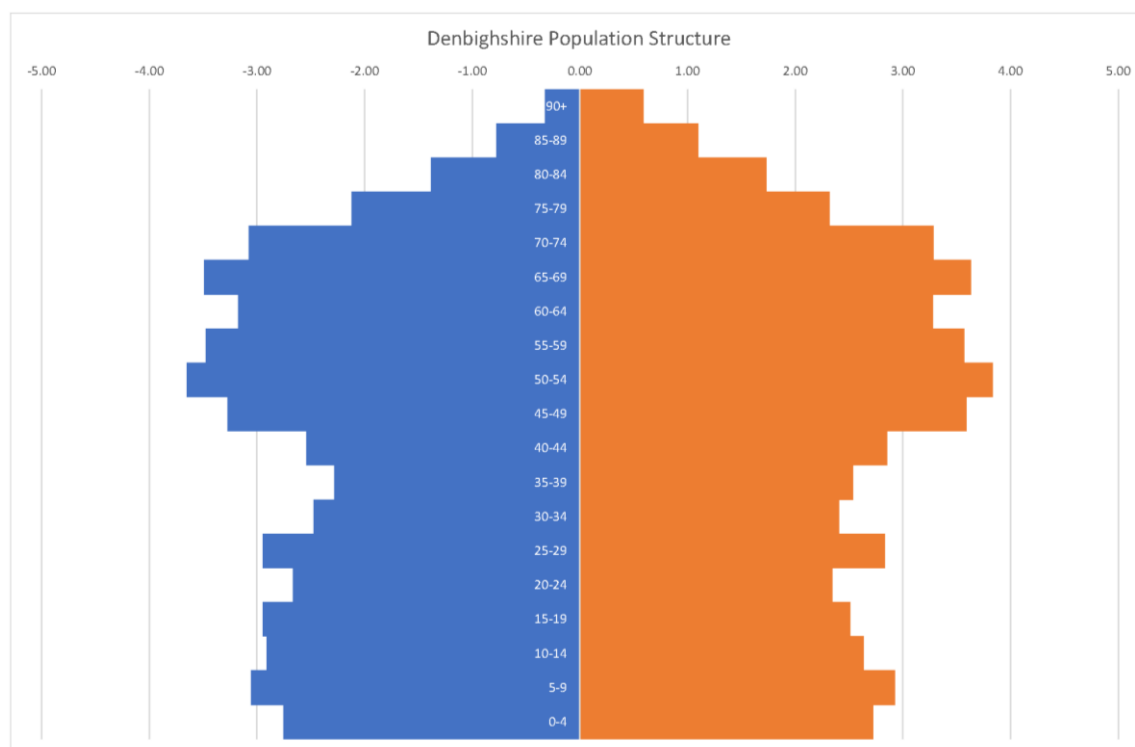


Figure 8-1: Population structures for Rhyl East ward and Denbighshire (female orange, male blue)

- 8.2.4 Rhyl East and South East have a low population of ethnic minorities; at the 2011 Census, 94.6% of the population of these wards were white British, compared to 86.0% in England and Wales.
- 8.2.5 This area also has a relatively high population of individuals of working age that are economically inactive; 25.5% of those of working age. 7.9% of the population are economically inactive due to a long-term sickness (Figure 8-2). This is significantly higher than the Wales figure of 6.7%⁶⁰.
- 8.2.6 According to the Welsh Index of Multiple Deprivation (WIMD), Rhyl, particularly West Rhyl, is one of the most deprived areas in Denbighshire and among the most deprived in Wales⁶². Rhyl East 3, covering the promenade along Splash Point and the amenity areas along East Parade and Marine Drive, ranks as the 99th most deprived in Wales, out of 1,909. It ranks as 78th for income, 46th for employment and 19th for health. Rhyl East 1, covering the residential areas backing the proposed scheme, is ranked as the 389th most deprived, and ranks 379th for income, 261st for employment and 392nd for health. Particular issues for the population of Rhyl include health and employment levels⁶¹ (Rhyl West 1 is the lowest ranked LSOA in Wales for health deprivation levels). 73.9% of individuals of working age are economically active, compared to 78.0% in Great Britain as a whole.

⁶⁰ Labour Market Profile for Denbighshire – [Online] Available at: <https://www.nomisweb.co.uk/reports/lmp/la/1946157386/report.aspx>

⁶¹ WIMD (Welsh Index of Multiple Deprivation), 2014. Denbighshire Local Authority (W06000004). [Online] Available at: <http://wimd.wales.gov.uk/geography/la/W06000004?lang=en#&min=0&max=10&domain=overall>

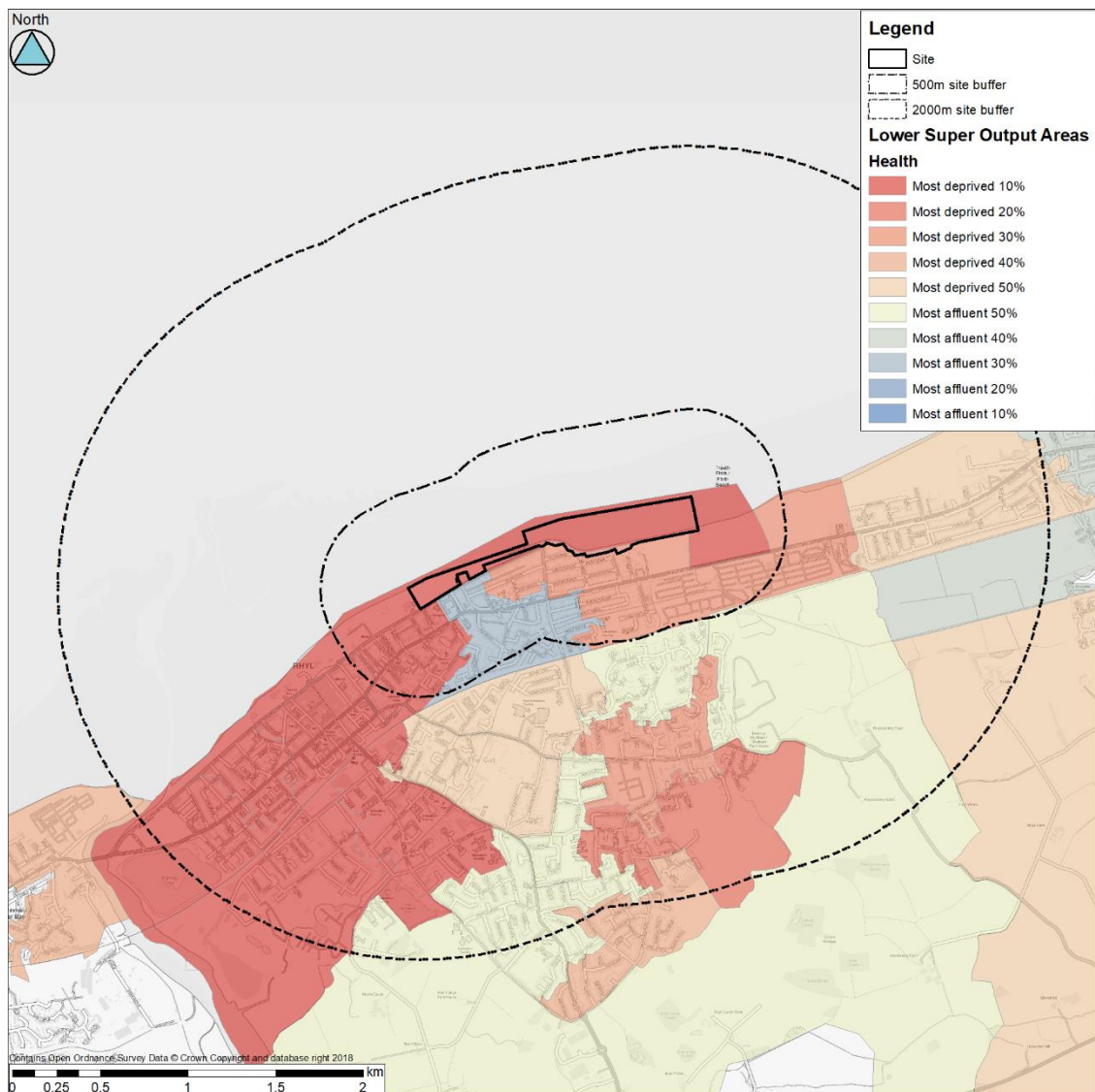


Figure 8-2: Health deprivation statistics for the area around the scheme⁶². Most deprived means that population health is poor. Classes are relative to Wales

8.2.7 Commuting statistics for Denbighshire (the lowest geographical area this data is available) show that the county is a net exporter of labour; 42,200 work in Denbighshire, as opposed to 42,900 economically active individuals that live there. 30,700 (71.6%) of economically active individuals that live in the county also work there. 11,500 commute into the county⁶³.

⁶² Department for Communities and Local Government (DCLG) – The English Indices of Deprivation 2015 – Technical Report. Available Online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/464485/English_Indices_of_Deprivation_2015_-_Technical-Report.pdf [Accessed 03/07/2018].

⁶³ StatsWales data on commuting [Online] Available at: <https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Commuting>

8.2.8 *Local Economy*

8.2.9 A higher proportion of Denbighshire residents work in the public sector than in any other local authority in the UK, with Denbighshire County Council, Betsi Cadwaladr University Health Board and state education all ranking among the largest employers in the area⁶⁴. This is partly due to the fact that in the past the private sector has shown a reluctance to invest in the area⁶⁵. In Rhyl however, slightly fewer people than the UK average work in the public sector, with the three largest industries being retail, leisure and tourism. Jobs in these sectors are often low paid and seasonal⁶⁵.

8.2.10 Since the 19th century, Rhyl's economy has been largely dominated by the tourism, retail and leisure sectors, traditionally attracting both large numbers of day visitors and those who stay for longer. However, the economy of Rhyl has found the changes in the UK tourism sector challenging and has remained dependent on long family holidays in the UK, even as these have steadily declined⁶⁴. Other coastal resorts along the North Wales coast, such as Colwyn Bay and Llandudno, have changed to continue to appeal to holiday-goers, by adapting to a change in holidaying habits, away from traditional seaside holidays and towards activities such as walking and mountain biking. Rhyl's failure to adapt has resulted in its peak season being short. Due to this, a high proportion of employment in Rhyl is seasonal and poorly paid (Figure 8-3). This has been a significant driver in the increasing levels of deprivation in many areas⁶⁵. Since the economic crash in 2008, unemployment levels in Rhyl have increased sharply, with younger residents (16-24) the most affected. Rhyl has one of the highest concentrations of individuals on Job Seeker's Allowance anywhere in Wales.

8.2.11 *Tourism in Denbighshire and Rhyl*

8.2.12 Tourism accounts for approximately 10% of employment in Denbighshire and slightly more in hotspots within the County, for example Rhyl and Prestatyn⁶⁵. In recent years tourism rates on a County-wide scale has shown small increases, but these are bolstered by an improving rural tourism market, whilst coastal tourism has been stagnant⁶⁵. Although tourism plays a significant part of Denbighshire's economy, it lags behind nearby areas, for example Conwy County, which has a tourism industry worth more than double that of Denbighshire⁶⁵.

8.2.13 Rhyl has attracted tourists, predominantly from the North-West of England and the West Midlands, since beach holidays first became popular in the 19th Century. The boom in tourism contributed to significant development in Rhyl, including many streets of three-storey townhouses in Rhyl to be used as guesthouses. These buildings are now largely divided into 1 bedroom privately-rented apartments and constitute some of Rhyl's most deprived areas⁶⁶.

8.2.14 Tourism in Rhyl has experienced a long, gradual decline. This decline is now beginning to level off but has resulted in the industry being fragile. Repeat business is high and numbers of day visitors have been more resilient than those who stay overnight, but these guests do not spend as much in the town⁶⁶.

⁶⁴ Denbighshire County Council Local Development Plan 2006-2021 [Online]. Available at: <http://www.denbighldp.co.uk/Webfiles/Adoption/Adopted%20LDP%20text%20english.pdf>

⁶⁵ Denbighshire Economic & Community Action Strategy 2013-2023 [Online] Available at: <https://www.denbighshire.gov.uk/en/your-council/strategies-plans-and-policies/corporate-strategies/economic-and-community-ambition-strategy-en.pdf>

⁶⁶ Rhyl Going Forward Appendix 1 – A review of the Rhyl Going Forward Delivery Plan, 2012 [Online] Available at: <https://moderngov.denbighshire.gov.uk/documents/s6689/RGF%20App%201.pdf>.

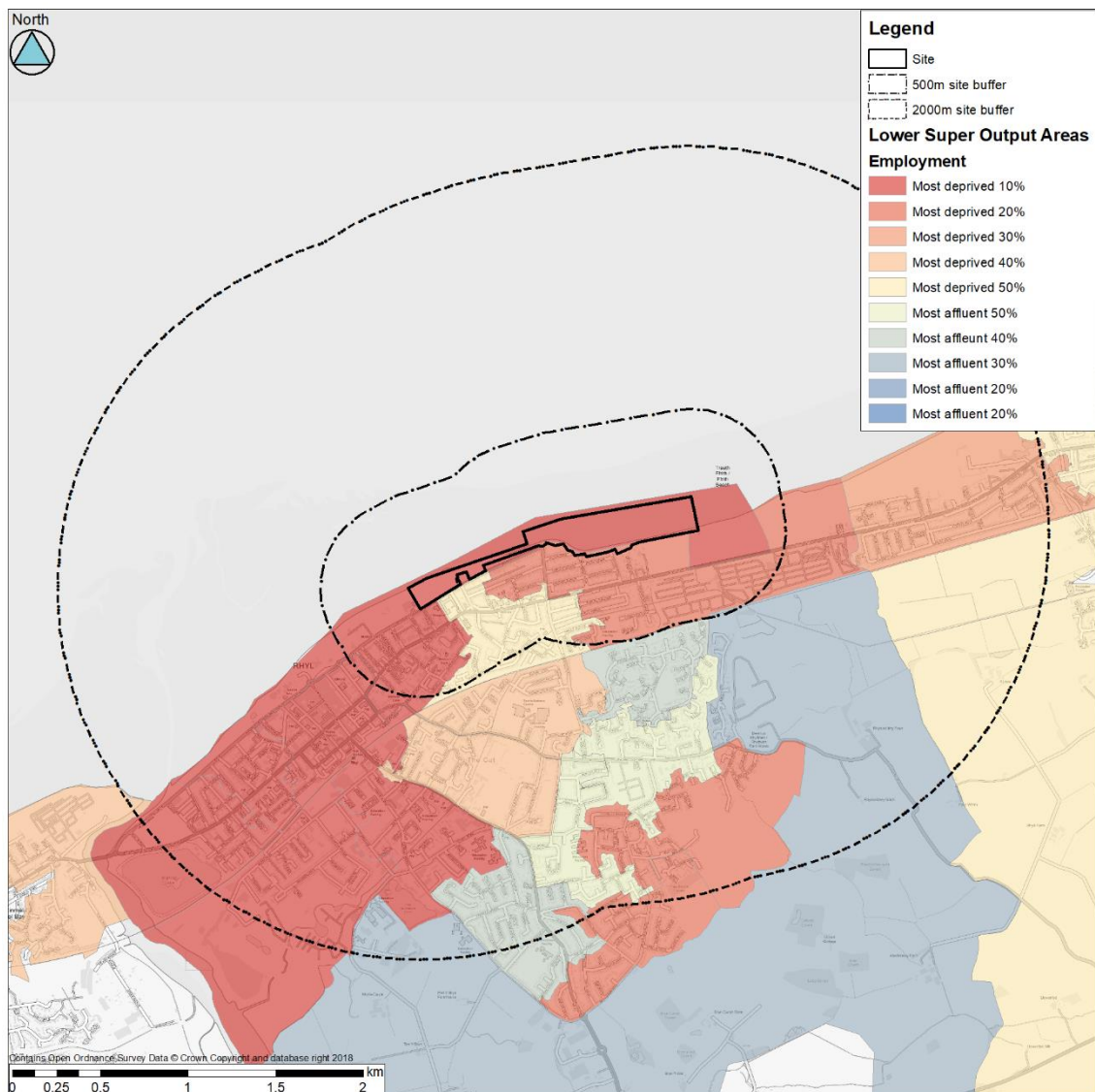


Figure 8-3: Employment deprivation statistics for the area around the scheme⁶². Most deprived means employment levels are low. Classes are relative to Wales

- 8.2.15 For tourists in Rhyl who do choose to stay overnight, the most common form of accommodation is the static caravan, in one of the many large caravan parks that lie along the Denbighshire Coast (Figure 8-4). However, recently, some large hotel chains have opened hotels in Rhyl and are already popular with both business users and tourists⁶⁷.
- 8.2.16 Recreational fishing is a popular activity with recreational visitors to Rhyl, meaning it is prominent along the promenade. Other large tourism receptors lie along the sea front within 2km of the scheme, described in Table 8-1.

⁶⁷ Personal Communication with Peter McDermott, of DCC's Tourism team, 20/08/2018

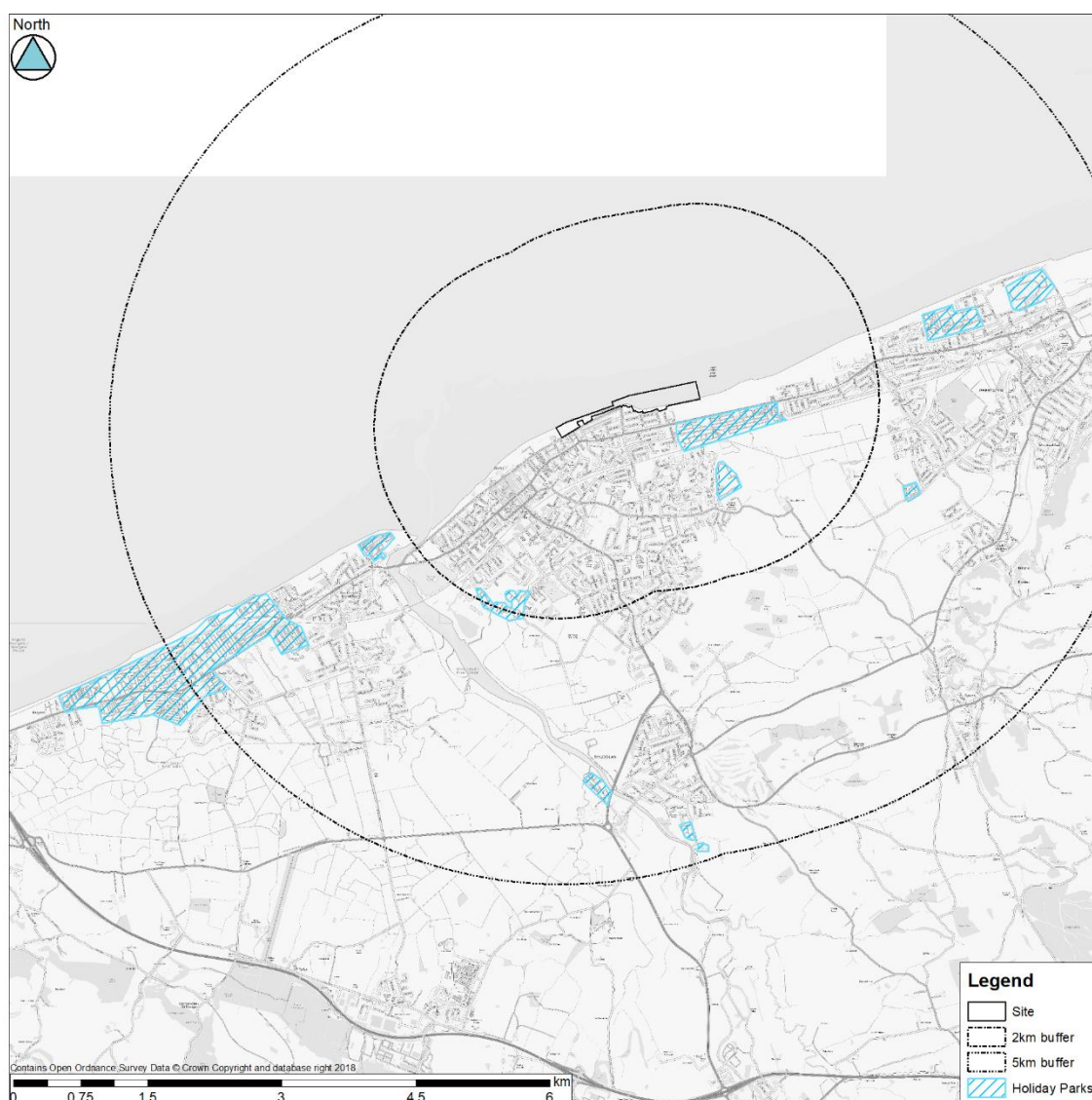


Figure 8-4: Holiday parks within 5km of the proposed site

Table 8-1: Large tourism receptors within 3km of the proposed scheme

| Tourism receptor | Distance from scheme (km) |
|-------------------------------|---------------------------|
| The Pavilion Theatre | Adjacent |
| Rhyl Golf Club | Adjacent |
| New Pines Holiday Home Park | 0.25 |
| SeaQuarium Rhyl | 0.65 |
| Lyons Robin Hood Holiday Park | 0.7 |
| Drift Park Water Play Area | 1.3 |
| Marine Holiday Park | 1.82 |

8.2.17 Within the town of Rhyl, the majority of tourist attractions and tourism accommodation, in the form of hotels, B&Bs and holiday caravan parks, lie to the west of the proposed scheme, as does Rhyl town centre. However, there are smaller businesses to the south

and west of the scheme, that have the potential to become isolated from the rest of Rhyl's tourism industry during the construction stage. However, they could benefit from construction workers requiring accommodation during the construction phase. These are displayed in Table 8-2. None of these businesses are in locations considered to be at risk of flooding and therefore are not in locations which stand to benefit from the proposed scheme.

Table 8-2: Small tourism-dependent businesses close to the scheme

| Tourism receptor | Distance from scheme (metres) |
|----------------------------|--------------------------------------|
| The Promenade B&B | 45 |
| Melbourne Guest House | 70 |
| Toffees Guest House | 86 |
| The Bexley Bed & Breakfast | 110 |
| Plastirion Court | 125 |
| Ocean View Guest House | 180 |

8.2.18 Rhyl town centre is 650m from the scheme as its closest point and contains facilities for tourists and residents of Rhyl, including bars & restaurants, banks, supermarkets and some high street stores.

8.2.19 Day visitors to Rhyl often rely on parking within the town to gain access to the Promenade and the beach. There is approximately 5.5 hectares of council-owned parking in Rhyl, the majority of which is to the west of the proposed scheme. The Pavilion Theatre Car Park is the only parking area located close to the proposals, but there is also approximately 2.4km of street parking along Rhyl Parade (including Marine Drive). The wider site boundary does not contain any of the Parade but does run alongside it (Figure 8-5)⁶⁸. The construction compound site entrance on Marine Drive would temporarily occupy a few of the existing on street parking spaces, however this is not considered significant given the availability of parking in the surrounding area.

8.2.20 *Education*

8.2.21 Rhyl town has two secondary schools, seven primary schools and one school for additional learning needs. Coleg Llandrillo Cymru, a further education college, has a campus in Rhyl, offering degrees, apprenticeships and further education courses for adults. Education centres within Rhyl are displayed in Table 8-3.

⁶⁸ Council Car Parks in Denbighshire, Online: <https://www.denbighshire.gov.uk/en/resident/parking-roads-and-travel/parking-and-permits/council-car-parks/find-a-car-park.aspx> [Accessed 05/08/2018]

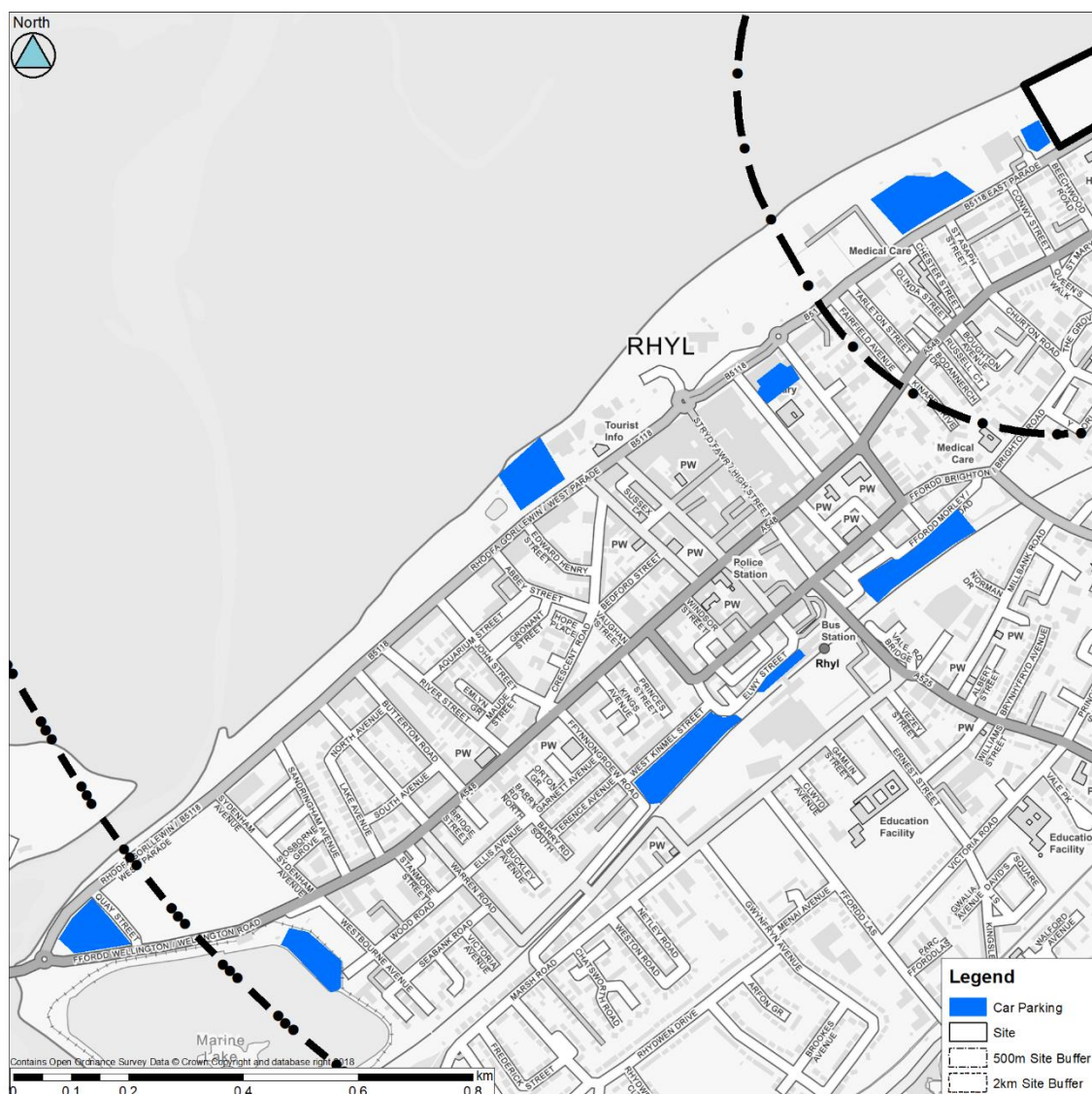


Figure 8-5: Location of public car parking within 2km of the scheme (none were identified to the east)⁶⁸

Table 8-3: Educational institutions within Rhyl⁶⁹

| Name of School | Type | Distance from scheme (km) |
|---|---------------------------|---------------------------|
| Ysgol Bryn Heddyd | Primary | 0.43 |
| Rhyl High School | Secondary | 0.98 |
| Ysgol Emmanuel | Primary | 1.13 |
| Ysgol Llewelyn | Primary | 1.60 |
| Blessed Edward Jones Catholic High School | Secondary | 1.36 |
| Ysgol Tir Morfa | Additional Learning Needs | 1.88 |

⁶⁹ Denbighshire County Council – find a school:
<https://www.denbighshire.gov.uk/en/resident/educaiton/school-by-category.aspx>

| Name of School | Type | Distance from scheme (km) |
|--------------------------------------|-----------------------------------|---------------------------|
| Christchurch Catholic Primary School | Primary | 1.12 |
| Ysgol Gymraeg Dewi Saint | Primary | 2.08 |
| Coleg Llandrillo Rhyl Campus | College – School leavers & adults | 1.77 |
| Ysgol Plas Cefndy | Primary | 1.91 |
| Ysgol Mair RC | Primary | 1.48 |

8.2.22 *Welsh Language*

8.2.23 The Denbighshire Local Development Plan states “The Local Development Plan will ensure that the impact of new development the Welsh Language and culture will be assessed in all parts of the County” (see 2.1.32).

8.2.24 According to figures obtained by the 2011 Census (the most recent year for which data is available), Rhyl has a lower proportion of individuals who can speak Welsh than average in Wales. 10.3% of Rhyl residents said they can read, write and speak Welsh (14.6% in Wales), 1.2% said they can speak and read Welsh but not write it (1.5% in Wales), 2.5% said they can speak Welsh but cannot read or write it (2.7% in Wales), 5.8% can understand spoken Welsh but not speak it themselves (5.3% in Wales), whilst 78% said they had no Welsh language skills whatsoever (73.3% in Wales)⁷⁰ (See Figure 8-6).

8.2.25 *Healthcare*

8.2.26 The health of the population of Denbighshire is broadly similar to the health of the Welsh population in most aspects. Approximately 5% of people in Denbighshire suffer from coronary heart disease, which is associated with low physical inactivity, poor diet and obesity, and smoking⁷¹. Approximately 4% of people suffer from the disease in North Wales. Furthermore, in 2013/14 58% of adults in Denbighshire were observed as being overweight or obese, which is the same percentage as reported for Wales. Rhyl however has an issue with the prevalence of its population who are long-term sick. Health centres that serve Rhyl are displayed in Table 8-4.

⁷⁰ Welsh Language Skills by Electoral Division, 2011 Census. Available online: <https://statswales.gov.wales/Catalogue/Welsh-Language/welshlanguageskills-by-ediv-2011census>. Accessed 10/10/2018

⁷¹ Health Profile for Denbighshire:

<http://www.wales.nhs.uk/sitesplus/documents/888/4831%20SC%20Wales%20Health%20Info%20Graphic%20-%20Denbighshire%20PROOF%208.pdf>

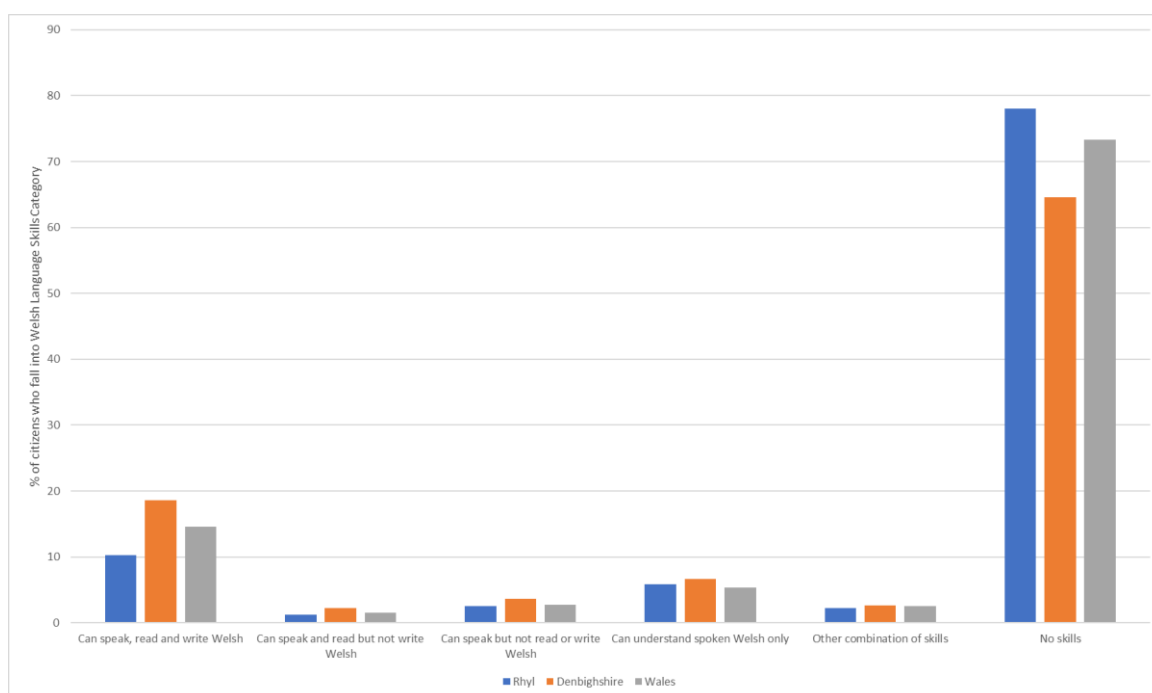


Figure 8-6: Graph showing Welsh Language provision in Rhyl, Denbighshire and Wales

Table 8-4: Health centres within 2km of the scheme

| Name of health centre | Type | Distance from scheme (km) |
|----------------------------|-----------------------------|---------------------------|
| Rowlands Pharmacy | Pharmacy | 0.28 |
| Hylton Dental Care | Dentist | 0.39 |
| Bod Heulong | Dentist (Children only) | 0.62 |
| Boots | Pharmacy | 0.74 |
| Lloyds Pharmacy | Pharmacy | 0.80 |
| Fford Elan Dental Practice | Dentist | 0.98 |
| Westfield Surgery | General Practice | 1.05 |
| Vale Road Pharmacy | Pharmacy | 1.08 |
| Elwy Dental Practice | Dentist | 1.10 |
| Lloyds Pharmacy | Pharmacy | 1.13 |
| Kings House Surgery | General Practice | 1.18 |
| Clarence Medical Centre | General Practice & Pharmacy | 1.19 |
| Parry's Corner | Pharmacy | 1.20 |
| Madryn House Surgery | General Practice | 1.29 |
| Park View Surgery | General Practice | 1.30 |
| Lakeside Medical Centre | General Practice | 1.30 |
| Wellington Road Pharmacy | Pharmacy | 1.50 |

8.2.27 *Open Space*

8.2.28 Rhyl is a small town within a relatively rural setting. Whilst the north Wales coast is fairly urbanised, the countryside further inland is of high recreational value, with Clwydian Range & Dee Valley AONB and Snowdonia National Park both within a 30 minute drive.

8.2.29 Physical activity statistics for Denbighshire and Wales show that in 2013/14, the average number of days of physical activity per week reported adults was 2.5 and 2.4, respectively⁷². The National Survey for Wales also revealed the types of activities that are undertaken by people in Denbighshire and Wales in the last 12 months⁷³:

- 75% of people in Denbighshire said they had been walking (72% in Wales);
- 12% of people in Denbighshire said they had been running (17% in Wales);
- 20% of people in Denbighshire said they had been wildlife watching (16% in Wales);
- 61% of people in Denbighshire said they do not undertake frequent sporting activity (53% in Wales).

8.2.30 Open space and areas for recreation are an important resource for the local population in Rhyl, as they offer a means to enjoy the local area and undertake physical activity. This benefits health and well-being. Recreational routes within the proposed site include the Wales Coast Path and National Cycle Route 5 (a traffic-free cycle route) which runs from Reading to Holyhead. The beach at Splash Point partly lies within the proposed scheme and provides important space for recreation.

8.2.31 Not including Rhyl Beach, there is 93.6 hectares of recreational greenspace within the town, or 37.2m² per resident⁷⁴. At lowest astronomical tide, the beach surrounding Rhyl is 229 hectares, which at highest astronomical tide, disappears. During lower tides the beach is popular with tourists, day visitors and residents for leisure activities.

8.2.32 *The Wales Coast Path*

8.2.33 The Wales Coast Path (WCP) runs from the England and Wales Border in Flintshire to the England and Wales Border in Monmouthshire, along the Wales Coastline. In 2014, a report was published on the end of the Coast Path Project, which assessed its contribution to the Welsh economy and to visitor numbers⁷⁵.

8.2.34 According to the report, users of the WCP contributed £32.3 million to the Welsh economy in 2012/13 (the latest year for which figures are available), of which 80.5% was from overnight visitors, despite this group only making up 30.5% of all users.

8.2.35 Over 40% of people who use the WCP do so every day, and over half use it more than once a month – showing that although the WCP is a draw for tourists, in some areas it is also an important community resource.

8.2.36 The average distance walked on the WCP was 1.8 miles.

⁷² <http://www.publichealthwalesobservatory.wales.nhs.uk/whs-trends-2015>

⁷³ National Survey for Wales – [Online] Available at: <https://statswales.gov.wales/Catalogue/National-Survey-for-Wales>

⁷⁴ Green Space in Denbighshire – Denbighshire County Council (<https://www.denbighshire.gov.uk/en/resident/leisure/play-areas.aspx>) [Accessed 31st July 2018]

⁷⁵ Natural Resources Wales (2014): Wales Coast Path – End of Project Report.

8.2.37 Over 1 mile of the WCP, that runs along Rhyl Promenade, will need to be diverted for the duration of the works, in order to protect the public.

8.2.38 *Community Facilities*

8.2.39 A list of community facilities within Rhyl, that do not fall within any other category, are displayed in Table 8-5.

Table 8-5: Community facilities within 2km of the proposed scheme

| Facility | Asset value | Distance from scheme (km) |
|---------------------------------------|---|---------------------------|
| Exercise park on East Parade | Recreational asset – promotes physical activity. | Within |
| Rhyl Library & One stop shop | Community facility that operates both as a library and a centre for advice on benefits, business rates and council tax. | 0.61 |
| Rhyl Leisure Centre | Promotes physical activity to local residents – contains swimming pools, sports areas and gym. | 0.79 |
| The Kings Storehouse – Rhyl Food Bank | Third sector facility – offering food aid to residents in need. | 1.20 |
| Rhyl Youth Centre | Community facility providing recreational asset to young residents. | 1.22 |

8.3 Assessment Methodology

8.3.1 A social impact assessment has been undertaken to assess the development proposals against the baseline presented. The assessment considers how the physical impacts of the proposed scheme, together with how the communities' knowledge or understanding of the scheme, may cause socio-economic impacts and affect socio-economic behaviours, aspirations, and health and well-being.

8.3.2 The Coastal Community Typology Report (2015) categorises Rhyl and the associated North Wales Coastline as being within a B2 "Resorts and Ports" area. Whilst providing a strategic perspective across Wales, this study also offers some benchmarks against which to analyse the situation and trends relating directly to Rhyl, including local economic factors, issues for vulnerable groups and change factors.

8.3.3 The EIA Scoping Response from DCC stated that footfall data could be used to establish a baseline of visitor numbers for tourist attractions in Rhyl. Sources for tourism baseline data consisted of publicly available information on tourism in Rhyl, local plan documents and correspondence with Peter McDermott, the Team Leader for Tourism at Denbighshire County Council. It was deemed that from these sources, the information already collated was sufficient to create an adequate baseline from which to assess potential impacts.

8.4 Potential Impacts & Significant Effects

8.4.1 *Employment*

8.4.2 It is anticipated that the construction of the proposal would take approximately 37 months from May 2019 to June 2022. Balfour Beatty has indicated that the scheme

would be registered with Considerate Constructors, one of the objectives of which is to contribute to and support the local community and economy. The project is procured through the SCAPE public-sector partnership under the National Civil Engineering and Infrastructure framework. Key performance indicators related to this include: local supplier and local labour spend; small and medium enterprise engagement and spend; and Fair payment.

- 8.4.3 In the construction strategy (provided in Appendix G), Balfour Beatty recognises that opportunities for local employment may be limited in terms of coastal specialism of the intertidal works but could be available through the more general civil engineering approach to the works outside the intertidal zone. The project therefore offers opportunity to a varied group of suppliers and subcontractors. Technical compliance, quality requirements and availability will dictate the radius of the project resource footprint.
- 8.4.4 Balfour Beatty anticipates a peak permanent staff contingent of 50 staff during the delivery of the scheme (excluding visiting service contractors) and that they will endeavour to source labour from the local area. In Rhyl, 8.4% of jobs are in Construction (higher than the Great Britain average of 4.6%). Assuming that all 50 positions would go to local residents would temporarily increase the percentage working in construction to 8.9%. If all 50 jobs were taken by individuals who live in Rhyl and previously were not economically active, the proportion of economically active individuals in Rhyl would rise from 62.1% to 62.4%⁷⁶ for the construction period of 37 months.
- 8.4.5 Leakage effects are those outside the impact area. Analysis carried out on commuting statistics from StatsWales⁷⁷ suggests that within the county of Denbighshire, 27% of individuals that work within the county commute in from another county. This suggests that of the 50 jobs created by the scheme's construction, 13 of them would be occupied by individuals that live outside of Denbighshire.
- 8.4.6 In addition to the direct construction employment gained by the project itself, there will be an increase in local employment arising from indirect and induced effects of the construction activity. Employment growth may arise locally through suppliers to the construction process. Additionally, it stands to reason that part of the additional income of the construction workers will be spent in Rhyl or elsewhere in Denbighshire, generating or supporting further employment. This is called the multiplier effect.
- 8.4.7 The impact of the multiplier effect depends on the size of the geographical area that is being considered, the business supply chain and strength of income effects.
- 8.4.8 During its operational stage, the proposed scheme would only negligibly contribute to local employment directly, through any necessary maintenance. However, the increased protection the structure would offer the town of Rhyl may contribute to the town becoming a more attractive area in which to live and work, contributing to the local economy. In this way, the proposed scheme could indirectly contribute to local employment levels.

⁷⁶ Nomisweb (2011): Local Area Report for Rhyl Built-up Area [Online]. Available at: <https://www.nomisweb.co.uk/reports/localarea?compare=1119885754>. Accessed 16th August 2018.

⁷⁷ StatsWales (2018): Commuting patterns by Welsh Local authority and measure [Online]. Available at: <https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Commuting/commutingpatterns-by-welshlocalauthority-measure>. Accessed 16th August 2018.

8.4.9 It is anticipated that due to the factors outlined above, the proposed scheme would have a slight positive impact on local employment (slight impact determined as medium importance of receptor, minor magnitude (refer to Table 3-5).

8.4.10 *Diversion of the Wales Coast Path and National Cycle Network Route 5*

8.4.11 The Wales Coast Path and National Cycle Network Route 5 both run along Rhyl Promenade and sections of them would both need to be diverted for the duration of the construction. Two short sections of footpath that connect with the Wales Coast Path from Hilton Drive and Garford Road would also be affected by PRow closures. The section of Promenade that would be diverted would be between the Pavilion Theatre and the public footpath that runs between Lyons Robin Hood Holiday Park and the coast, through Rhyl Golf Club's course (Figure 8-7)⁷⁵. The diversion would run along East Parade and Marine Drive, south down Tynwydd Road, then along Rhyl Coast Road until Lyons Robin Hood Holiday Park, before heading north and meeting its usual position on Rhyl Promenade.

8.4.12 The proposed diversion would be 550m (25%) longer than the original route and would run through urban areas of Rhyl, thereby offering no views over Liverpool Bay, as the usual route does. The diversion could make the WCP less appealing to use and has the potential to temporarily make Rhyl a less attractive tourist and leisure destination for visitors that enjoy cycling and/or walking. However, this group of individuals do not comprise a significant group of visitors to Rhyl, therefore it is not anticipated that this would impact upon the tourist economy overall.

8.4.13 The proposed diversion would be approximately 800m to the east of the busiest tourist areas in central Rhyl, and so would mainly be expected to affect residential users. Rhyl does not experience a significant influx of tourism from walkers or cyclists⁶⁷, unlike Prestatyn and Holywell⁷⁸. Therefore, it is not anticipated that the diversion will have a negative impact upon the local tourism industry.

8.4.14 For local residents who use the Wales Coastal Path, it is calculated that the diverted route would take approximately 7.5 minutes longer to walk than the original route (assuming an average walking speed of 4.8kph). This diversion is therefore not considered long enough to have a negative impact upon local users.

⁷⁸ Towns and villages in Wales that hold Walkers are Welcome status – Available online: (<https://walkersarewelcome.org.uk/waw-towns-wales/>) Accessed 21/09/2018

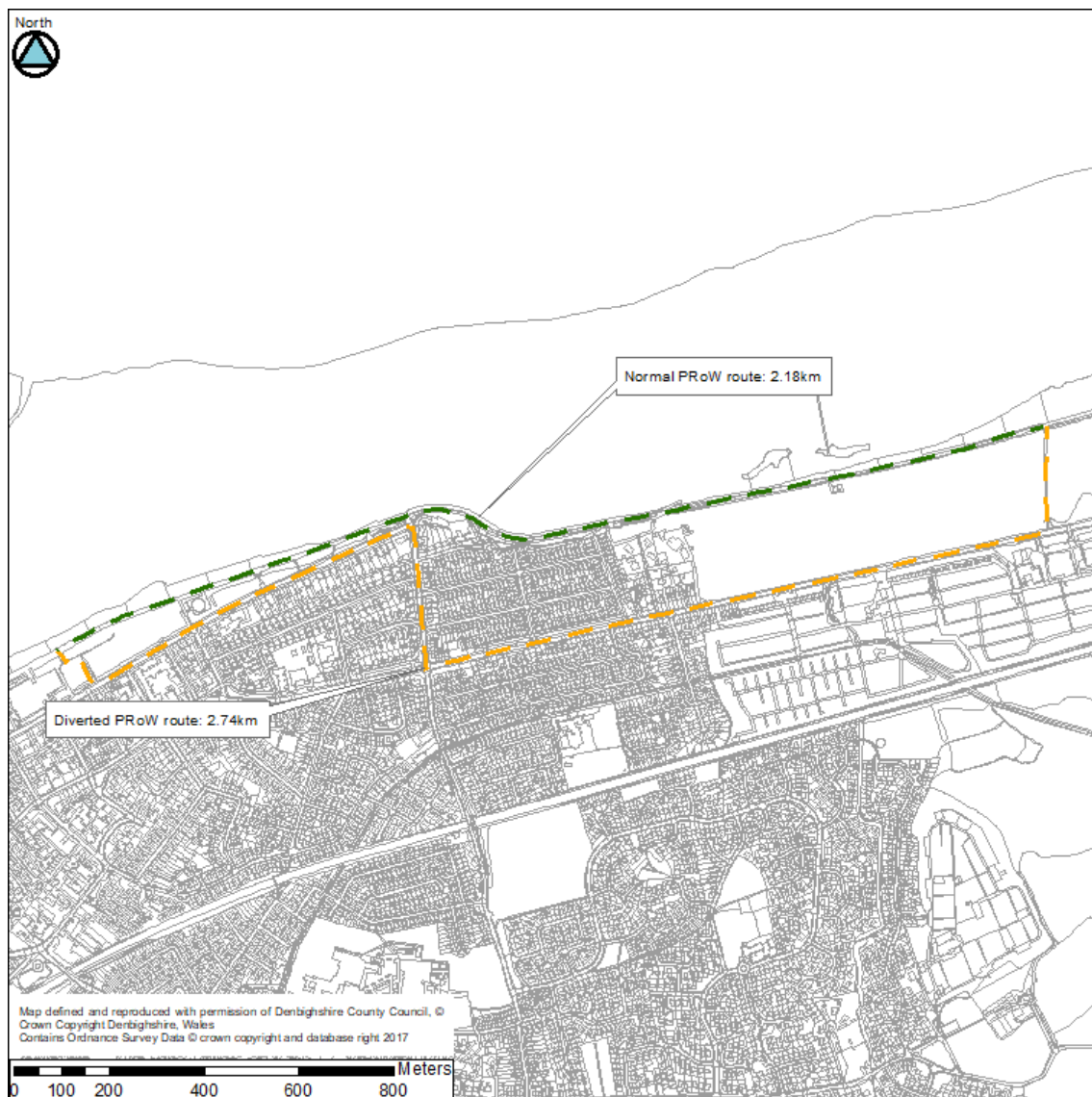


Figure 8-7: Diversion of the Wales Coast Path and National Cycle Network Route 5 proposed

8.4.15 Due to its location with regards to local facilities, it is not anticipated that diversion of the Wales Coast Path or National Cycle Network Route 5 would restrict local residents' access to community facilities, such as Rhyl library or food bank. A decrease in connectivity would arise from the closure of public areas along Rhyl Promenade, although this would be mitigated by the proposed diversion route.

8.4.16 *Tourism*

8.4.17 The location of the development proposals in the east of Rhyl, in an area that is largely residential, would mean that few tourism-related businesses would be directly affected during construction. Tourism is a major sector in Rhyl's economy, but a substantial majority of tourism-related businesses, tourist attractions and tourist accommodation (Figure 8-4) are near Rhyl centre, approximately 1km west of the proposed construction site⁶⁷.

- 8.4.18 Day visitors to Rhyl almost exclusively drive, with a small minority taking the train (predominantly from the Northwest and the West Midlands)⁶⁷. Given that a staff car park would be provided during construction and few staff are likely to use public transport for travel, the public car parks (Figure 8-5) and train station in Rhyl are not expected to experience any impacts from the construction (public car parking provision in Rhyl is anticipated to reduce by approximately 3%). No bus routes would be affected by the development proposals, but there could be secondary traffic impacts on buses (refer to Chapter 9 Traffic and Transport).
- 8.4.19 It has been determined in Chapter 9: Traffic and Transport that West Parade will see a significant increase in HGV movements during the construction stage. This will also result in there being slight impacts upon pedestrian amenity and pedestrian fear and intimidation along this street (defined in 9.3.22). As West Parade runs through the main tourism areas of Rhyl, it is anticipated that regular HGV movements along this street will have a temporary moderate negative impact upon Rhyl's tourism industry.
- 8.4.20 Due to the length of the construction period, it is expected that it would overlap with several tourism 'peak seasons' in Rhyl. However, overall it is not considered likely that there would be an effect upon tourism in Rhyl from the proposed development during construction or operation, due to Rhyl's tourism industry being centred one kilometre west of the scheme.
- 8.4.21 *Education*
- 8.4.22 The proposed scheme is not expected to directly impact upon school provision or demand during construction or operation.
- 8.4.23 No schools are within a close enough proximity to the proposed scheme to be directly impacted by construction. The closest school to the proposed site, Ysgol Bryn Heddyd (Table 8-3), is not close enough to be impacted by noise or construction dust (i.e. over 350m away and not within 50m of the route used by construction on the public highway – refer to air quality assessment provided in Appendix M). The catchment area suggests that pupils are unlikely to use the Wales Coast Path or the National Cycle Network Route 5 to travel to and from school, therefore the diversion of these routes is not anticipated to have an impact⁷⁹. The diversion route proposed in the Construction Strategy would only extend the Wales Coast Path by an additional 550m, and so would not sever this route.
- 8.4.24 *Welsh Language*
- 8.4.25 It is not anticipated that the proposed development will have a significant impact, positive or negative, upon the Welsh Language.
- 8.4.26 There is the potential for the construction to have a slight positive impact upon the Welsh Language in Rhyl during construction. The Non-Technical summary of this ES is available in both English and Welsh. Any information about the development presented before, during and after construction will be available in both English and Welsh. It is recommended that Balfour Beatty, the construction contractor for the scheme hire a Community Liaison Officer (CLO) to engage with the public. If so, they should be proficient in both English and Welsh, to answer queries from the public in both languages.

⁷⁹ SchoolGuide.co.uk – Catchment area for Ysgol Bryn Heddyd, Denbighshire.

8.4.27 *Healthcare*

- 8.4.28 The proposed scheme is not expected to directly impact upon healthcare provision or demand during construction or operation.
- 8.4.29 The locations of general practices, dental practices and pharmacies in Rhyl suggests that the diversion of the WCP would not impact upon local residents' ability to access these facilities. The diversion of these routes is not anticipated to have an impact.

8.4.30 *Open space*

- 8.4.31 It is anticipated that during construction, 14.5 hectares of Rhyl Beach would be closed to the public, as would a section of Rhyl Promenade that contains 3ha green space. In total, this would result in a reduction of public open space in Rhyl of 4.9%. Reduction in available space on Rhyl Beach (at lowest astronomical tide) would be 6.3%.
- 8.4.32 There would also be permanent land take on Rhyl Beach during the operational stage. It is currently estimated that this would be approximately 1.46ha, or 0.63% of the beach at lowest astronomical tide.
- 8.4.33 The exercise park on East Parade will be inside the area of Rhyl Promenade that will be closed to the public during construction. The grassed area around Splash Point, near Hilton Drive, will also be closed for the duration of the works.
- 8.4.34 The loss of access to open space during the construction and operational phases is expected to have a slight negative impact on Rhyl residents. Some areas of Rhyl, especially in the west, have high levels of health deprivation. Therefore, limiting the amount of open space, especially in an area of high recreational and environmental value, is likely to have a slight negative impact on local health. Rhyl beach is adjacent which could be used as alternative green space. The nearest public grassed area is a recreational ground between Tynwydd Road and Fford Anwyl, immediately south of the railway (SJ 02311 81712), approximately a 10 minute walk south of the development site.

8.5 **Mitigation Measures**

- 8.5.1 The diversion of the PRow and the NCR away from the construction site would provide tertiary mitigation, which would work to reduce the impact caused by reducing the connectivity of Rhyl.
- 8.5.2 This project was procured by Balfour Beatty through the Scape public-sector partnership, under the National Civil Engineering and Infrastructure framework⁸⁰. Scape mirrors Balfour Beatty's recognition of how they identify and address social, environmental and economic concerns on their projects. Balfour Beatty abide by Scape via key performance indicators. Two performance indicators that provide socio-economic mitigation are⁸⁰;
- An aim towards local supplier and local labour spend; and
 - Small and medium enterprise engagement.
- 8.5.3 Balfour Beatty are also voluntary members of the Considerate Constructors Scheme (CCS). Members of the CCS abide by the Code of Considerate Practice, which outlines the Scheme's expectations with regards to individual sites and describes those areas

⁸⁰ The Scape Group – Our Frameworks - <https://www.scapegroup.co.uk/services/procure/frameworks>

that are considered fundamental for registration with the Scheme⁸¹. Some expectations that would contribute to secondary mitigation of potential socio-economic impacts are outlined below;

- Informing, respecting and showing courtesy to those affected by the work;
- Minimising the impact of deliveries, parking and work on the public highway;
- Contributing to and supporting the local community and economy; and
- Working to create a positive and lasting impression⁸¹.

8.5.4 The final revision of the wider site boundary offers a much-reduced presence on Rhyl Beach, in order to avoid important archaeology. As a result, the site will only occupy 6.6ha of Rhyl Beach, a 55% reduction in the land take.

8.5.5 JBA Consulting and Balfour Beatty are undertaking community engagement and pre-application consultation on the scheme proposals. During stakeholder engagement sessions, local residents will have the opportunity to voice their opinions on the scheme and its construction period. This information may be used by Balfour Beatty or JBA Consulting to provide secondary mitigation, reducing potential impacts on the local population.

8.6 Residual Effects

8.6.1 It is not anticipated that there would be any significant negative socio-economic impacts associated with the proposed development. There would be a slight temporary negative effect on local health deprivation, caused by the reduction in open green space in Rhyl, during the construction stage of the development.

8.6.2 It is expected that the increase in HGV traffic along West Parade to have a temporary moderate negative impact upon tourism. As Rhyl's most popular tourist attractions are along West Parade, an increase in heavy traffic along the road has the potential to discourage visits in Rhyl, especially those who visit for the day rather than stay overnight.

8.6.3 Impacts upon the residents and local economy of Rhyl are important and must be stated, and mitigation measures should be adopted if possible. However, socio-economic impacts must be viewed in the context of the significant socio-economic benefits that will be delivered to East Rhyl from the proposed scheme. The new defences would protect properties from a 1 in 200 year coastal flood event, ensuring a repeat of the flooding seen in 2014 is much less likely. This will ensure Rhyl remains a viable community now and in the future, in the face of considerable climate uncertainty. It may also increase the economic competitiveness of Rhyl as a town, helping it to prosper in future, delivering substantial socio-economic benefits.

⁸¹ The Considerate Constructors Scheme – Code of Considerate Practice - <https://www.ccscheme.org.uk/ccs-ltd/code-of-considerate-practice-2/>

9 Traffic and Transport

9.1 Introduction

- 9.1.1 This chapter of the ES has been prepared by Fore Consulting Limited (Fore) and will assess the impact of the construction process upon the transport network.
- 9.1.2 The baseline situation is considered before the likely environmental effects of the construction process upon the current uses are identified. Impacts are considered during the demolition and construction phase, but not the operational phase as traffic movements associated with the completed development will be limited to occasional maintenance vehicles and are likely to be negligible in practice. Finally, mitigation measures to reduce any adverse environmental effects are identified as appropriate, before the residual environmental effects are assessed.
- 9.1.3 A Transport Assessment has been prepared by Fore as part of the planning submission to demonstrate that the proposals are acceptable in planning terms, subject to appropriate mitigation. These documents are located in Appendix L.
- 9.1.4 *Legislative & Planning Policy Context*
- 9.1.5 Planning Policy Wales
- 9.1.6 Planning Policy Wales: Edition 9 (PPW) was published in November 2016 and sets out Welsh land use planning policy. Chapter 8 related to Transport and sets out policy for promoting active travel, supporting public transport, and managing traffic and parking.
- 9.1.7 Notable points relating to the East Rhyl Coastal Defence Scheme include that:
- “[Transport Assessments] can be required for any proposed development if the local planning authority considers that there is a justification or specific need.” The TA will “provide the basis for negotiation on scheme details”.
 - “Local Authorities should consider which routes are most suitable for use by road freight [...]. The same applies to other developments generating frequent road freight movements”.
- 9.1.8 PPW also outlines the factors taken into account when determining a planning application for a development which has transport implications. Those factors relating to the East Rhyl Coastal Defence Scheme include:
- The impacts of the proposed development on travel demand;
 - The nature of public transport provision;
 - The environmental impact of both transport infrastructure and the traffic generated (with a particular emphasis on minimising the causes of climate change associated with transport); and
 - The effects on the safety and convenience of other users of the transport network.
- 9.1.9 Technical Advice Note 18: Transport
- 9.1.10 Technical Advice Note 18 should be read in conjunction with PPW. It states that the aims of a Transport Assessment are, amongst other things, to:
- Understand the transport impacts of the development; and
 - Clearly communicate the impacts to assist the decision-making process.

- 9.1.11 The Transport Assessment should include an implementation strategy identifying access arrangements and management measures required to accommodate the development and mitigate its potential impacts.

9.1.12 *Denbighshire County Council's Local Development Plan*

- 9.1.13 The Local Development Plan (LDP) sets out the proposals and policies for future development and use of land in Denbighshire. The LDP was adopted in June 2013. Regarding Transport Assessments, it notes that:

"A Transport Assessment for a proposed development should assist in predicting implications and identifying measures to counteract the likelihood of negative impacts. Like non-motorised user audits, the conclusions and recommendations of a transport assessment should be incorporated into the development proposal."

9.2 Baseline Conditions

9.2.1 Site Location

- 9.2.2 The site is bordered by the Rhyl Promenade to the west which is a popular leisure destination, providing access to the beach as well as other facilities such as a cinema and aquarium. To the south of the site is the centre of Rhyl, containing a mixture of residential, commercial, and recreational land uses. The east of the site is bordered by the Rhyl golf course.

9.2.3 Local Highway Network

- 9.2.4 The main materials compound will be accessed from a dedicated entrance off East Parade, near the existing Theatre Car Park. East Parade is a single carriageway road, approximately 9m wide with dedicated space for on-street parking. It is subject to a 30mph speed limit.
- 9.2.5 To the west, East Parade connects to West Parade which is also approximately 9m wide with dedicated on-street parking areas and subject to a 30mph speed limit. West Parade connects to Ffordd Wellington via a roundabout. Ffordd Wellington runs through Rhyl town centre to the east and crosses the River Clwyd via Foryd Bridge connecting to A548 Foryd Road in the west. There are no height or weight restrictions posted for the bridge.
- 9.2.6 To the east of East Parade is Marine Drive which is also approximately 9m wide with dedicated parking areas and subject to a 30mph speed limit. After a sharp turn, Marine Drive turns into Tynewydd Road which connects to the Rhyl Coast Road at a signal-controlled junction. To the west of the junction, Rhyl Coast Road leads to Rhyl town centre and to the east it leads out of Rhyl and into the neighbouring town of Prestatyn, approximately 4km to the east.

9.2.7 Pedestrian and Cycle Infrastructure

- 9.2.8 The Rhyl Promenade provides a continuous footpath and cycleway along the seafront. The Promenade forms part of National Cycle Route 5 and there are several registered Public Rights of Way within the vicinity of the Promenade.
- 9.2.9 There are footpaths and pedestrian crossing facilities provided along all of the main roads within Rhyl, include the East/West Parade, Marine Drive, Rhyl Coast Road, and

Ffordd Wellington. The streets in the town centre and Promenade also well-lit by street lighting.

9.2.10 Bus Service

9.2.11 400m is typically considered to be a convenient walking distance to bus stops. A summary of the bus services available from the closest stops to the construction compounds are presented in Table 9-1.

Table 9-1 Summary of bus services

| Number | Route | Approximate frequency | | |
|---|-------------------------|-----------------------|------------|---------------|
| | | Weekday | Saturday | Sunday |
| East Parade (Primary 'Materials' Compound) | | | | |
| 35 | Rhyl-Prestatyn | 2 per hour | 2 per hour | Every 2 hours |
| PS1 | Rhyl-Prestatyn-Rhuddlan | 1 per hour | No service | No service |
| Rhyl Coast Road (Secondary 'Office' Compound) | | | | |
| 11* | Rhyl-Flint | 1 per hour | 1 per hour | No service |
| 19 | Rhyl-Flint | 2 per day | 2 per day | No service |
| 35 | Rhyl-Prestatyn | 2 per hour | 2 per hour | Every 2 hours |
| PS1 | Rhyl-Prestatyn-Rhuddlan | 1 per hour | No service | No service |
| Eaton Avenue (Secondary 'Office' Compound) | | | | |
| 47 | Rhyl Circular | 2 per day | 2 per day | No service |

* Service 11 is split into 11F, 11G, 11M and 11X and each have a slightly different route

9.2.12 This assessment demonstrates that each compound is served by Service 35 which provides a regular frequency bus service between Rhyl and Prestatyn. These are supplemented by other services which provide additional opportunities for bus travel to the site.

9.2.13 Rail Service

9.2.14 Rhyl Train Station is located within the centre of the town, approximately 1.3km from the primary compound and 2.3km from the secondary compound. It connects to the Chester and Holyhead Line, providing services to Bangor and Holyhead to the west and Chester and Crewe to the east. There are also connections to Manchester and Birmingham. The station therefore provides opportunities for rail travel to the site.

9.3 Assessment Methodology

9.3.1 The scope and methodology for the Transport Assessment to be submitted as part of the planning application has been discussed and developed with Denbighshire County Council (DCC), as the Local Planning and Highway Authority. The methodology is set out in full in the Transport Assessment (provided in Appendix L). The scoping report and associated comments from DCC are also included in Appendix L.

9.3.2 Following the assessment of the potential effects, additional transport measures are identified to mitigate the potential adverse effects of the Proposed Development, where relevant. An assessment of the residual effects following the implementation of the mitigation measures is then undertaken.

9.3.3 Data Sources

9.3.4 Vehicle movements associated with the construction process are split into two distinct components: movements associated with staff trips and movements associated with construction materials.

9.3.5 *Construction Staff*

9.3.6 In the outline construction methodology, Balfour Beatty estimate that 50 full-time staff will be on site for the duration of the construction: 15 office staff and 35 construction workers. Regular working hours are scheduled to be between 07:00 and 19:00, although much of the construction work subject to beach access will require variations around tidal patterns.

9.3.7 For the purposes of the Transport Assessment, in the interest of providing a robust indication of the traffic impacts associated with the construction, it has been assumed that all staff will arrive and depart from the site during the typical highway peak hours of 08:00-09:00 and 17:00-18:00.

9.3.8 On the basis of the assessment of existing public transport provision, it has been assumed that 80% of staff will drive to work, 10% will be passengers in a car share, and a further 10% will travel via sustainable modes (walking, cycling, bus, or rail).

9.3.9 The distribution and assignment of staff-related vehicle trips onto the local highway network was achieved via a population-based gravity model using 2011 census data⁸² for Census Merged Local Authority Districts in Wales, North-West England, and the West Midlands.

9.3.10 *Construction Materials*

9.3.11 Based on the current construction method, Balfour Beatty have provided the quantity of bulk construction materials required for the project. Based on these data, Balfour Beatty have provided a month-on-month estimate of the number of HGV movements to the construction site, broken down by trip purpose and destination compound. These movement estimates also include trips related to the mobilisation and demobilisation of the construction compounds, and the disposal of waste materials.

9.3.12 It should be noted that these trip estimates are based on the un-optimised geometry of the rock armour revetment to provide a robust assumption of the traffic generation; the optimised geometry could reduce the amount of rock armour required by 5%, thereby reducing HGV movements to the site.

9.3.13 The following assumptions have been made to convert estimated monthly trips into peak hour estimates:

- The total monthly trips have been divided by the number of working days in the month. This provides an estimated daily number of HGV trips.
- The daily number of HGV trips have been equally distributed across the working hours (07:00-19:00) to provide an hourly estimate.
- This hourly estimate has been utilised for the AM and PM peak hours.

9.3.14 The distribution and assignment of these trips is based on one bulk delivery route which have been scoped with Denbighshire County Council:

⁸² Dataset KS101EW – Usual resident population

- The primary route, which will be used by the majority of construction traffic, exits off the A55 at Junction 27 onto the A525. It then turns left onto Ffordd Abergele and then right onto St. Asaph Avenue before turning right onto Foryd Road and crossing the River Clwyd. At the roundabout after the bridge, it turns left onto West Parade and continues along the Parade to the primary compound. Traffic travelling to the secondary compound via this route could then continue to the junction between Tynewydd Road and Rhyl Coast Road, turning right onto Rhyl Coast Road before turning right again onto Garford Road.

9.3.15 A secondary (and tertiary) route was initially considered an alternate route, but on the advice of Denbighshire County Council Highways has not been assessed further herein.

9.3.16 *Assessment Scenarios*

9.3.17 The period which has been assessed in the Transport Assessment is February 2020. This represents an absolute 'worst-case' scenario of the impacts of the construction process upon the local transport network and so has been chosen to provide a robust assessment.

9.3.18 The assessment is considered robust for the following reasons:

- The hourly HGV trips are derived from February 2020 which is the month with the highest single number of estimated HGV trips associated with the delivery of construction materials; the 408 estimated trips in February 2020 is significantly higher than the median number of estimated HGV trips for a given month (344).
- Arrivals and departures of all staff have been assumed to occur wholly within the AM and PM peak hours (08:00-09:00 and 17:00-18:00). In reality, it is likely that the arrivals and departures of staff will be more widely distributed throughout the day rather than concentrated in the AM and PM peak hours, especially given the need to schedule construction work around tidal patterns.
- The construction material estimates do not account for the optimisation of the geometry of the rock armour revetment which could reduce the amount of rock armour required by 5%. It should however be noted that this reduction is within design tolerances of the rock armour revetment, and so is unlikely to significantly affect quantities of materials required.

9.3.19 As well as the AM and PM peak hours, the assessment has also been undertaken on a daily basis.

9.3.20 *Significance Criteria*

9.3.21 The methodology used in this assessment accords with guidance produced by IEMA in their Guidelines for the Environmental Assessment of Road Traffic (IEMA Guidelines).

9.3.22 The IEMA guidelines identify a number of environment effects that may arise from changes in vehicular travel demand and set out the broad principles of how to assess the magnitude of effect for each category. This is summarised, below:

- Severance – This is the perceived division that can occur within a community when it becomes separated by a major artery. Such division may result from the crossing of a heavily trafficked road or a physical barrier created by the road itself. The IEMA guidelines refer to the Manual of Environmental Appraisal, which suggests that changes in traffic flow of 30%, 60% and 90% would be likely to produce 'slight', 'moderate' and 'substantial' changes in severance, respectively.

- **Driver Delay** – The IEMA guidelines note that driver delay can occur at several points on the network, although the effects are only likely to be significant when the traffic on the highway network is predicted to be at, or close to, the capacity of the system.
- **Pedestrian Delay** – The IEMA guidelines note that a change in the volume, composition and/or speed of traffic may affect the ability of a person to cross a road. Typically, an increase in the traffic level results in increased pedestrian delay, although increased pedestrian activity itself may also contribute. The guidelines do not set any thresholds for assessing pedestrian delay, recommending instead that assessors use their judgement to determine the significance of the effect.
- **Pedestrian Amenity** – This is broadly defined as the relevant pleasantness of a journey. It is affected by traffic flow, traffic composition, footway width and separation from the carriageway. The IEMA guidelines suggest a tentative threshold for judging the significance of a change in pedestrian amenity where the traffic flow (or the HGV component) is halved or doubled.
- **Fear and Intimidation** – The impact of fear and intimidation is dependent upon the volume of traffic, the HGV composition, the proximity of traffic to people and the lack of protection caused by factors such as narrow footway width.
- **Accidents and Safety** – The IEMA guidelines does not include a definition in relation to accidents and safety, suggesting that professional judgement will be needed to assess the implications of local circumstance or factors which may increase or decrease the risk of accidents, i.e. junction conflicts.

9.3.23 From the IEMA guidelines, it should be noted that a projected change in traffic flow of less than 10% is generally considered to create no discernible environmental impact, given that daily variations in background traffic flow may fluctuate by this amount under normal operating conditions.

9.3.24 The ES classifies the effect of the development using the matrix of significance presented in Table 3-5. This matrix judges the relationship between the magnitude of effects to the sensitivity and/or importance of the receptor. For example, a low magnitude effect on a low value receptor is determined to be a slight adverse effect.

9.4 Potential Impacts & Significant Effects

9.4.1 This section assesses the predicted effects as a result of transportation during the construction process.

9.4.2 The estimated trip generation associated with the construction, as determined in the Transport Assessment, is presented in Table 9-2. Data is presented for total vehicles and for the number of HGVs.

Table 9-2: Estimated Traffic Impacts at Key Links and Junctions

| Junction | AM | | | PM | | | Daily | | |
|----------------------------|------|------|-----------|------|------|-----------|-------|------|-----------|
| | Cars | HGVs | Total | Cars | HGVs | Total | Cars | HGVs | Total |
| Links | | | | | | | | | |
| West Parade | 1 | 4 | 5 | 1 | 4 | 5 | 2 | 40 | 42 |
| East Parade / Marine Drive | 27 | 0 | 27 | 27 | 0 | 27 | 54 | 0 | 54 |
| Garford Road | 12 | 0 | 12 | 12 | 0 | 12 | 24 | 0 | 24 |
| Rhyl Coast Road | 15 | 0 | 15 | 15 | 0 | 15 | 30 | 0 | 30 |

| Junction | AM | | | PM | | | Daily | | |
|--|------|------|-----------|------|------|-----------|-------|------|-----------|
| | Cars | HGVs | Total | Cars | HGVs | Total | Cars | HGVs | Total |
| Junctions | | | | | | | | | |
| East Parade / Primary Compound Junction | 28 | 4 | 32 | 28 | 4 | 32 | 56 | 40 | 96 |
| Fford Wellington / West Parade Roundabout | 1 | 4 | 5 | 1 | 4 | 5 | 2 | 40 | 42 |
| St. Asaph Avenue / Foryd Road Junction | 1 | 4 | 5 | 1 | 4 | 5 | 2 | 40 | 42 |
| A525 / Abergele Road / Station Road Roundabout | 37 | 4 | 32 | 27 | 4 | 31 | 54 | 40 | 94 |
| A55 Junction 27 | 37 | 4 | 32 | 27 | 4 | 31 | 54 | 40 | 94 |
| Rhyl Coast Road / Tynewydd Road Junction | 37 | 0 | 37 | 37 | 0 | 37 | 74 | 0 | 74 |
| Rhyl Coast Road / Garford Road Junction | 17 | 0 | 17 | 17 | 0 | 17 | 34 | 0 | 34 |

9.4.3 When distributed over the hour, the 37 two-way trips estimated during each peak Hour at the Rhyl Coast Road / Tynewydd Road junction (which is the junction which experiences the greatest increase in traffic) represent less than one additional vehicle trip per minute.

9.4.4 When distributed over the day, the maximum increase in HGV trips on any link or junction is 4 additional trips per hour.

9.4.5 Given the limited nature of these impacts, it is considered that the traffic associated with the construction will not affect the operation of the local highway network. The following sections consider the magnitude of effects for each category summarised in section 9.3.22.

9.4.6 *Severance*

9.4.7 The IEMA guidelines suggest that changes in traffic flow of 30%, 60% and 90% would be likely to produce 'slight', 'moderate' and 'substantial' changes in severance, respectively. It is advised, however, that regard should be paid to local conditions, in particular, the location of pedestrian routes to key local facilities and whether or not crossing facilities are provided.

9.4.8 The Department for Transport maintain several traffic count locations within and near Rhyl which provide estimates of AADT (total vehicles and HGVs) which can be compared with the estimated traffic impacts of the construction. This comparison is presented in Table 9-3.

Table 9-3: Changes in Traffic Flow

| Location | 2017 Base AADT | | Construction AADT | | % Change | |
|-----------------|----------------|------|-------------------|------|--------------|---------|
| | All vehicles | HGVs | All Vehicles | HGVs | All Vehicles | HGVs |
| West Parade | 7,700 | 29 | 42 | 40 | +0.5% | +137.9% |
| Ffordd Abergele | 14,146 | 291 | 40 | 40 | +0.3% | +13.7% |

| Location | 2017 Base AADT | | Construction AADT | | % Change | |
|------------------------|----------------|-------|-------------------|------|--------------|-------|
| | All vehicles | HGVs | All Vehicles | HGVs | All Vehicles | HGVs |
| A525, north of A55 J27 | 16,751 | 484 | 94 | 40 | +0.6% | +8.3% |
| A55, East of J27 | 41,076 | 2,529 | 82 | 40 | +0.2% | +1.6% |
| A548 Rhyl Coast Road | 12,297 | 95 | 30 | 0 | +0.2% | +0.0% |

9.4.9 In terms of all vehicles, there are no links in the study area which are predicted to experience an overall increase in AADT over 1%. While there is a significant percentage increase in HGVs, particularly on West Parade, this primarily results from a low base of HGV traffic along the link. In absolute terms, it is considered that an additional 40 HGVs per day would not represent a substantial effect on severance.

9.4.10 The closure of sections of the Rhyl promenade and associated diversions will extend the length of some pedestrian and cycle trips. In practicality however, the effect is likely to be limited given the non-essential nature of the length of footpath/cycleway which will be diverted; the closures are therefore not considered likely to result in disruption to regular journey patterns.

9.4.11 The potential effect of the construction on the majority of the study area is considered to be **not significant**; for West Parade, due to the increase in HGV traffic, the potential effect is considered to be **slight**. This effect will be of a temporary nature for the duration of the construction.

9.4.12 *Driver Delay*

9.4.13 The IEMA guidelines note that driver delay can occur at several points on the network, although the effects are only likely to be significant when the traffic on the highway network is predicted to be at, or close to, the capacity of the system.

9.4.14 It is concluded in the Transport Assessment that the impact of the traffic associated with the construction will not practically impact the operation of the local highway network. As such the potential effect of the construction on driver delay is considered to be **not significant**.

9.4.15 *Pedestrian Delay*

9.4.16 The IEMA guidelines note that a change in the volume, composition and/or speed of traffic may affect the ability of a person to cross a road. The guidelines do not set any thresholds for assessing pedestrian delay, recommending instead that assessors use their judgement to determine the significance of the effect.

9.4.17 It is demonstrated in Table 9-3 that the construction traffic does not represent a significant increase in AADT throughout the study area and, as such, the potential effect of the construction on pedestrian delay is considered to be **not significant**.

9.4.18 *Pedestrian Amenity*

9.4.19 The IEMA guidelines suggest a tentative threshold for judging the significance of a change in pedestrian amenity where the traffic flow or the HGV component is halved

or doubled. It is noted that pedestrian amenity is also affected by footway width and separation from the carriageway.

- 9.4.20 For most of the network, the potential effects of the construction on pedestrian amenity is considered to be **not significant**; for West Parade, due to the increase in the proportion of HGV trips, the potential effect is considered to be **slight**. This effect will be of a temporary nature for the duration of the construction.

9.4.21 *Fear and Intimidation*

- 9.4.22 The IEMA guidelines suggest some tentative thresholds for judging the significance of a change in fear and intimidation based on the volume of traffic, the HGV composition and the speed of vehicles.

- 9.4.23 For most of the network, the potential effects of the construction on pedestrian amenity is considered to be **not significant**; for West Parade, due to the increase in the proportion of HGV trips, the potential effect is considered to be **slight**.

9.4.24 *Accidents and Safety*

- 9.4.25 The IEMA guidelines note that a projected change in traffic of less than 10% is generally considered to create no discernible environmental impact, given that daily variations in background traffic flow may fluctuate by this amount under normal operating conditions.
- 9.4.26 It is demonstrated in Table 9-3 that the construction traffic does not represent a significant increase in AADT throughout the study area and, as such, the potential effect of the construction on accidents and safety is considered to be **not significant**.

9.5 Mitigation Measures

- 9.5.1 In general, the potential effects of the construction project on the operation of the transport network have been identified to be **not significant**, although it is considered possible for a **slight** negative effect on West Parade in terms of severance, pedestrian amenity, and fear and intimidation.
- 9.5.2 These potential effects will be mitigated, as far as possible, through active community engagement under the Considerate Constructors Scheme. This will ensure that the public is aware of the bulk construction routes and potential impacts of the construction processes.

9.6 Residual Effects

- 9.6.1 This chapter has identified that for the duration of the construction process, there is potential for a slight negative effect on West Parade in terms of severance, pedestrian amenity, and fear and intimidation. This impact will be temporary, lasting only for the duration of the construction, and slight in nature. In terms of the wider study area, there are considered to be no significant impacts relating to the construction traffic.
- 9.6.2 It is considered that the construction traffic will be satisfactorily accommodated by the local transport network and will not give rise to any substantial or moderate adverse effects. It is therefore concluded that the environmental effects of the Proposed Development as a result of transportation are acceptable.

10 Other Construction Effects

10.1 Introduction

- 10.1.1 Other construction related effects assesses impacts on human and environmental receptors arising specifically during the construction phase, which are not considered in each of the specialist ES topic chapters (Chapters 4 to 9 and 11). Consideration is particularly given to impacts from construction activities associated with noise, air quality and potential for pollution of the environment. With reference to Schedule 4 of the EIA Regulations this chapter provides where relevant *'an estimate, by type and quantity, of expected residues and emissions (such as water, air, oil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction phase'*.
- 10.1.2 Where possible, an iterative approach to avoiding and mitigating construction related effects has been employed, to minimise the potential for significant environmental effects to arise during construction. Reference is made to the description of construction activities provided in section 2.7 and the Construction Strategy prepared by Balfour Beatty provided in Appendix G, which should be read in conjunction with this assessment. This assessment has been used to inform an outline Construction Environmental Management Plan (CEMP) provided in Appendix M.

10.2 Baseline Conditions

10.2.1 Construction activities

- 10.2.2 Two main site compounds are proposed. The main compound to the west of the proposed site (Compound 1), would be located in the grassed area opposite Grosvenor Road. It is intended primarily for bulk materials import into the site and will be the principal area for plant and equipment. The secondary compound to the east (Compound 2), would be located adjacent to Rhyl Golf Course, at the end of Brynheddydd Bay [road] (Figure 10-1). It would contain an office compound and an access route for minor plant. For more details, a Construction Strategy is available in Appendix M.
- 10.2.3 The promenade would be used as the main construction haul route and so there will be significant plant and machinery movements along the promenade during construction. This is subject to weight testing to confirm the promenade is able to support construction traffic. If the promenade is unable to support construction traffic then plant will travel along a haul route along the upper edge of the beach.
- 10.2.4 When plant is not in use it will be kept in Compound 1. From here, plant would travel along the promenade to the workforce. Precast concrete units would be transported from Compound 1, along the promenade, using lightweight tractor and trailer units, with some storage taking place at Compound 2 (Figure 10-1). Given the narrow form of the construction site it is unlikely that a one way haulage from the primary to the secondary construction compound would be possible. Turning areas and passing points may need to be constructed to facilitate two way haulage. Access from Compound 2 to the Promenade is via an existing ramp, which may require minor improvements (widening, edge protection, pedestrian access) to facilitate access. The compounds will also accommodate welfare, office and parking facilities.

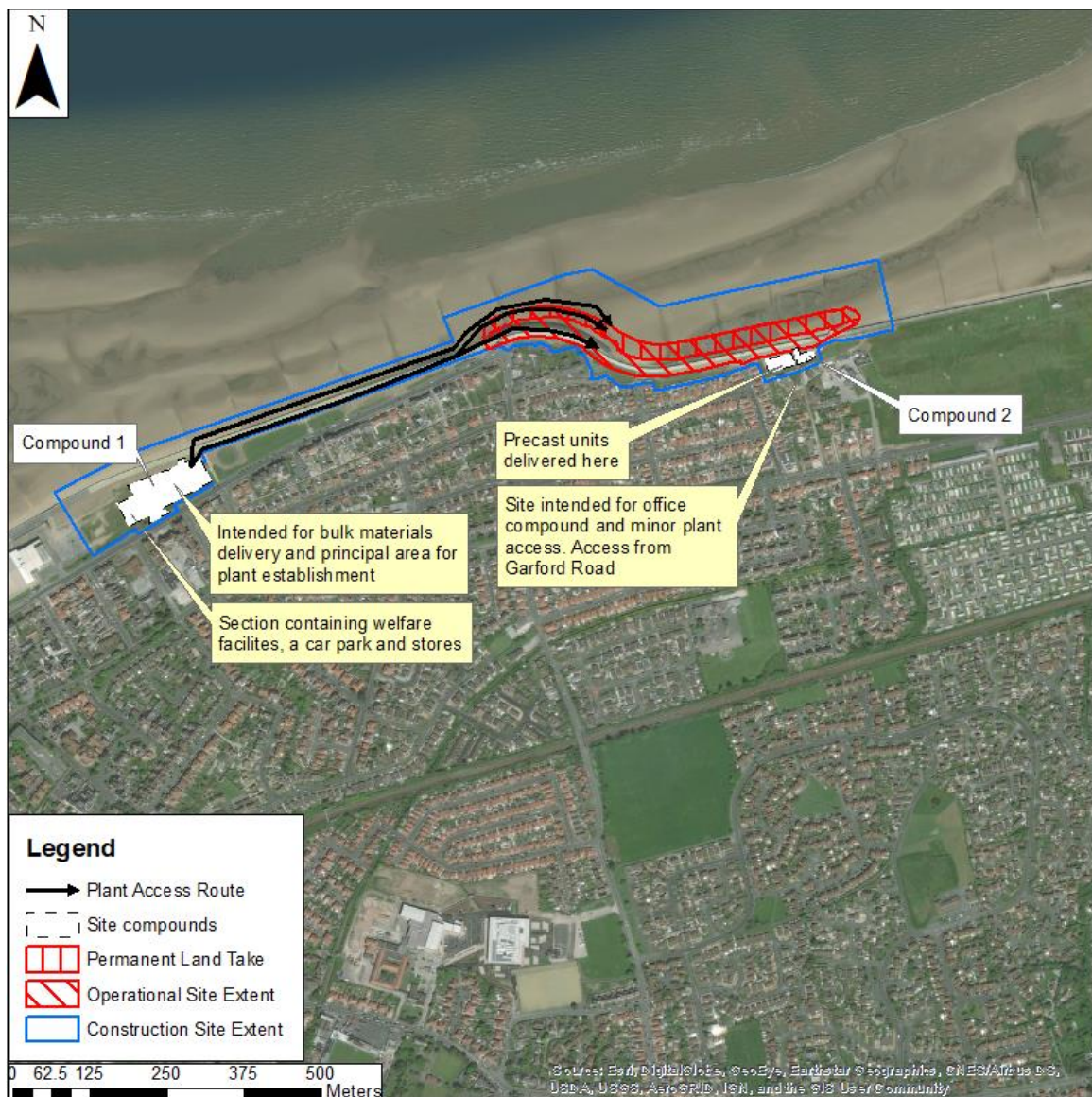


Figure 10-1: Layout of the site during the construction period

- 10.2.5 The bulk construction materials offloaded at Compound 1 would need to be tipped, sorted and then stockpiled on the foreshore. Significant excavation of the beach would be required to construct the toe of the rock armour revetment. The sorted bulk materials would then be placed into the excavation and built up in layers. This would comprise a geotextile sheet overlain with quarry run fill, an infiltration layer formed in a triple interlocking layer and rock armour formed in a double interlocking layer.
- 10.2.6 Demolition of the upstand concrete sea wall would be required for reconstruction of the new concrete sea wall. Concrete access steps would also be constructed to maintain existing access to the beach through the newly constructed rock armour revetment. Tie-in works with the existing coastal defence would be required to complete the main phase of construction works. Further detail on the proposed construction works are provided in the Construction Strategy in Appendix G.

10.2.7 *Air quality & dust*

10.2.8 Historic Air Quality Assessment reports for Denbighshire County Council indicate that no exceedances of the annual mean objective for NO₂ have been experienced across the County. There are currently no AQMAs in place across Denbighshire. Concentrations of SO₂, Benzene, Lead and CO are not considered to be significant within the County. Consequently, no further consideration is given to these pollutants as it is highly unlikely that they would be of concern on the proposed development site.

10.2.9 Construction activities can generate significant quantities of airborne particulate matter as a result of vehicle movements on bare ground, movement and tipping of material, as well as from the exhaust of diesel-powered machinery. These activities have the potential to cause dust to settle on local properties and vehicles. It is also recognised that in coastal areas such as Rhyl, salt spray gives rise to elevated levels of fine particulate matter (PM₁₀). Given this, there is potential for construction works to exacerbate dust impacts.

10.2.10 *Noise and vibration*

10.2.11 East Rhyl is considered to be a low-noise environment, with background noise sources mainly comprising noise from human visitors, the natural environment (birds, wind, and waves), and traffic noise along the adjacent roads. Recreational activities along the beach may also cause daily and seasonal variations in background noise levels. Given the exposed location of East Rhyl, background noise levels can vary considerably depending on the weather conditions. Due to the short distance of residential properties from the proposed construction works (in some cases <10 metres), local residents and visitors are considered to be important noise receptors.

10.2.12 *Light spill & glare*

10.2.13 Some aspects of construction are reliant on tidal patterns and will need to be undertaken at low tide, regardless of the time of day. Therefore during times when works will need to be undertaken at night, work areas, construction compounds and haul routes may need to be artificially lit.

10.2.14 Street lighting columns are present on the Promenade between the main construction compound and Splash Point. Additionally, there is street lighting on Marine Drive and East Parade. It is therefore unlikely that the construction haul route between the main compound and the beach access slipway would require additional lighting for night time working. Where haul route lighting is required this will be fitted with automatic cut off, so that lighting is only on when in use. There would also be a requirement for lighting on the beach between the access slipway and the working areas, where tidal working is proposed at night. For these construction activities 7m VT2 lighting towers are proposed. The lighting towers provide directional lighting and so can be positioned to minimise light spill on the beach and to neighbouring areas. Given this and the distance (over 30m) to residential receptors on the landward side of the existing sea wall, it is not considered likely that residents would be directly affected by light spill where tidal working is proposed on the beach at night.

10.2.15 It is proposed that both construction compounds would be lit by VT Hybrid LED lighting towers. Opposite the main construction compound on the well-lit Marine Drive/East Parade are residential properties and the grade II listed Royal Alexandra Hospital. Given their reasonable proximity to the proposed compound location (within 30m) these are considered potential sensitive receptors to increased glare from the

additional lighting of the compound. There are also residential properties on Garford Road and Brynheddydd Bay which are in the vicinity of the secondary compound. Although the front of the properties on Garford Road are lit by street lighting columns, the rear of these properties and the properties on Brynheddydd Bay are unlit. The closest residential properties to the secondary compound location are located within 10m and are therefore considered potential sensitive receptors to both light spill and glare.

10.2.16 Contamination

10.2.17 As part of the Supplementary Ground Investigation (provided in Appendix M), four beach samples, two of which comprising the beach sands and two of the intertidal flat deposits at the site, were recovered and submitted for the following screening suite of potential contaminants:

- a range of metals and semi-metals;
- pH, cyanide, water soluble sulphates, asbestos and organic matter;
- a range of hydrocarbon analyses comprising:
 - Phenol
 - speciated Poly Aromatic Hydrocarbons (PAH's)
 - speciated Total Petroleum Hydrocarbons (TPH-CWG)
 - speciated Poly Chlorinated Biphenyls (PCB's)
- a range of pesticides
- the Organotin compounds MBT, DBT & TBT
- a range of potential bacterial contaminants

10.2.18 The results of the above analyses were compared, where applicable, against the Cefas Dredging Action Levels. Almost all analyses results reveal concentrations of the various determinands either below levels of detection and/ or below the Cefas Action Level 1. The one exception to this is that in the sample of the tidal flat deposits from TP101 at 1.0mbgl, the concentration of Cadmium (0.45mg/kg) slightly exceeded the Action Level 1 concentration of 0.40mg/kg. However, the result is well below the Action Level 2 concentration of 5.0mg/kg for Cadmium. Such a small exceedance is considered unlikely to be significant in relation to potential impacts on the marine environment given the volumes of material worked (refer to Chapter 4 and the WFD Assessment provided in Appendix H).

10.2.19 In addition to the above a bitumen coating found to be present on parts of the existing rock armour revetment was tested for leachates; Total Petroleum Hydrocarbon (TPH) fractions, speciated poly-aromatic hydrocarbons (PAHs), semi-volatile organic compounds (SVOCs) and also an assessment of potential Asbestos Containing Materials presence (ACMs). The testing confirmed that the coating found on the rock armour is most likely to have been derived from a bitumen-based source rather than potentially more hazardous coal tar derived material. The bitumen coating was also found to contain principally heavier end hydrocarbon fractions (aliphatic and aromatic carbon chains of 12 and above), which are typically of lower potential mobility in aqueous environments. No asbestos containing materials (ACMs) were identified in any samples. Given the low leaching potential of the bitumen coating, this would not present a significant hazard to the marine environment.

10.2.20 The samples were also subject to bacterial analyses which revealed contents of C.

perfringens and Total Coliforms below levels of detection so there is no evidence of any sewage contamination in the samples. For further details see the Bathing Water Assessment in Appendix H. Regarding the Total Viable Count (TVC) results, there is no specific guidance on assessing TVC results in soils, but there would appear to be a low bacterial loading (max 290 cfu/g [colony forming units per gram]) in the Beach Sand samples and a higher loading (max 51,000 cfu/g) in the tidal flat deposits. Given that tidal flats are a rich ecological environment with a higher organic content such higher results are not surprising, and it is thus considered unlikely that the results suggest any significant hazard to the marine environment.

10.2.21 *Waste management & pollution prevention*

10.2.22 A total of 150m of existing groynes on the beach would need to be removed to formation level, including removal of 3m of each groyne from the footprint of the rock armour revetment toe to create a tide escape route.

10.2.23 Approximately 400m³ of concrete sea wall would be demolished. If the demolition material cannot be reused within the proposed development as fill or hardstanding, then it will be categorised as waste for offsite disposal.

10.2.24 The construction strategy refers to site storage of fuel and chemicals at least 10m away from the sea (above the heist astronomical tide), with refuelling taking place at designated refuelling areas above the mean high-water level (no refuelling would take place on the beach).

10.3 **Assessment Methodology**

10.3.1 *Air Quality Assessment of Construction Traffic*

10.3.2 An assessment has been undertaken by Will Totty Air Quality Consultant at Hawkins Environmental, to assess the impact of the changes in road traffic flows on air pollutant concentrations, at nearby sensitive receptors (specifically in relation to construction traffic). The construction traffic air quality assessment utilises local air quality records (including monitoring data, Local Air Quality Management reports etc.), establish the current air quality situation within the area, particularly with regard to any existing Air Quality Management Areas (AQMA) and the constraints this may present upon the proposed development. Also, any predictions of pollutant concentrations from local sources (including traffic flows, speed, mix and growth data; background pollution data etc).

10.3.3 The data is used to construct an air pollution model of the environment around the development site and along the proposed traffic routes, using the Breeze Roads Detailed Dispersion Model (or similar), which is a new generation Detailed Dispersion Model, incorporating local Meteorological Data for improved accuracy. Using local measurement data, the air quality model is validated in order to ensure accurate modelled results for the development, subject to availability of data. Applying any validation correction factors as appropriate, the Breeze Road Detailed Dispersion Model is used to predict future pollution concentrations of PM₁₀, PM_{2.5} and NO₂, at the proposed development site and at surrounding sensitive residential receptors for the proposed opening year of the development.

10.3.4 The results are compared against the relevant National Air Quality Objectives, to determine the extent to which traffic generation from the site will result in air quality impacts at sensitive receptors alongside the existing highway network, and to

determine whether compliance is achieved.

10.3.5 *Construction Dust Assessment*

10.3.6 A construction dust assessment has also been undertaken using the "Guidance on the assessment of dust from demolition and construction", published by The Institute of Air Quality Management in February 2014, to conduct a construction dust risk assessment, to determine whether air quality impacts are likely to arise from the construction of the proposed development. Under the IAQM guidance, since there are existing human receptors within 350m of the boundary of the Site and within 50m of the route used by construction on the public highway, it has been determined that a detailed assessment is required to determine potential dust impacts. The assessment has determined the magnitude of the anticipated works for each of the four main dust creating activities on-site – demolition, earthworks, construction and construction vehicle tracking out of the site. The approach taken to assessment of dust impacts is a risk assessment with best practicable means recommended where risk of soiling from dust is identified.

10.3.7 Further details of the traffic air quality and construction dust assessment methodology are provided in Appendix M.

10.3.8 *Noise Assessment for Construction Traffic Assessment*

10.3.9 A traffic noise assessment has been undertaken by Nick Hawkins Acoustics Consultant at Hawkins Environmental, to assess impact of the changes in road traffic flows on noise levels, at nearby sensitive residential receptors (specifically in relation to construction traffic). The construction traffic noise assessment has been undertaken in accordance with BS 7445-2: 1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use' and the Shortened Measurement Procedure of the Calculation of Road Traffic Noise. This involved short-duration noise measurements to sample noise levels at representative locations around the development site likely to be affected by changes in traffic flow.

10.3.10 An assessment of road traffic noise impacts is then based on forecast or estimated changes in traffic flow. The assessment will be completed using the Calculation of Road Traffic Noise (CRTN) methodology, published by the Department of Transport in 1988. Representative existing residential receptor locations are identified and predictions of changes in traffic noise are calculated. Where appropriate, noise modelling software (such as CadnaA) was used to predict traffic and any cumulative impact of all noise sources.

10.3.11 Change in noise levels at the existing sensitive receptor locations as a result of the development is determined in terms of traffic noise and used to assess the acceptability and significance of the noise impact.

10.3.12 *Construction Noise Assessment*

10.3.13 An assessment of the impact of construction and demolition on noise and vibration at nearby sensitive receptors has also been undertaken. In accordance with BS 7445-2: 1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use', a detailed noise measurement study was undertaken in order to determine ambient and background noise levels in the local environment. This included twenty-four hour noise monitoring using a semi-permanent unattended environmental noise monitor to determine background noise levels, at a

location representative of the residential properties likely to be worst affected by construction activities.

10.3.14 An indicative assessment of the likely construction impacts to surrounding sensitive receptors, was undertaken using the methodology contained within BS 5228: 2009 Part 1. Using the plant noise levels and likely plant lists from similar schemes, noise levels were be calculated for surrounding sensitive receptors. The noise levels calculated were compared to measured indicative current ambient noise levels to determine how acceptable noise levels are likely to be, to establish likely construction noise limits and to identify any limitations on construction noise. Where appropriate, noise modelling software (such as CadnaA) was used to predict construction noise. The assessment determines the acceptability and significance of the noise impact.

10.3.15 Although construction vibration is difficult to predict, BS 5228 provides guidance on determining whether impacts are likely to affect nearby receptors, by providing distances from typical construction activities at which vibration would be noticed. BS 5228 suggests that for most people, the threshold of vibration perceptibility is between 0.14 and 0.3 mms^{-1} PPV. This has been used as a basis for predicting the impact of vibration from heavy goods vehicles, excavation, hydraulic breaking and piling that will all take place during the construction phase of the development.

10.3.16 Further details of the traffic noise and construction noise assessment methodology are provided in Appendix M.

10.3.17 *Light spill & glare*

10.3.18 A qualitative assessment of light spill and glare has been undertaken with reference to the ILP *Guidance on Undertaking Environmental Lighting Impact Assessments*⁸³ and ILE *Guidance Notes for the Reduction of Obtrusive Light*⁸⁴. The guidance notes provide criteria for assessing the sensitivity of the lighting environment provided in Table 10-1, and magnitude of impact criteria are provided in Table 10-2. Information on the number and arrangement of additional lighting columns was not available for the assessment. A judgement has therefore been made on the extent to which impacts would occur. This is based on the sensitivity of receptors given the existing lighting environment and the expected magnitude of change. The magnitude of change is based on the relative proximity of receptors to proposed lighting that will be associated with the proposed compound locations.

Table 10-1: Criteria for assessing the sensitivity of the lighting environment

| lighting environment | Sensitivity score | Criteria |
|----------------------------------|-------------------|--|
| Intrinsically dark landscapes | Very high | National Parks, Areas of Outstanding Natural Beauty, etc |
| Low district brightness areas | High | Rural, small village, or relatively dark urban locations |
| Medium district brightness areas | Medium | Small town centres or urban locations |

⁸³ Institute of Lighting Professionals (ILP) (2013) PLG 04 *Guidance on Undertaking Environmental Lighting Impact Assessments*.

⁸⁴ Institute of Lighting Engineers (ILE) (2005) GN01 *Guidance Notes for the Reduction of Obtrusive Light*.

| lighting environment | Sensitivity score | Criteria |
|--------------------------------|-------------------|---|
| High district brightness areas | Low | Town/city centres with high levels of night-time activity |

Table 10-2: Criteria for assessing the magnitude of lighting impacts

| Impact score | Criteria |
|--------------|---|
| Major | Major increase in the level of light spill and/or glare on to surrounding areas and illuminance levels at the windows of residential properties, resulting in a major change in lighting conditions. |
| Moderate | Moderate increase in the level of light spill and/or glare on to surrounding areas and illuminance levels at the windows of residential properties, resulting in a moderate change in lighting conditions. |
| Minor | Minor increase in the level of light spill and/or glare on to surrounding areas and illuminance levels at the windows of residential properties, resulting in a perceptible change in lighting conditions. |
| Negligible | No perceptible change in the level of light spill and/or glare onto surrounding areas and illuminance levels at the windows of residential properties and would cause no discernible change in lighting conditions. |

10.3.19 *Ground contamination*

10.3.20 As noted above four beach samples were tested for a suite of potential contaminants as part of the Supplementary Ground Investigation (provided in Appendix M), two of which comprise the beach sands and two for the intertidal flat deposits at the site.

10.3.21 Analysis of the leachability of the bitumen coating at Splash Point found that the speciated PAHs in the leachate produced were below laboratory detection in all cases indicating low potential contaminant mobility. This indicated that although hydrocarbon-based compounds are present within the bituminous material the overall mobility of these compounds is low and therefore that risks of future leaching are also low.

10.3.22 *Waste management & pollution prevention*

10.3.23 A review of waste management and pollution prevention proposals as outlined in the Construction Strategy (provided in Appendix G) has been undertaken and used to inform an Outline Construction Environmental Management Plan (provided in Appendix M). Recommendations for the sustainable use of materials and waste management is provided in Chapter 11.

10.4 **Potential Impacts & Significant Effects**

10.4.1 *Air quality*

10.4.2 Predictions of changes in pollutant concentrations relative to AQAL at the worst affected sensitive receptors reflect that the increase in traffic flow is very small. Consequently, the proposed development will not have an impact on the air quality of the local area and the impact is considered to be 'negligible' and therefore not significant.

10.4.3 Similarly at the worst affected sensitive receptor, the worst-case annual mean NO₂ is

21.28 $\mu\text{g}/\text{m}^3$, therefore hourly exceedances of National Air Quality Objective of NO_2 are not expected to occur. There is only a risk that the NO_2 1-hour objective (200 $\mu\text{g}/\text{m}^3$) could be exceeded if the annual mean nitrogen dioxide concentration is greater than 60 $\mu\text{g}/\text{m}^3$. Consequently, local short duration pollutant concentrations would not be considered a cause for concern in gardens, balconies and other outdoor amenity spaces associated with sensitive receptors.

- 10.4.4 The proposals have been assessed as a 'High Risk Site' for dust based on the types of activities proposed and the sensitivity of nearby receptors, and there would be potential for major adverse impacts if unmitigated. A dust management plan is therefore required for the site during the construction phase of the development. Within the dust management plan 51 mitigation measures will be implemented. Given a dust management plan will be implemented, it is anticipated that any temporary adverse effects will be mitigated. Therefore, it is considered that the effect of construction and demolition dust on air quality will be of negligible significance (not significant). The detailed construction quality assessment results are presented in Appendix M.

10.4.5 *Construction noise*

- 10.4.6 A number of the construction phases require construction activities to occur along the whole length of the sea wall. However, these construction activities will not occur continuously along the whole length, rather construction will be concentrated in one particular location and move along the sea wall as the construction period progresses. The maximum noise levels assessed for these activities generally correspond to the period of time when the construction activity is located closest to the receptor. At other times in the activity period, the construction activities may be several hundred metres further away from the receptor than is modelled. If one considers 'typical' noise levels over each construction phase, the predicted noise levels are likely to be significantly lower than those predicted.
- 10.4.7 At the five sample receptors closest to the construction area (12 Brynheddydd Bay, 26 Molineaux Road, 2 Tynewydd Road, Splash Point Apartments and 31 Garford Road), all five would experience noise levels of 5 dB(A) or more in excess of the maximum construction noise levels (depending on the BS 5228 category of the receptor) during the day, evening and night time periods; therefore, at these receptors it is likely that there would be a temporary major adverse impact on noise.
- 10.4.8 At 37 Marine Drive and at properties close to this location, noise levels at night during the rock revetment construction phase of the construction period could be up to 3 dB in excess of the maximum construction noise level of 45 dB and therefore there could be a temporary minor adverse impact on noise in this area.
- 10.4.9 At the Royal Alexandra Hospital and at properties close to this location, noise levels during rock stockpiling and storage in compound phase of the construction period could be up to 5 dB in excess of the maximum construction noise levels of 65 dB and therefore there could be a temporary moderate adverse impact on noise in this area.
- 10.4.10 Unmitigated, the moderate and major adverse impacts would be considered significant due to the sensitivity of the existing residents. The detailed construction noise assessment results are presented in Appendix M.

10.4.11 *Construction vibration*

10.4.12 Proposed construction activities involving heavy goods vehicles, excavation, hydraulic breaking and piling will all take place during the construction phase of the development. However, the use of heavy goods vehicles, excavation and hydraulic breaking would place at least 20m from the closest receptor locations and therefore, vibrations from these activities are unlikely to be perceptible.

10.4.13 Vibration from driven piling may be perceptible 50 to 100m from the piling location, and therefore sheet piling proposed as part of the construction of the stepped access points could be perceptible at receptors closest to the construction site. The specific magnitude of the impact is difficult to predict, as is the duration of the impact, without specific details of the plant to be used. However, during the piling, which would take place during the construction of the stepped access points, it is anticipated that a PPV of 1.0 mms^{-1} or more could be experienced at the closest receptors. This is likely to result in a moderate adverse short duration impact. The detailed construction vibration assessment results are presented in Appendix M.

10.4.14 *Construction traffic noise*

10.4.15 The change in traffic noise is very small at the worst affected sensitive receptors located closest to the haul route, with the biggest increase in noise levels in the region of 0.2 dB(A). It should be noted that an increase of 3.0 dB(A) is generally acknowledged to be the threshold of perceptibility; therefore, it is anticipated that this very small temporary change in noise levels would not be perceptible to the average resident. Consequently, the impact of changes in traffic flows associated with the proposed development is considered to be negligible and therefore not significant. The detailed construction traffic noise assessment results are presented in Appendix M.

10.4.16 *Light spill & glare*

10.4.17 Although outside of Rhyl Town Centre, Marine Drive and East Parade have been considered a medium sensitivity light environment given that existing street lighting is already present. The main construction compound, Compound 1, would be located across the road from two groups of receptors. The grade II Listed Princess Alexandra Hospital is set back from the road and has a lit car park in front of its main façade. This receptor has therefore been assessed as being of low sensitivity to light spill and glare. The residential properties on Marine Drive located between Grosvenor Road and Old Golf Road are considered potentially more sensitive as these properties are located closer to the road. The façade of the properties, which would be located approximately 30m from the boundary of the main compound, has been assessed as medium sensitivity. Given this distance it has been assessed that there would be a moderate change in the lighting environment for these properties during construction. Using the matrix of significance provided in Table 3-5 the effect of this is assessed as slight as summarised in Table 10-3.

10.4.18 The closest residential properties to the secondary compound location, Compound 2, situated adjacent to Garford Road and Brynhydd Bay are considered to be located in a high sensitivity lighting environment, given that no existing street lighting is present on the façade facing the compound area. The compound would be less than 10m from the affected façade of these properties and so the predicted magnitude of impact has been assessed as major. Using the matrix of significance provided in Table 3-5 the effect of this is assessed as large as summarised in Table 10-3.

Table 10-3: Summary of significance of effect on receptors from compound lighting impacts.

| Receptors | Sensitivity score | Predicted magnitude of impact | Significance score |
|---|-------------------|-------------------------------|--------------------|
| Grade II Listed Royal Alexandra Hospital | Low | Moderate | Slight adverse |
| Closest residential properties on Marine Drive | Medium | Moderate | Moderate adverse |
| Closest residential properties on Garford Road | High | Major | Large adverse |
| Closest residential properties on Brynheddydd Bay | High | Major | Large adverse |

10.4.19 *Ground contamination, waste management & pollution prevention*

10.4.20 There is low potential for pollution during construction of the scheme, due to a low risk of mobilising contaminants. However, there is a risk of pollution as a result of mechanical failure or human error during construction, although these risks would be minimised through implementation of the CEMP and adherence to best practice guidance by the contractor.

10.5 Mitigation Measures

10.5.1 *Air quality*

10.5.2 As noted above a dust management plan for 'High Risk Sites' would be implemented as standard. In accordance with The Institute of Air Quality Management Guidance on the assessment of dust from demolition and construction, the 51 mitigation measures identified as highly recommended or desirable will be implemented as part of the dust management plan.

10.5.3 Specifically all potentially dust generating activities would be subject to adequate dust suppression techniques. All vehicles leaving the site are required to pass through a wheel wash facility. Should there be any build-up of mud on the access/egress route through the residential area, a road sweeper will be employed to remove it during the regular site working hours.

10.5.4 *Noise and vibration*

10.5.5 Non-tidal out of hours work has the greatest potential to generate complaints, and so would be avoided where reasonably practicable. Specific mitigation measures to reduce noise impacts would also be employed. White noise reversing warning beacons would be fitted to vehicles on the site rather than tonal beacons. When accessing/egressing the site during unsociable hours, vehicles would adhere to a voluntary low speed limit while passing through residential areas.

10.5.6 Construction noise monitoring will be required to verify the predictions of the noise assessment and provide specific mitigation measures to ensure any significant noise effects are adequately controlled. Worst-case plant noise levels have been assessed in the noise assessment. Careful planning to select quiet plant could dramatically reduce noise levels. Similarly, typical plant running times have been assessed, but, careful planning could be employed such that the noisiest activities could be restricted

to a maximum number of hours per day.

- 10.5.7 With regards to construction vibration the activity with the greatest potential impact is piling. If driven piling is necessary, this would cause levels of vibration that are likely to cause a moderate adverse impact. Given the requirement for tidal working, and therefore likelihood of piling taking place outside of regular construction working hours, consideration would be given to Best Practicable Means.

10.5.8 *Light spill & glare*

- 10.5.9 Commitment would be made to the ILE *Guidance Notes for the Reduction of Obtrusive Light* which recommends the following mitigation for reducing light spill and glare:

- Do not over-light working areas.
- Dim or switch off lights when a task is complete or the area is not in use.
- Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal when the task is finished
- Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70°.
- Higher mounting heights allow lower main beam angles, which can assist in reducing glare.

- 10.5.10 Solid hoarding would be erected around site compound boundaries only, so as not to obscure sea view. Nevertheless floodlights would be directed away from residential buildings so as not to cause light spill. Any generators to be used on site are to be the quietest available and preferably sited within an enclosure and as far as possible from residential properties.

10.5.11 *Waste management & pollution prevention*

- 10.5.12 Although considered unlikely should any deposits suspected to be potentially contaminated be uncovered during construction, the arising would need to be subject to waste acceptance criteria (WAC) testing, prior to disposal at an appropriately licenced waste management facility.

- 10.5.13 Waste that is recyclable will be sorted on site. All waste materials will either be placed into the relevant storage disposal container situated within the main site compound or removed from site by the individual sub-contractor and disposed of in an appropriate manner. For any waste that is taken off site, a chain of custody must be recorded at all times.

- 10.5.14 With reference to mitigation measures set out in section 5.5, measures undertaken to reduce risks to the water environment following CIRIA Guidance: *Control of water pollution from construction sites. Guidance for consultants and contractors* (C532D) (Masters-Williams, 2001). Examples of good practices that would be undertaken to minimise the risk of pollution to the marine environment are set out as follows.

- 10.5.15 Site storage of fuel and chemicals shall be above the mean high water level and away from high-risk locations, such as 10m of a waterbody. All liquids and solids of a potentially hazardous nature (for example diesel fuel, oils, solvents) will be stored in a bunded locked container on surfaced areas (bund to contain an additional 10% over the capacity of the liquid stored).

10.5.16 Refuelling of plant and equipment will only be permitted at designated refuelling areas. No refuelling shall take place on the beach area at any time. Small plant will be taken from the works face (when on the beach) and refuelled at a designated fuel area established above the mean high water level. All refuelling and bulk deliveries shall be supervised at all times. The relevant emergency prevention oil spill kits will be available where plant is operating and operatives shall be trained in the use. Any spillages shall be contained and reported to the using the formal incident recording system. Drip trays will be used to prevent oil leaking from machinery when parked/stored, and during refuelling of machinery.

10.5.17 *Construction Environmental Management Plan*

10.5.18 This assessment has been used to inform development of an outline Construction Environmental Management Plan (CEMP) provided in Appendix M. The CEMP has been written to carry forward the recommendations for environmental management made in this ES, to the construction phase of the development project. It outlines the likely roles and responsibilities of those involved in the delivery of the project and sets out the environmental actions required to achieve a series of environmental management objectives identified for the scheme.

10.5.19 Environmental management actions are set out in the CEMP, against which an appropriate project team member is identified for ensuring that the action is fully implemented. Monitoring of the CEMP would be undertaken by the construction Contractor as part of their Environmental Management System (EMS).

10.6 Residual Effects

10.6.1 No significant impacts on air quality are predicted either during the construction or operational phases of the development. No residual effects on air quality are therefore predicted.

10.6.2 It is anticipated that there will be temporary large adverse impacts as a result of construction noise at some sensitive receptors (specifically the areas represented by the five sample receptors closest to the construction area - 12 Brynhedydd Bay, 26 Molineaux Road, 2 Tynewydd Road, Splash Point Apartments and 31 Garford Road).

10.6.3 With regards to construction vibration the activity with the greatest potential impact is piling. If driven piling is necessary, this would cause levels of vibration that are likely to cause a moderate adverse impact. Given the requirement for tidal working, and therefore likelihood of piling taking place outside of regular construction working hours, consideration would be given to Best Practicable Means.

10.6.4 The construction compounds would be lit by VT Hybrid LED lighting towers, which provide directional lighting and so can be positioned to minimise light trespass on adjacent property. However given the duration of the construction period over 3 years it is recommended that the lighting of the compounds would be carefully designed to minimise impacts of glare and light spill on adjacent properties. Mitigation measures set out above are incorporated into the Construction Environmental Management Plan. With the mitigation proposed, the residual effect of construction lighting for the closest receptors on East Parade/ Marine Drive would be slight adverse. For receptors on Garford Road and Brynhedydd Bay the residual effect of construction lighting would be moderate adverse.

10.6.5 Table 10-4 summarises the residual construction effects.

Table 10-4: Summary of significance of residual construction effects

| Receptors | Pre-mitigation significance score | Residual effect |
|--|--|---------------------------------|
| Dust Generated by Demolition and Construction of the Proposed Development | Large | Not significant |
| Traffic Emissions Generated by Construction Traffic | Not significant | Not significant |
| Construction Noise | Slight to Large | Slight to Large |
| Construction Vibration | Moderate | Minor to Not significant |
| Construction Traffic Noise | Not significant | Not significant |
| Glare impacts on the Grade II Listed Princess Alexandra Hospital | Slight/ moderate | Slight |
| Light spill and glare impacts on the closest residential properties on Marine Drive | Moderate | Slight |
| Light spill and glare impacts on the closest residential properties on Garford Road and Brynheddydd Bay | Large | Moderate |
| Pollution to the marine environment from construction practices or disturbance of potential contaminants | Negligible | Not significant |

11 Sustainability and Climate Change

11.1 Introduction

11.1.1 This chapter assesses the potential impacts of the proposed development on sustainability and climate change, during construction, operation and beyond the design life of the proposals. The following key issues are assessed in this chapter:

- sustainable resource use;
- carbon footprint of the proposed development; and
- resilience and adaptation of the proposed development to a changing climate.

11.1.2 This chapter also addresses the EIA Scoping Opinion response that consideration should be given to the standard of protection afforded by the proposals under different climate change projections. Standard of protection from wave overtopping flooding has been assessed with reference to a Flood Consequences Assessment prepared in accordance with the requirements of TAN15, which is provided in Appendix N.

11.2 Baseline Conditions

11.2.1 The Environment Act (Wales) 2016 aims to position Wales as a low carbon, green economy, ready to adapt to the impacts of climate change. Key parts of the act that are particularly relevant to sustainability and climate change include:

- Part 1: Sustainable management of natural resources – enables Wales’ resources to be managed in a more proactive, sustainable, and joined-up way.
- Part 2: Climate change – provides Welsh Ministers with powers to put in place statutory emission reduction targets, including at least an 80% reduction in emissions by 2050 and carbon budgeting to support their delivery.

11.2.2 The Climate Change Strategy for Wales⁸⁵ sets out an adaptation framework to present a coordinated approach in Wales to the risks and opportunities that climate change presents and to ensure Wales is well placed to adapt to the risks of climate change.

11.2.3 *Carbon footprint*

11.2.4 The East Rhyl coastal defence scheme is a response to wave overtopping flooding, forecast to increase with future sea level rise and increased storminess, as a result of climate change. It is well recognised that emissions of carbon dioxide (CO₂) and other greenhouse gases (GHGs) such as methane (CH₄) and nitrogen dioxide (NO₂) from human activities, have caused global warming and climate change⁸⁶.

11.2.5 As well as a response to climate change it is recognised that CO₂ emissions would also result from construction of the coastal defence scheme, as a result of transport of materials via heavy vehicle movements, embodied carbon within the materials used and use of plant for construction.

11.2.6 The total CO₂ emissions emitted from Denbighshire Local Authority area in 2016 was

⁸⁵ <https://gov.wales/docs/desh/publications/101006ccstratfinalen.pdf>

⁸⁶ IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151pp.

489,745,000kgCO₂⁸⁷. The total for Wales in 2016 was 24,866,059,000kgCO₂. It should be noted that these figures do not take into account non-CO₂ sources of GHGs, such as methane and other aerosols, which is measured in CO₂-equivalent (CO₂e) and is unavailable for the Denbighshire area. However, the total emissions for Wales in 2015 was 45,698,900,000kgCO₂e⁸⁸.

11.2.7 *Climate change resilience and adaptation*

- 11.2.8 TAN 15¹³ recognises that sea level rise and increased storminess are some of the most likely effects of climate change, to which Wales will need to adapt in the future. Policy Clarification Letter CL-03-16¹⁴ sets out the requirements of TAN 15 with regard to the climate change allowances for planning. Associated Flood Consequences Assessment guidance¹⁵ makes reference to the source of the new requirements in *FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities—Climate Change Impacts*¹⁶. This discusses in detail that the response to climate change requires appropriate decisions on whether to consider a managed adaptive approach or whether to adopt a more precautionary approach to coastal defence. The managed adaptive approach involves tracking the change in risk and managing this through multiple interventions.
- 11.2.9 The East Rhyl scheme has been designed to provide coastal defence from wave overtopping flooding over 60 years, for up to a 1 in 200 year Standard of Protection (SoP)¹³. The engineered design life of the scheme is up to 100 years, although it would not be cost beneficial (nor environmentally acceptable) to achieve a 1 in 200 year SoP over the next 100 years, as a significantly larger coastal defence than proposed would be required. This does not preclude that the current proposals could be extended or modified at a later date, depending on how realisation of the impacts of climate change affect the standard of protection provided by the coastal defences. A managed adaptive approach to climate change is considered to be in line with current planning policy (i.e. TAN15¹³).
- 11.2.10 The scheme and its business case have been developed under the transitional arrangements of *Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales*¹⁸. Although the guidance advises the use of different climate change predictions for Flood Consequences Assessment contained in the FCDPAG3^{15 16}, transitional arrangements do still allow for continued use of the UK Climate Projections (UKCP09) where detailed design of development proposals had commenced prior December 2017.
- 11.2.11 The EIA Scoping Opinion response received from NRW advises that '*New guidance removes the use of UKCP09 data for future tidal predictions and utilises those based on FCDPAG3 data. This change could have significant implications on the design of the improved coastal defences, which has been based on UKCP09 data, and this could subsequently affect the anticipated standard of protection offered by the proposed improvements. We consider that this requires urgent consideration*'.
- 11.2.12 Although the business case for the scheme proposals has been presented on the basis of the UKCP09, in order to address the EIA Scoping Opinion the proposals have also been assessed to the requirements of TAN15 using the climate change predictions advised in FCDPAG3¹⁶. These predictions are for regional net sea level rise allowances

⁸⁷ UK local authority and regional carbon dioxide emissions national statistics: 2005-2016 [online] Available at: <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-2016>

⁸⁸ https://naei.beis.gov.uk/reports/reports?section_id=4

and indicative sensitivity ranges over defined periods (epochs) based on higher emissions scenarios of the IPCC Third Assessment Report. As advised in Welsh Government Guidance¹⁸ the TAN15 requirements are consistent with the latest global sea level rise predictions and the IPCC Fifth Assessment Report. A comparative assessment of how the proposals would perform in terms of the SoP under UKCP09 and FCDPAG3 (current TAN15) scenarios is therefore provided.

11.2.13 UKCP09 Projections

11.2.14 Marine and coastal related impacts of climate change that are of relevance to the proposed development have been considered to establish the baseline for this chapter. This consists of changes in sea level, storm surges, and wave heights, and storminess. Projected changes in these factors have been sourced from UKCP09. These are based on three emission scenarios: low, medium, and high. A high emissions scenario is associated with very rapid economic growth, a peak in global population in 2050 of 8.7 billion, and a rapid introduction of new and efficient fossil fuel intensive technologies⁸⁹. Projections used here are mainly based on the high emissions scenario to capture the worst-case scenario (adopting the precautionary principle). Where this is not the case, it has been stated.

11.2.15 A summary of baseline climate change data obtained from the UKCP09 user interface⁹⁰ is provided in Table 11-1.

Table 11-1: Summary of projected climate change impacts to the coastal cell for East Rhyl from UKCP09

| Climate Change Impact | 5th Percentile | 50th Percentile | 95th Percentile | Emissions Scenario |
|--|----------------|-----------------|-----------------|--------------------|
| Sea level rise by 2100 (m) | 0.186 | 0.509 | 0.832 | High |
| Extreme water levels (Exceedance of present-day astronomical tide – 50-yr return level for 2095 (m)) | - | 15 – 1.8 | - | Medium |
| Winter mean and extreme wave heights | - | Decrease | - | Medium |
| Sea level pressure for 2070-2099 (hPa) | -0.444 | 0.342 | 1.13 | High |

11.2.16 Projected sea level rise for specific years for specific coastal cells can be obtained from the UKCP09 user interface⁹¹. Under the high emissions scenario, the central estimate (50th percentile) for sea level rise by 2100 for the coastal cell for East Rhyl is 0.509m above 1990 levels. The 5th percentile is 0.186m (meaning there is a 5% chance that sea level rise will be less than this). The 95th percentile is 0.832m (meaning there is a 5% chance that sea level rise will be more than this).

11.2.17 Storm surges are high water levels that occur due to atmospheric forcing (atmospheric pressure and winds associated with storms). Changes in storm surge and extreme

⁸⁹ Warren, R. 2009. Annex 1: Emissions Scenarios Used in UKCP09. [Online] Available at: <http://ukclimateprojections.metoffice.gov.uk/media.jsp?mediaid=87884&filetype=pdf> (Accessed 11 August 2017)

⁹⁰ UKCP09, 2009. UK Climate Projections User Interface. [Online] Available at: <http://ukclimateprojections-ui.metoffice.gov.uk/ui/admin/login.php> (Accessed 18 August 2017)

⁹¹ UKCP09, 2009. UK Climate Projections User Interface. [Online] Available at: <http://ukclimateprojections-ui.metoffice.gov.uk/ui/admin/login.php> (Accessed 18 August 2017)

water levels can be reflected in the modelled exceedance of present-day astronomical tides (tidal height as a result of astronomical forcing alone such as the gravitational pull of the sun and moon) by projected future extreme water level (extreme water levels as a result of storm surges and sea level rise due to climate change). The UKCP09 uses a medium emission scenario to model storm surges. The central estimate for the exceedance level for a 50-yr return level for 2095, which is the level expected to be exceeded on average once in a 50-yr period, is projected to be between 1.5 and 1.8m surrounding East Rhyl. For comparison, the central estimate for the present-day exceedance level above present-day astronomical tides for a 50-year return level is between 0.9m and 1.2m for East Rhyl⁹².

11.2.18 Wave model results presented in the marine and coastal projections report, show a slight reduction in mean and extreme winter wave heights to the north of the UK, under a medium emissions scenario (based on a mid-climate sensitivity version of the Met Office wind forcing)⁹². However, there is a large amount of uncertainty associated with this, and further work is needed to fully interpret wave projections in light of changes in weather patterns from climate model results.

11.2.19 There has been an increase in severe gales over the past century⁹³. The distribution and frequency of storms in the UK is linked to the North Atlantic Oscillation (NAO); high pressure differences between the Azores islands and Iceland coincide with the stormiest periods in the last century⁹⁴. Furthermore, evidence suggests an increase in storms that take a more southerly track towards the UK, which has been typical of the recent storms that have occurred in the UK in the early half of this decade⁹⁵. However, there is limited evidence to suggest increases in storminess are due to anthropogenic climate change⁹⁵. Models generally predict limited changes in sea level pressure due to climate change. Under the high emissions scenario, the projected annual changes in sea level pressure between 2070 and 2099 for the Irish Sea and North Channel are likely to be between -0.444hPa (5th percentile – 5% chance of being below) and 1.13hPa (95th percentile – 95% chance of being below). The central estimate (50th percentile) is 0.342hPa. Further research is required to investigate the relationship between storminess in the UK, climate change, NAO, and how this can be projected in the future.

11.2.20 FCDPAG3 Projections (current TAN15)

11.2.21 In Wales, TAN 15 requires that it is necessary to take account of the potential impact of climate change over the lifetime of development (75 years for non-residential development)¹⁵. Within TAN 15, Policy Clarification Letter CL-03-16¹⁴ and FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities—Climate Change Impacts¹⁶ sets out the climate change allowances that should be used in flood consequences assessments submitted in support of relevant planning applications, and to inform development plan allocations¹⁵. The allowances used in TAN 15 originate from

⁹² Lowe et al. 2009. UK Climate Projections science report. Marine and Coastal Projections. [Online] Available at: <http://ukclimateprojections.metoffice.gov.uk/media.jsp?mediaid=87906&filetype=pdf> [Accessed 15 August 2017]

⁹³ Jenkins, G., Perry, M. & Prior, J. 2008. The climate of the United Kingdom and recent trends. Met Office Hadley Centre, Exeter, UK. [Online] Available at: http://www.ukcip.org.uk/wp-content/PDFs/UKCP09_Trends.pdf (Accessed 10 August 2017)

⁹⁴ Allan, R. (2006). Impacts of climate change on storminess in marine climate change impacts annual report card 2006 (Eds. Buckley, P.J., Dye, S.R. and Baxter, J.M) Online Summary Records, MCCIP, Lowestoft, www.mccip.org.uk

⁹⁵ Met Office, 2014. The recent storms and floods in the UK, [Online] Available at: <http://nora.nerc.ac.uk/505192/1/N505192CR.pdf> (Accessed 15 August 2017).

Environment Agency Flood and Coastal Defence Appraisal Guidance 3¹⁶. The Regional Sea Level allowances used in FCDPAG3 were taken up from the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report High Estimates and are provided in Table 11-2.

Table 11-2: Regional net sea level allowances used in FCDPAG3¹⁶.

| Administrative or Devolved Region | Assumed Vertical Land Movement (mm/yr) | Net Sea-Level Rise (mm/yr) | | | | Previous allowances |
|---|--|----------------------------|-----------|-----------|-----------|---------------------|
| | | 1990-2005 | 2025-2055 | 2055-2085 | 2085-2115 | |
| South West and Wales | -0.5 | 3.5 | 8.0 | 11.5 | 14.5 | 5 mm/yr* constant |
| * Updated figures now reflect an exponential curve and replaces the previous straight line graph representations. | | | | | | |

11.2.22 Sustainable use of resources and bulk waste disposal

11.2.23 The sea wall, precast steps and raised walkway along Rhyl Promenade will all be made of concrete. The cement and concrete industry is a significant contributor to climate change, accounting for between 5 and 6% of global emissions⁹⁶. The Sustainable Concrete Forum, an organisation established to tackle emissions in the UK concrete industry, states that in 2015 (the most recent year for which information is available), 133.1kWh of energy were used to produce each tonne of concrete in the UK. This is an increase from a record annual low of 127.0kWh/tonne in 2012⁹⁷.

11.2.24 The mining and quarrying industry is also a significant contributor to UK carbon emissions, accounting for 4.5% of total emissions in 2015⁹⁸. Rock armour for sea defences is usually limestone, granite or concrete, due to those materials' hardness and durability. Limestone is the most common rock armour material. Due to its formation, limestone has a relatively low embodied carbon value in comparison with other quarried rock types (17kg CO₂/t)⁹⁹.

11.2.25 Construction is one of the most significant producers of waste of any industry, creating 25-30% of UK waste by weight¹⁰⁰. The nature of construction waste can also make disposal difficult – most construction sites will create some waste of a hazardous nature¹⁰⁰. The proposed scheme has the potential to create waste – some existing groynes around Splash Point need to be removed to aid access and the existing sea wall will be removed.

⁹⁶ United Nations Framework Convention on Climate Change (UNFCCC) - Bigger Climate Action Emerging in Cement Industry. Available online: <https://unfccc.int/news/bigger-climate-action-emerging-in-cement-industry> [Accessed 29/06/18].

⁹⁷ The MPA Concrete Centre (2016) - Concrete Industry Sustainability Performance Report.

⁹⁸ Statista (2018): Carbon dioxide (CO₂) emissions of the mining and quarrying industry in the UK from 1990 to 2015. Available online <https://www.statista.com/statistics/486099/co2-emission-of-mining-and-quarrying-uk/> [Accessed 29/06/18].

⁹⁹ Hammond, G.P. and Jones, C.I. (2008), 'Embodied energy and carbon in construction materials', Proc. Instn Civil. Engrs: Energy, in pres

¹⁰⁰ European Commission, 2018. Construction and Demolition Waste (CDW). Available online: http://ec.europa.eu/environment/waste/construction_demolition.htm

11.3 Assessment Methodology

11.3.1 Three aspects of climate change are assessed herein:

- 1 climate change avoidance (carbon footprint & minimising greenhouse gas emissions, sustainable use of resources);
- 2 climate change resilience (assessing the standard of protection of the proposals); and
- 3 climate change adaptation (planning for future climate change scenarios).

11.3.2 This assessment within this chapter has followed IEMA EIA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance¹⁰¹ and Climate Change Resilience and Adaptation¹⁰².

11.3.3 *Climate change avoidance*

11.3.4 The GHG assessment uses the Environment Agency's e:Mission Carbon Planning Tool. This program predicts the GHG impacts of construction activities in terms of CO₂e. It does this by calculating the embodied CO₂e of materials plus the CO₂e associated with their transportation. It also considers personnel travel, site energy use and waste management. The tool was developed by the EA, initially for use on its projects that are predominantly fluvial and coastal schemes¹⁰³.

11.3.5 Where information was not available to complete the climate change calculations, assumptions were made that detail a worst-case scenario (following the guidelines of the precautionary principle). Assumptions are stated below:

- The Environment Agency's e:Mission Carbon Planning Tool assumes that transporting material by road emits GHGs at a rate of 0.10672kgCO₂e km⁻¹kg⁻¹;
- It was assumed that in construction stages where heavy plant is to be used, individual plant will run constantly during working hours, consuming diesel at a rate of 23 litres (5 gallons) per hour;
- It was assumed that all site offices and welfare facilities would be heated and lit constantly during working hours, for the entire duration of the construction stage; and
- Where a range of potential sources, or no source, for the material required were stated, the furthest away source UK was used, presenting the longest realistic haulage distance (see 0 for the locations chosen for the assessment).

11.3.6 Operational GHG emissions of the proposed development are not considered significant. Although there would be emissions associated with maintenance (i.e. patch repair usage of concrete), these would be difficult to quantify and would be likely to be negligible in comparison to construction GHG emissions.

11.3.7 There could be significant future GHG emissions associated with adapting the proposals beyond the design life. This is considered further in section 0.

¹⁰¹ IEMA & Arup, 2017: Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance.

¹⁰² IEMA & Mott MacDonald, 2015. Environmental Impact Assessment Guide to: Climate Change Adaptation and Resilience.

¹⁰³ Environment Agency, 2016. e:Mission Carbon Planning Tool [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/571707/LIT_7067.pdf

11.3.8 *Climate change resilience*

- 11.3.9 As part of detailed design, the performance of the development proposals to withstand wave overtopping has been assessed through the development of the East Rhyl TUFLOW flood inundation model. However, in addition to this, there has been the need to understand the standard of protection (SoP) that could be achieved by the coastal flood defence proposals.
- 11.3.10 To determine the SoP offered by the rock armour revetment (in conjunction with the adjacent frontages) it was first necessary to establish how much wave overtopping could be tolerated from the adjacent frontage before Garford Road floods (sensitivity testing). This was assessed by incrementally producing TUFLOW flood inundation models for different overtopping rates to determine the point at which flooding does not occur.
- 11.3.11 The second stage of the assessment associates a return period to the maximum allowable wave overtopping rate for the defence extent. This return period provides an estimate of the SoP offered, with any higher return periods likely to result in flooding to Garford Road.
- 11.3.12 The full methodology for determination of the SoP for the proposals is provided in the Wave Overtopping Technical Note in Appendix N.
- 11.3.13 The numerical modelling described above was undertaken using UKCP09 projections adjusted for the epochs 2017, 2037, 2057, 2077, 2097 and 2117. Therefore, in order to provide a comparison with the climate projections set out in FCDPAG3 (TAN15), it has been necessary to recalculate SoP for similar comparable epochs. The methodology used for recalculation of the SoP provided is the same as that set out above, albeit with the new climate change projection data applied. There were however some additional assumptions made, set out as follows:
- The presented SoP is calculated from one cross-section on the Rhyl frontage (the 'worst case' location by the slipway) as opposed to the average of 5 cross-sections as in previous methodology.
 - This approach therefore assumes that the relative overtopping rates over the other 4 cross-sections will not change to that observed in UKCP09 predictions.
 - The approach also assumes no increase in overtopping over the designed revetment, which has been designed on the basis of the UKCP09 predictions.
 - Only 4 epochs have been assessed using the with the climate projections set out in FCDPAG3 (TAN15).
 - The new SoP values presented are estimated and should only therefore be used for comparison with UKCP09 SoP data.

11.3.14 *Climate change adaptation*

11.3.15 The assessment of climate change adaptation involves the following steps as presented in the IEMA Climate Change Resilience and Adaptation Guidelines¹⁰²:

- 1 identifying the emerging baseline, taking account of the influence of climate change;
- 2 identifying the potential impacts from the scheme during construction, operation and decommissioning;
- 3 assessing the sensitivity of baseline receptors to climate change;
- 4 assessing the scale of impact of the project in combination with climate change;
- 5 assessing the significance of the combined impact; and
- 6 identifying mitigation measures and, where these do not result in acceptable impacts, refine the design and reassess the residual effect (climate change adaptation in a plan).

11.3.16 The climate change baseline is set out in Section 11.2 above. Given that the coastal defence scheme has been designed to protect 472 residential properties from wave overtopping flooding which is predicted to become exacerbated by climate change, it is the residential properties which are considered the key receptors to future climate change. In accordance with the IEMA Climate Change Resilience and Adaptation Guidelines¹⁰², receptors are categorised on the basis of the impact that climatic factors would have as follows:

- High sensitivity - absolutely reliant on specific climate conditions prevailing;
- Moderate sensitivity - affected by changes in climate but not dependent on specific conditions;
- Low sensitivity - hardly influenced by change in climate at all.

11.3.17 On the basis of these definitions the residential receptors are considered highly sensitive to the effects of climate change.

11.4 **Potential Impacts & Significant Effects**

11.4.1 *Climate change avoidance*

11.4.2 GHG emissions would result from the construction of the proposed development due to the following factors:

- vehicle movements arising from the delivery of materials to site;
- use of construction equipment and plant; and
- embodied carbon of the materials used to construct the proposed development.

11.4.3 The materials used in the proposed development have associated carbon and GHG emissions relating to the emissions during the production of the material. This is known as embedded or embodied carbon. The EA's carbon calculator was used to calculate the embodied energy of the materials used. From this, GHG emissions as CO₂e could be calculated based on the estimated mass of the material that would be used. The estimated embodied GHG emissions associated with the use of materials for the proposed development is provided in Table 11-3.

Table 11-3: Estimated embodied carbon associated with the construction material for the proposed development

| Description | Material | Quantity (t) | Kg Embodied carbon/kg | Embodied tCO ₂ e |
|---|---------------|--------------|-----------------------|-----------------------------|
| Rock armour stone 3t to 6t | Limestone | 172,720 | 0.090 | 15,544.8 |
| Filter layer stone 0.3t to 1t | | | | |
| Quarry run core | | | | |
| Geotextile (HPS14 or similar) | Polypropylene | 0.286 | 2.54 | 0.8 |
| Hydraulically bound subbase material | Concrete | 8,724 | 0.135 | 2820.3 |
| Pre-cast concrete wall sections | | | | |
| Pre-cast concrete access step units | | | | |
| Ready-mixed concrete | | | | |
| Reinforcing steel to concrete (excluding pre-cast elements) | Steel | 163 | 1.46 | 238.7 |
| Total embodied carbon equivalent (tCO₂e) | | | | 18,604.6 |

11.4.4 Vehicle movements associated with transporting construction materials would cause GHG emissions. The estimated equivalent GHG emissions associated with the delivery of materials for the proposed development is provided in Table 11-4. This was calculated using the EA carbon calculator, which assumes a base value of 0.00010672tCO₂e/t.km.

Table 11-4: Estimated CO₂ emissions associated with the delivery of construction materials for the proposed development

| Material for delivery | Mass (t) | Mode of transport | Average distance between source of supply and site (km) | Tonnes CO2e resulting from transport |
|--|----------|-------------------|---|--------------------------------------|
| Limestone | 172,720 | Road | 1,418,870 | 2,110.9 |
| Polypropylene | 0.286 | | 77 | 0.015 |
| Concrete | 8,724 | | 4,950 | 596.6 |
| Steel | 163 | | 270 | 0.765 |
| Total embodied carbon equivalent (tCO2e) | | | | 2,708.3 |

11.4.5 The locations of the sources of the required material have been derived from the following locations:

- Limestone: six quarries were shortlisted to provide the required stone in February 2018. Balfour Beatty's construction strategy stated that 61.6% of the limestone was expected to come from Wales and 38.4% from outside Wales. The shortlisted quarries the furthest distance away from the proposed development within the shortlist were selected, presenting a worst-case scenario.
- Concrete: Balfour Beatty's construction strategy stated that all precast concrete was to come from outside Wales. The location of the Hanson cement production plant in Cambridgeshire, the furthest plant from the site in England, was used as

a worst-case scenario of where the concrete for the pre-cast units could travel from.

- Polypropylene: Balfour Beatty's construction strategy stated that the geotextile membrane would come from outside Wales. The furthest plastics factory from the site in England, Coda Plastics Ltd in Norfolk, was used as a worst-case scenario.
- Steel: Balfour Beatty's construction strategy stated that all concrete was to come from within Wales. Location of Tata Steel's plant in Deeside Industrial Park was used.

- 11.4.6 When embodied carbon values and values resulting from the freight of these materials are combined, the total CO₂e emissions resulting from the materials used from the proposed development are **21,312.9tCO₂e**.
- 11.4.7 Construction waste would be created as part of the development. The bulk of the construction waste would arise from the removal of some of the existing groynes to allow plant access to the beach and the waste concrete created from removing the existing sea wall. Due to disposal of these materials into landfill (representing the worst-case scenario for climate change calculations), **110.3 tCO₂e** would be emitted.
- 11.4.8 GHGs would also be emitted from the plant during construction of the proposed development. The number and specifics of the plant that would be used for construction have been supplied by Balfour Beatty in the Construction Method Statement (Appendix G). Assuming an average fuel usage of heavy plant is 5 gallons of diesel/hr (18.9l/hr), **7,682.5tCO₂e** would be emitted as a result of plant from the development. To reach this value it was also assumed that for every stage of construction that each of the plant were required, they would run constantly.
- 11.4.9 Emissions that would result from the powering of the site offices has also been estimated. It was assumed that they would be heated and lit during the entire construction period and the temporary buildings would be uninsulated, kept at 21°C. **480.3tCO₂e** would be emitted.
- 11.4.10 Emissions that would result from personnel travelling to the site to work has also been calculated. Assuming 35 permanent staff and a construction period of 159 weeks (as described in Balfour Beatty's construction strategy), **299tCO₂e** would be emitted.
- 11.4.11 A total of **29,885tCO₂e** is expected to be emitted as a result of construction of the proposed development.
- 11.4.12 As illustrated in Figure 11-1, over 50% of emissions that would result from the development would arise from the embodied carbon of quarried rock armour stone, with plant and equipment emissions and embodied carbon of the concrete both also contributing over 10% of the overall emissions. Portable site accommodation, personnel travel, embodied carbon within the steel, waste removal and embodied carbon in the polypropylene used to create the geotextile membrane would between them constitute less than 4% of the total scheme emissions.

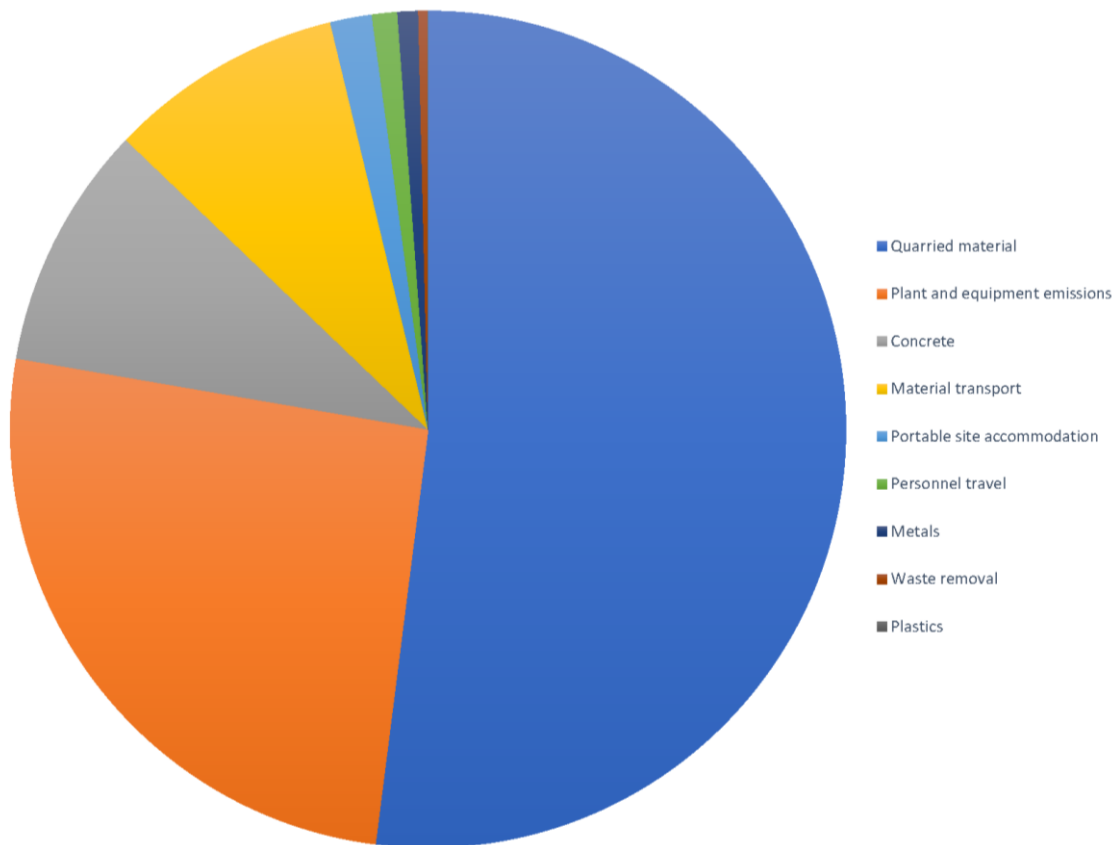


Figure 11-1: Relative proportion of emissions resulting from the scheme arising from each stage

11.4.13 Given the global effect of GHGs on the climate, the value of this as a receptor is considered to be high. However, the impact of GHG emissions on climate from the development proposals in isolation (or indeed any other large infrastructure development project) is negligible at the global scale and therefore is not a useful comparison. The IEMA Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance states that: “*GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant*”¹⁰¹. Although GHG emissions from an infrastructure development project may be negligible in isolation, it is not appropriate to suggest this is insignificant, as GHG emissions from human activity constitute the single greatest cumulative environmental effect. To put the impact of the proposed development on GHG emissions into context it is therefore much more useful to make national and regional comparisons.

11.4.14 The proposed development is likely to result in a **0.0401%** contribution to Wales GHG emissions in relation to 2016 figures. The GHG emissions associated with the proposed development comprises **2.03%** of CO₂ emissions from the Denbighshire region in 2016 which are slightly less than total GHGs measured in CO₂e, which are unavailable for the region. GHG emissions that would result from construction of the proposed development would therefore be likely to significantly increase the overall carbon footprint of Denbighshire. In particular it would raise the Industrial & Commercial

emissions in Denbighshire by **18.6%** per year during the three year construction period (based upon 2016 emission values)⁸⁷.

11.4.15 *Climate change resilience*

11.4.16 Impacts during construction

11.4.17 Construction of the new concrete buttress would be progressed ahead of the rock armour revetment works, with minimal or no work is required to the existing upstand re-curve wall face prior to concreting. Given that the concrete buttress would be formed in-situ, then there would be no impact on the existing sea defences from this operation.

11.4.18 Where sections of rock armour revetment are completed, demolition of the existing upstand sea wall can be undertaken, to allow the new pre-cast wall to be craned onto the new concrete buttress. Demolition of the existing wall would only take place in sections ready to receive the new wall, to ensure that any spatial or temporal gap in the sea defence would only occur immediately while demolition of the existing sea wall is taking place. No gap would be left between the old and new sea wall sections, minimising the impact of this operation on the sea defences. As part of the planning of the demolition works weather and tidal forecasts would be reviewed by the construction contractor, with any demolition works coinciding with increased risk of overtopping of the sea defences postponed until this risk is sufficiently reduced.

11.4.19 The full construction methodology is provided in the Construction Strategy in Appendix G, and the detailed consideration of the flood risk associated with demolition and replacement of the sea wall is provided in the Flood Consequence Assessment in Appendix N.

11.4.20 Impacts during operation

11.4.21 Under UKCP09 climate projections, the proposed coastal defences would initially provide a 1 in 2,500-year standard of protection (SoP) based upon 2017 sea-levels and weather patterns. Due to climate change, this SoP would decrease over time and the scheme would achieve a 1 in 200-year SoP until approximately the year 2087. By the year 2117 (when the scheme would be approaching its 100-year operational lifetime), the defence would be offering a 1 in 48-year SoP.

11.4.22 Under FCDPAG3 projections (current TAN15), the proposed coastal defences would provide a 1 in 1,667-year SoP based upon 2017 levels. Due to climate change, this SoP would decrease over time and the scheme would achieve a 1 in 200-year SoP until approximately the year 2067. By the year 2117 (when the scheme would be approaching its 100-year operational lifetime), the defence would be offering a 1 in 5-year SoP (Figure 11-2).

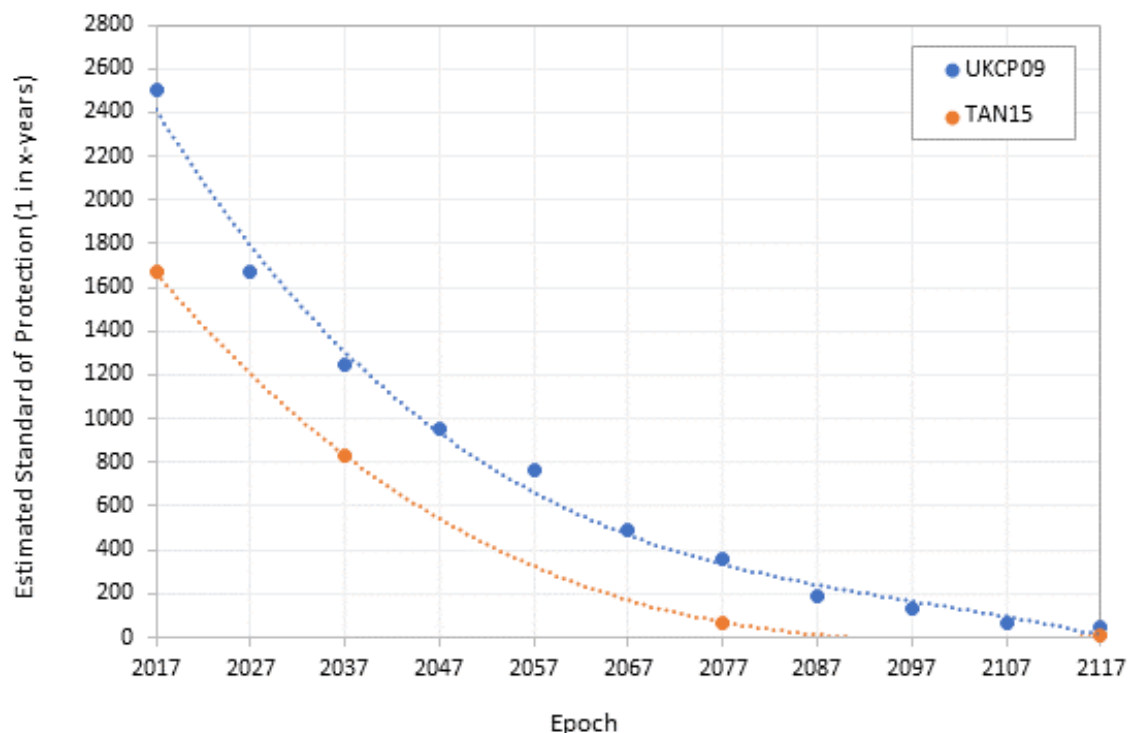


Figure 11-2: Graph showing Standard of Protection the proposed scheme will offer, when calculated using UKCP09 and FCDPAG3 (TAN15) climate projections

11.4.23 Impacts during decommissioning

11.4.24 Future operation of the scheme may involve extension of coastal defences to provide protection beyond the 60 years at 1 in 200 year SoP, or to adapt depending on how the impacts of climate change are realised. Alternatively, should the Shoreline Management Plan policy of Hold the Line change, or not be extended beyond 100 years, there could be a policy of managed retreat involving decommissioning of coastal defences. Given the uncertainty of future climate change scenarios and future shoreline management policy in this context, it is not considered possible to assess likely significant effects of the scheme beyond the 60 years SoP, nor over 100 years as a result of changes in shoreline management policy.

11.4.25 Any future coastal defence proposals, or changes to the development proposals, would be subject to consenting requirements at the time, but would need to be informed by long-term environmental monitoring to address uncertainty in future decision making.

11.4.26 *Climate change adaptation*

11.4.27 The primary impacts of climate change in respect of the proposed development, are likely to be increased risk of wave overtopping flooding from sea level rise and increased storminess associated with climate change. Due to the location of East Rhyl on a low lying area of coastline reliant on manmade coastal defences, the town is highly sensitive to the effects of climate change associated with wave overtopping flooding. 472 properties protected by the existing coastal defences would benefit from the improved standard of protection provided by the proposals and are therefore considered to be sensitive receptors to climate change. Other impacts of climate

change, such as changes in rainfall or temperature are unlikely to significantly effect these receptors.

11.4.28 There would be a large positive impact on these receptors from improved resilience to wave overtopping flooding, from the improvement in standards of protection illustrated in Figure 11-2. However, there would be no long-term climate change adaptation benefit afforded by the development proposals beyond the design life, other than the potential for future additional coastal defence interventions to be considered (i.e. future beach recharge to 'top up' the standard of protection). Therefore, the climate change impact of the scheme with regards to adaptation is considered to be neutral.

11.4.29 *Sustainable waste management*

11.4.30 The proposed development would create waste, arising from construction activities, the demolition of the existing sea wall and removal of existing groynes on the beach around Splash Point. A site waste management plan (SWMP) will be produced to assist with the sustainable disposal bulk waste materials including dismantled timber groynes and demolition concrete where this is not able to be reused as aggregate. This plan would be based on the principles of the waste hierarchy of the reduction, reuse, recycling and disposal of waste, in that order of preference.

11.4.31 Waste that is recyclable will be sorted on site. All waste materials to be either placed into the relevant storage disposal container situated within the main site compound or removed from site by the individual sub-contractor and disposed of in the appropriate manner. For any waste that is taken off site, a chain of custody must be recorded at all times.

11.5 Mitigation Measures

11.5.1 The proposed scheme is itself a response to the consequences of climate change. Climate change is resulting in more extreme weather phenomena and will continue to cause flood events to be more frequent, more severe and less predictable. The potential impact climate change will have upon storminess could further exacerbate these issues. The scheme has been designed to incorporate climate change allowances and therefore adapts to future climate change. Due to this, the mitigation options for this scheme are limited. Mitigation has the potential to reduce the SoP offered to the properties that stand to benefit from the scheme.

11.5.2 To minimise the use of new material, reuse is suggested where possible. However, for schemes such as this, there are complications surrounding material reuse – as the SoP cannot reduce at any point during construction. Therefore, the new sea wall may have to be constructed before the old sea wall is demolished; eliminating the opportunity for recycling of old material. Balfour Beatty will develop a Site Waste Management Plan (SWMP) to assist with the sustainable disposal of materials that cannot be reused. This plan would be based upon the principles of the waste hierarchy of the reduction, reuse, recycling and disposal of waste, in that order of preference.

11.5.3 The limestone and concrete required for the construction should be sourced from areas local to Rhyl, wherever possible, to minimise carbon emissions resulting from the transport of material to site.

11.5.4 Design optimisation of the scheme has the potential to slightly reduce the volume of rock needed for the scheme. It is not expected that rock volume would reduce by a greater magnitude than 5%, which would place it within the tolerances of the existing

detailed designs.

11.6 Residual Effects

- 11.6.1 The projected GHG emissions for the scheme would constitute an increase in emissions from Denbighshire of 2.03%, and an increase in emissions from Wales of 0.04%, over the 37 month construction period. IEMA EIA guidance recommends that as contextualising GHG emissions on a global or even national scale is not an effective way of assessing them, all emissions should be viewed as **significant**¹⁰¹.
- 11.6.2 The negative effects of this development are arguably outweighed by the need to protect residents of East Rhyl from the adverse effects of climate change, maintaining the viability of Rhyl as a settlement. The proposed development would have a significant, direct **positive** impact on climate change resilience of East Rhyl.
- 11.6.3 There would be no long-term climate change adaptation benefit afforded by the development proposals beyond the design life, other than the potential for future additional coastal defence interventions to be considered (i.e. future beach recharge to 'top up' the standard of protection). Therefore, the climate change impact of the scheme with regards to adaptation is considered to be **neutral (Not Significant)**.

12 Cumulative Effects

12.1 Introduction

- 12.1.1 Regulation 17(3) and 4(2) of the EIA Regulations requires with reference to paragraph 5 of Schedule 4, that a consideration of cumulative effects is included in the Environmental Statement:
- 12.1.2 *'A description of the likely significant effects of the development on the environment resulting from...(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources...*
- 12.1.3 *The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development...'*
- 12.1.4 Cumulative effects are therefore assessed with regard to (i) the environmental impacts of the development proposals when considered cumulatively with the environmental impact of other existing adjacent and approved development projects at the time of submission of the ES; and (ii) the cumulative effect of inter-relationships between multiple environmental impacts on individual receptors.

12.2 Baseline Conditions

- 12.2.1 A search of Denbighshire County Council planning applications identified developments which may cause cumulative effects¹⁰⁴. Development projects that meet the above criteria, during the scoping stage, were identified as:
- 45/2017/1164 – Demolition of existing school buildings and erection of replacement school accommodating 920 pupils incorporating playgroup, nursery, primary and secondary places with associated play space, grass pitch, all weather pitch, hard play areas, access and car parking arrangements.
 - 43/2017/0947 – Prior notification for the demolition of disused Bodnants Infant School.
 - 40/2017/1058 – Change of use of land to caravan storage including amendments to existing access.
- 12.2.2 Denbighshire County Council EIA Scoping Response identified the following developments, that they considered may also cause cumulative impacts with the proposed development (the full Scoping Response is in Appendix D, for reference). These developments are now considered along with those previously identified, in
- 12.2.3 Table 12-1.
- 45/2013/1510 – Development of 5.3 hectares of land for mixed-use redevelopment to include provision of a foodstore, large format non-food retail and café/ restaurant units, with associated car parking.

¹⁰⁴

http://planning.denbighshire.gov.uk/Planning/lg/plansearch.page?org.apache.shale.dialog.DIALOG_NAME=gfplanningsearch&Param=lg.Planning

- 45/2015/1151 – Change of use of playing fields to rugby club including erection of clubhouse, formation of rugby pitches with associated floodlighting and car parking and alterations to existing vehicular access.
- 45/2016/0740 – Demolition of the former 'Sun Centre' and the external refurbishment of the adjoining Theatre, Pavilion Theatre (full), erection of Class D2 Exhibition/events centre as extension to theatre. Erection of detached hotel and restaurants.
- 45/2016/1204 – Change of use of former WC/Café to a KiteSurf school and café/ Change of use of former land train building to retail shop, café/wine bar and storage ancillary to the kite school and external works including installation of climbing wall and hard landscaping.
- 45/2017/0384 – Demolition of an existing skate park and ancillary retail huts. Construction of new Waterpark and Leisure Attraction comprising of an indoor leisure pool.
- 45/2018/0005 – Formation of a skate park and associated works.
- 45/2018/0123 – Erection of a retail unit with associated parking, access, servicing and landscaping.
- 45/2018/0124 – Variation of Condition 11 of outline planning permission code no. 45/2013/1510 to permit a maximum of 4,411m² of retail floorspace across the development site.

12.2.4 A request to DCC, on September 18th 2018, for information on major planning applications submitted since the submission of the Scoping Report yielded the following developments that could create cumulative impacts with the proposed development;

- 43/2018/0750 – Demolition of existing dwelling and outbuildings, erection of 133 buildings, construction of internal estate roads, sewers, SUDS drainage and open spaces, strategic and hard/soft landscaping and ancillary works in association with 43/2018/0751 for new link road to Fford Talargoch (A547).
- 45/2018/0263 – Demolition of existing building and redevelopment of land by the erection of 18 apartments and associated works.
- 45/2018/0822 – Construction of 41 housing association apartments for local residents over 55 years of age together with new and altered vehicular and pedestrian access, associated parking provision and associated works.

12.2.5 Natural Resources Wales publish lists of application received for marine licences¹⁰⁵. The following projects/ schemes are within the vicinity of the proposed scheme:

- SC1711 Rhyl Yacht Club Harbour Wall and Flood Defence Renewal.
- CRML1615 Rhyl Golf Club Flood Water release scheme – Phase 4 outfall.
- CML1615 Rhyl Marina Quay redevelopment.
- BUML1506 Fford Harbour, Rhyl

12.3 Assessment Methodology

12.3.1 As noted above cumulative effects are assessed with regard to (i) the environmental impacts of the development proposals when considered cumulatively with the environmental impact of other existing adjacent and approved development projects at the time of submission of the ES; and (ii) the cumulative effect of inter-relationships

¹⁰⁵ <http://infrastructure.planninginspectorate.gov.uk/>

between multiple environmental impacts on individual receptors.

12.3.2 Regarding (i), the spatial and temporal scope of the EIA would take into account the following:

- the physical extent of the proposed works, as defined by the limits of land to be used (temporarily or permanently) as denoted in the respective planning or marine licence consents by their site boundary;
- the nature of the existing baseline environment, including the location of sensitive receptors;
- the geographical extent of impacts beyond the sites, e.g. effects from traffic, visual effects and disturbance of ecological receptors;
- the geographical boundaries of the political and administrative institutions and authorities, which provide the planning and policy context for the project; and
- the timing of the works for the respective development projects.

12.3.3 Cumulative effects would therefore consider the impacts of any other committed developments where these would coincide with both the temporal and spatial scope of the development proposals assessed within this ES. The environmental impacts of the respective development projects are assessed collectively on individual receptors to determine where this could give rise to synergistic likely significant effects.

12.3.4 Regarding (2) the cumulative effect of inter-relationships between multiple environmental impacts would consider any impacts assessed individually within this ES, the synergistic effect of which would either be made greater as a result of the cumulative effect on the individual receptors, or which otherwise would not be considered significant on its own.

12.4 Potential Impacts & Significant Effects

12.4.1 Cumulative Effects with Other Committed Developments

12.4.2 The environmental impacts of the development proposals when considered cumulatively with the environmental impact of other existing adjacent and approved development projects at the time of submission of the ES is assessed for significance in Table 12-1.

Table 12-1: Committed developments that could combine with the proposed scheme to create a cumulative impact

| Planning/ Marine License Reference Number | Description | Location | Status | Potential for Cumulative Effects | Significance |
|---|---|--|---------|---|-----------------|
| 45/2017/1164 | Demolition of existing school buildings and erection of replacement school accommodating 920 pupils | Blessed Edward Jones High School and Yspol Mair Primary School | Granted | If consented could temporarily increase construction traffic along similar routes to the East | Not significant |

| Planning/ Marine License Reference Number | Description | Location | Status | Potential for Cumulative Effects | Significance |
|---|--|--|---------------------------------|---|---|
| | incorporating playgroup, nursery, primary and secondary places with associated play space, grass pitch, hard play areas, access and car parking arrangements | Cefndy Road Rhyl LL18 2EU | | Rhyl Coastal Defence Scheme, but considered too small scale to be significant. | |
| 43/2017/0947 | Prior notification for the demolition of disused Bodnant Infants School | Bodnant Infant School Marine Road Prestatyn LL19 7HD | Demolition prior approval | Could temporarily increase construction traffic along similar routes to the East Rhyl Coastal Defence Scheme, but considered small scale and unlikely to be significant. | Not significant |
| 40/2017/1058 | Change of use of land to caravan storage including amendments to existing access | Blairmore Nurseries St Asaph Road Rhuddlan Rhyl LL18 5UG | Granted | Could temporarily increase construction traffic along similar routes to the East Rhyl Coastal Defence Scheme, but considered small scale and so unlikely to be significant. | Not significant |
| 45/2016/0740 | Demolition of the former 'Sun Centre' and the external refurbishment of the adjoining Theatre, Pavilion Theatre (full), | East Parade Rhyl LL18 3AQ | Granted (committed development) | Works would be completed by the time the East Rhyl construction phase in May 2019. | Not significant – This development is at or near to completion and is not expected to coincide with |

| Planning/ Marine License Reference Number | Description | Location | Status | Potential for Cumulative Effects | Significance |
|---|--|--|---------------------------------|--|---------------------------|
| | erection of Class D2 Exhibition/ events centre as extension to theatre. Erection of detached hotel and restaurants | | | | the East Rhyl development |
| 45/2016/1204 | Change of use of former WC/café to a KiteSurf School and café/ Change of use of former land train building to retail shop, café/ wine bar and storage ancillary to the kite school and external works including installation of climbing wall and hard landscaping | Pro Kitesurfing School and Land Train Shed East Parade Rhyl LL18 3AF | Granted (committed development) | Could increase tourism related traffic along routes potentially used for the East Rhyl Coastal Defence Scheme. Increased impacts of tourism related disturbance to Liverpool Bay SPA. Scale of the development unlikely to be significant. | Not significant |
| 45/2018/0005 | Formation of a skate park and associated works | Bowling Green East Parade Rhyl LL18 3AF | Granted (committed development) | Could temporarily increase construction traffic along similar routes to the East Rhyl Coastal Defence Scheme, but unlikely to be of a scale to be considered significant. | Not significant |
| 45/2017/0384 | Demolition of existing skate park and ancillary retail huts. Construction of new Waterpark and Leisure Attraction | Former Drift Park West Parade Rhyl | Granted (committed development) | Could temporarily increase construction traffic along similar routes to the East | Not significant |

| Planning/ Marine License Reference Number | Description | Location | Status | Potential for Cumulative Effects | Significance |
|---|---|---|---------------------------------|---|-------------------------|
| | comprising of an indoor leisure pool | | | Rhyl Coastal Defence Scheme. Could increase tourism related traffic along routes potentially used for the East Rhyl Coastal Defence Scheme. Scale of the development unlikely to be considered significant. | |
| 45/2015/1151 | Change of use of playing fields to rugby club including erection of clubhouse, formation of rugby pitches with associated floodlighting and car parking and alterations to existing vehicular access | Land at Ty Newydd Road Playing Fields Ty Newydd Road Rhyl | Granted (committed development) | Could temporarily increase construction traffic along similar routes to the East Rhyl Coastal Defence Scheme, although the scale of the development is not considered significant. | Not significant |
| 45/2013/1510 & 45/2018/0124 | Development of 5.3 hectares of land for mixed-use re-development to include provision of a foodstore, large format non-food retail and café/ restaurant units, with associated car parking. Variation of Condition 11 of outline planning permission code | Ocean Beach Site Wellington Road Rhyl LL18 1LN | Granted | Could increase retail-related traffic along routes potentially used by construction traffic for the East Rhyl Coastal Defence Scheme. Could temporarily increase | Potentially significant |

| Planning/ Marine License Reference Number | Description | Location | Status | Potential for Cumulative Effects | Significance |
|---|--|---|----------------------------------|---|-------------------------|
| | no. 45/2013/1510 to permit a maximum of 4,411m ² of retail floorspace across the development site | | | construction traffic along similar routes to the East Rhyl Coastal Defence Scheme. | |
| 45/2018/0123 | Erection of a retail unit with associated parking, access, servicing and landscaping | Ocean Beach Site Wellington Road Rhyl LL18 1LN | Approved (committed development) | Could increase retail-related traffic along routes potentially used by construction traffic for the East Rhyl Coastal Defence Scheme. Could temporarily increase construction traffic along similar routes to the East Rhyl Coastal Defence Scheme. | Potentially significant |
| SC1711 | Rhyl Yacht Club Harbour Wall and Flood Defence Renewal | Rhyl | Issued | Disturbance from both projects could adversely affect residents of Rhyl and/or qualifying species of local designated sites, most notably Liverpool Bay SPA. Both works could create airborne dust, noise and light which could | Potentially significant |

| Planning/ Marine License Reference Number | Description | Location | Status | Potential for Cumulative Effects | Significance |
|---|---|----------|---|--|---|
| | | | | create a more substantial effect on Liverpool Bay SPA and local residents. Could temporarily increase construction traffic along similar routes as the East Rhyl coastal defence scheme. | |
| CRML1615 | Rhyl Golf Club Water release scheme – Phase 4 outfall | Rhyl | EIA Screening (not committed) | Could temporarily increase construction traffic along similar routes as the East Rhyl Coastal Defence Scheme. The scale of the development is not considered large enough to be significant. | Not significant |
| BUML1472 | Fford Harbour, Rhyl | Rhyl | Dredging Licence Issued (committed development) | Disturbance from both projects could adversely affect residents of Rhyl and/or qualifying species of local designated sites, most notably Liverpool Bay SPA. | Not significant – This application was approved in 2015 and it is therefore assumed that the activity has been completed. |

- 12.4.3 There are a number of committed developments that have been identified as having the potential to have cumulative effects with the East Rhyl Coastal Defence Scheme upon receptors (See Table 12-1). However, the majority of these developments are either not on a scale, or not within a close enough proximity, for these effects to be considered significant. The developments that have the potential to cause significant cumulative impacts are set out as follows:
- 45/2013/1510 & 45/2018/0124
 - 45/2018/0123
 - SC1711
- 12.4.4 If the construction of any of these developments and the East Rhyl Coastal Defence Scheme coincide, construction traffic are likely to utilise similar routes to access the sites. Noise impacts from both schemes could impact the same residents.
- 12.4.5 Similarly there is the potential to increase construction and/or tourism-related traffic along similar routes as the proposed developments. This has the potential to impact upon residents of and visitors to Rhyl in the following ways;
- By increasing congestion and therefore wasting time of motorists – thereby reducing regional economic health;
 - An increase in time spent in stationary vehicles increases local air pollution;
 - Economic impacts to individuals that frequently drive on local routes from wear and tear on vehicles as a result of idling in traffic;
 - Impacting on health of motorists by increasing stress levels;
 - Increased congestion could inhibit emergency vehicles from reaching destinations; and
 - An increase in the incidence of the Spillover effect, where drivers attempt to find alternative, less congested routes, possibly through much smaller roads, affecting neighbourhood quality of life and in extreme cases also local house prices.
- 12.4.6 The Rhyl Yacht Club Harbour Wall and Flood Defence Renewal (SC1711) is identified as having the potential to have a cumulative effect upon qualifying features of Liverpool Bay SPA, through the creation of visual and noise impacts, and a reduction in adjacent habitat. This can cause displacement of qualifying species and their prey, consideration of which is given in the HRA Screening Assessment provided in Appendix I.
- 12.4.7 *Interrelationship Effects*
- 12.4.8 The closest residential properties to the development proposals would be subject to synergistic interrelationship effects during construction, principally arising from the following:
- Visual impacts from construction activities;
 - Disturbances from construction noise impacts during both the day time and night time;
 - Light spill/glare impacts from site compound at night; and
 - Impacts from increases in construction related traffic in and around Rhyl.
- 12.4.9 Table 12-2 summarises the interrelationship effect on specific residential receptors, as an accumulation of environmental effects assessed individually for these receptors elsewhere in the ES.

Table 12-2: Interrelationship impact during construction on specific residential receptors where environmental effects have been assessed individually elsewhere in the ES

| Receptor | Visual impact | Noise | Air quality | Light spill glare | Congestion | Overall significance assessed |
|--|-----------------|-------|-----------------|-------------------|-----------------|-------------------------------|
| Residential properties on Marine Drive | Moderate | Minor | Not significant | Moderate | Slight | Moderate |
| No 2 Tynwydd Road | Moderate | Large | Not significant | Not significant | Slight | Large |
| Splash Point Apartments | Moderate | Large | Not significant | Not significant | Not significant | Large |
| 25/26 Molineaux Road | Slight/moderate | Large | Not significant | Not significant | Not significant | Large |
| 16/31 Garford Road | Slight/moderate | Large | Not significant | Large | Not significant | Large |
| 12 Brynheddydd Bay | Moderate | Large | Not significant | Large | Not significant | Large |

12.4.10 Interrelationship effects are also possible on some environmental receptors where mitigation is proposed on other environmental topics. For example the reduction in the construction site area from 22 ha to 13 ha proposed in Chapter 7 Cultural Heritage, would also have a generally positive effect on impacts identified in other ES chapters such as landscape.

12.4.11 More specific would be the impact that proposed archaeological investigations resulting from additional disturbance on the beach, which could have an increased impact on sediment mobilisation and on benthic marine invertebrates. However given that the scale of archaeological investigations would be small in comparison with the wider construction activities on the beach, the effect of the additional disturbances from archaeological investigations is not considered significant.

12.5 Mitigation Measures

12.5.1 Given the significance of cumulative interrelationship effects on local residential receptors, a Community Liaison Officer will be appointed during the construction phase of the project. The role of the Community Liaison Officer will be to communicate and coordinate between the construction contractor and local residents. This will ensure that any disruptive construction activities are well communicated to residents in advance, and that the views or concerns of residents are taken into account by the construction contractor when planning the works. The Community Liaison Officer would also assist residents with resolving any complaints.

12.5.2 As noted in the description of development section (refer to section 2.9), future operation of the scheme may involve extension of coastal defences beyond the 60 years SoP, or to adapt depending on how the impacts of climate change are realised or any changes in coastal management policy. Given this uncertainty, it is not considered possible to assess likely significant effects of the scheme beyond the 60

years SoP that the scheme has been designed to provide. Any future coastal defence proposals would be subject to consenting requirements at the time, but should be informed by long-term environmental monitoring to address uncertainty in future decision making.

12.6 Residual Effects

- 12.6.1 It is recognised that during severe storm events in 2013 wave overtopping of the existing seawall caused flooding of 130 residential properties, and led to 400 people being evacuated from their homes, with some having to be rescued by boat. The new defences would provide protection to up to 472 of these properties over the next sixty years. It is therefore important to note that the residential receptors most affected by cumulative effects during construction are those that will also see the most benefit in terms of flood defence. Whilst this does not diminish the significance of the impacts for up to 3 years during construction (of which the worst case is assessed as major severe adverse for the closest receptors), it is important to take the context of the flood defence scheme into consideration when determining the acceptability of the impacts. The proposed Community Liaison Officer will play a key role in communicating this message.

13 Summary

13.1 EIA Outcomes

13.1.1 Table 13-1 provides a summary of the significant effects, mitigation measures and residual effects identified in each of the chapters of the ES. For the purpose of this summary table, some significance scores have been adapted to reflect the standardised approach to significance scoring as detailed in Table 3-5. Refer to the individual topic specific ES chapters for the topic specific guidelines significance terminology.

Table 13-1 Summary of significant effects, mitigation measures and residual effects

| Environmental Topic | Potential Likely Significant Effect | Significance Score | Proposed Mitigation | Residual Effect Significance Score |
|--|--|--------------------|--|------------------------------------|
| Coastal Hydrology & Hydromorphology | Impact of temporary storage and sorting of rock on Rhyl Beach on local hydrodynamic and sediment regimes | Not significant | Tertiary mitigation as set out in CEMP | Not significant |
| | Impact of excavation of beach material on onshore ridge migration | Not significant | None proposed | Not significant |
| | Impact of increased turbidity from disturbance of beach during high energy storm events | Not significant | Tertiary mitigation as set out in CEMP | Not Significant |
| | Impact on sediment regime from excavation of beach groynes to formation level | Not significant | None proposed | Not significant |
| | Impact of temporary slipway on localised hydrodynamic and sediment regimes | Not significant | None proposed | Not significant |
| | Impact of wheeled and tracked vehicles on the beach on the local sediment regime. | Not significant | Tertiary mitigation as set out in CEMP | Not significant |
| | Impact of new rock revetment on local tidal or sediment regimes | Not significant | None proposed | Not significant |
| | Impact on hydromorphological elements of WFD | Not significant | Tertiary mitigation as set out in CEMP | Not significant |
| | Impacts on biological elements of WFD | Not significant | Tertiary mitigation as set out in CEMP | Not significant |

| Environmental Topic | Potential Likely Significant Effect | Significance Score | Proposed Mitigation | Residual Effect Significance Score |
|---|---|--------------------|--|------------------------------------|
| Biodiversity & Nature Conservation | Impacts on water chemistry elements of WFD | Not significant | Tertiary mitigation as set out in CEMP | Not significant |
| | Impacts on protected area elements of WFD | Not significant | None proposed | Not significant |
| | Non-physical disturbance to Red-throated Diver and Common Scoter | Not significant | None proposed | Not significant |
| | Non-physical disturbance to overwintering and migratory bird species | Not significant | None proposed | Not significant |
| | Impact of changes to local tidal or sediment regimes from the existence of the coastal defences on qualifying features of the Liverpool Bay SPA, Dee Estuary SPA, SAC and Ramsar designations | Not significant | None proposed | Not significant |
| | Impact of localised turbidity on foraging Common and Little Tern | Not significant | None proposed | Not significant |
| | Non-physical disturbance to foraging Common and Little Tern | Not significant | None proposed | Not significant |
| | Impact to nesting Little Tern at the Gronant Dunes & Talacre Warren SSSI from changes to coastal processes | Not significant | None proposed | Not significant |
| | Risk of direct damage to qualifying features of the Dee Estuary SAC and Ramsar designations as a result of pollution during construction | Not significant | None proposed | Not significant |
| | Reduced access to intertidal sand foraging habitat of fish species at high tide arising from storage of rock armour on the beach | Not significant | None proposed | Not significant |

| Environmental Topic | Potential Likely Significant Effect | Significance Score | Proposed Mitigation | Residual Effect Significance Score |
|-------------------------------|---|---------------------|--|------------------------------------|
| | Impact of localised turbidity on foraging fish | Not significant | None proposed | Not significant |
| | Impact of localised turbidity on migratory fish | Not significant | None proposed | Not significant |
| | Risk of direct damage to fish species as a result of pollution during construction | Not significant | Tertiary mitigation as set out in CEMP | Not significant |
| | Direct damage to fish species from noise or vibration | Not significant | None proposed | Not significant |
| | Impact of changes to local tidal or sediment regimes from the existence of the coastal defences on fish species | Not significant | None proposed | Not significant |
| | Risk of direct damage to non-designated intertidal habitats as a result of pollution during construction | Not significant | Tertiary mitigation as set out in CEMP | Not significant |
| | Direct loss of habitat through the placement of rock armour onto intertidal habitats | Not significant | None proposed | Not significant |
| | Impact from changes to the sediment regime and near shore turbidity on <i>Sabellaria alveolata</i> | Not significant | None proposed | Not significant |
| | Impact from changes to the sediment regime and near shore turbidity on other polychaete worms | Not significant | None proposed | Not significant |
| | Impact of changes to local tidal or sediment regimes from the permanent loss of 1.7 ha of intertidal habitats | Not significant | None proposed | Not significant |
| | Risk of contributing to the spread of INNS including the invasive barnacle <i>Austrominius modestus</i> on timber groynes | Not significant | Tertiary mitigation as set out in CEMP | Not significant |
| Landscape & Visual | Impact upon landscape character | Temporary Moderate; | None proposed | Temporary Moderate; |

| Environmental Topic | Potential Likely Significant Effect | Significance Score | Proposed Mitigation | Residual Effect Significance Score |
|---------------------|---|--|---------------------------------|--|
| | | Permanent Slight | | Permanent Slight |
| | Impact upon Landscape Policy RD2 | Slight | None proposed | Slight |
| | Impact upon Landscape Policy BSC11 | Temporary Moderate; Permanent Slight | None proposed | Temporary Moderate; Permanent Slight |
| | Impact on views out to sea from the WCP / NCN Route 5 | Temporary Moderate; Permanent Slight | None proposed | Temporary Moderate; Permanent Slight |
| | Impact on views from Rhyl Golf Course | Temporary Slight; Permanent Not Significant | None proposed | Temporary Slight; Permanent Not Significant |
| | Views from Rhyl Coast Road | Temporary Slight; Permanent Not Significant | None proposed | Temporary Slight; Permanent Not Significant |
| | Views from East Parade/ Marine Drive | Temporary Moderate; Permanent Slight | Visually permeable site fencing | Temporary Moderate; Permanent Slight |
| | Views from Tynewydd Road, Molineaux Road, Garford Road and Brynhedydd Bay | Temporary Slight; Permanent Not Significant | None proposed | Temporary Slight; Permanent Not Significant |
| | Views from Beechwood Road, Alexandra Road, Grosvenor Road, Old Golf Road | Temporary Slight; Permanent Not Significant | None proposed | Temporary Slight; Permanent Not Significant |
| | Views from residential properties on East Parade and Marine Drive | Temporary Moderate; Permanent Not Significant | None proposed | Temporary Moderate; Permanent Not Significant |
| | Views for residential properties from on Eaton Avenue, Hilton Drive, north end of Molineaux Road and Garford Road | Temporary Slight; Permanent Not Significant | None proposed | Temporary Slight; Permanent Not Significant |
| | Views from residential properties north of Brynhedydd Bay | Temporary Moderate; Permanent Not Significant | None proposed | Temporary Moderate; Permanent Not Significant |
| | Views from residential properties at Splash Point Apartments | Temporary Moderate; Permanent Slight | None proposed | Temporary Moderate; Permanent Slight |

| Environmental Topic | Potential Likely Significant Effect | Significance Score | Proposed Mitigation | Residual Effect Significance Score |
|--------------------------|---|---|--|--|
| Cultural Heritage | Impact upon Area A deposits on the foreshore | Large | Site boundary altered to avoid this area | Not Significant |
| | Impact upon Area B deposits and structures on the foreshore – PRN 123322 | Large | Archaeological investigation and preservation by record. | Moderate |
| | Impact upon Area C deposits on the foreshore | Large | Site boundary altered to avoid this area | Not Significant |
| | Impact upon PRN17103 Rhyl foreshore submerged landscape | Large | Walkover survey; Geophysical survey; Recording after storm exposures; Test pits/ boreholes; Watching brief, recording and sampling; Analysis and reporting | Moderate |
| | Impact upon PRN106402 causeway | Large | Archaeological watching brief | Slight |
| | Setting impact on Lookout Tower in Boundary Wall | Not significant | None proposed | Not significant |
| | Setting impact on War Memorial | Not significant | None proposed | Not significant |
| | Setting impact on Grafton Lodge | Not significant | None proposed | Not significant |
| | Setting impact on Royal Alexandria Hospital | Temporary Moderate/Large; Permanent Not Significant | None proposed | Temporary Moderate/Large; Permanent Not Significant |
| | Impact upon local employment rates in the construction industry | Temporary Slight (Positive) | None proposed | Temporary Slight (Positive) |
| Socio-economics | Impact upon tourism in Central Rhyl due to increase in HGV traffic along West/East Parade | Temporary Moderate | Traffic management plan | Temporary Moderate |
| | Impact upon Welsh language and culture in Rhyl | Temporary Slight (Positive) | Community Liaison Officer | Temporary Slight (Positive) |
| | Impact of reduction in access to open green space | Temporary Slight | Reduction in construction site extent on beach | Temporary Slight |
| | | | | |

| Environmental Topic | Potential Likely Significant Effect | Significance Score | Proposed Mitigation | Residual Effect Significance Score |
|-----------------------------------|--|--------------------|---|------------------------------------|
| | Impact on users of the Wales Coast Path (WCP) and National Cycle Route (NCR) 5 | Not Significant | Appropriate diversion around the construction site. | Not significant |
| | Long term socioeconomic impacts on the local community | Positive | Community Liaison Officer | Positive |
| Traffic & Transport | Impacts on severance due to HGV traffic movements on West Parade during construction | Slight | Traffic management plan | Slight |
| | Impacts on driver delay due to HGV traffic movements during construction | Not Significant | None proposed | Not significant |
| | Impacts on pedestrian delay due to HGV traffic movements during construction | Not Significant | None proposed | Not significant |
| | Impacts on pedestrian amenity due to HGV traffic movements on West Parade during construction | Slight | Traffic management plan | Slight |
| | Impacts from fear and intimidation due to HGV traffic movements on West Parade during construction | Slight | Traffic management plan | Slight |
| | Impact on accidents and safety due to HGV traffic movements during construction | Not Significant | None proposed | Not significant |
| Other Construction Effects | Dust Generated by Demolition and Construction of the Proposed Development | Large | Dust management plan | Not significant |
| | Traffic Emissions Generated by Construction Traffic | Not significant | None proposed | Not significant |
| | Construction Noise | Slight to Large | Noise monitoring to inform Best Practicable Means | Slight to Large |
| | Construction Vibration | Moderate | Best Practicable Means | Slight to Not significant |
| | Construction Traffic Noise | Not significant | None proposed | Not significant |

| Environmental Topic | Potential Likely Significant Effect | Significance Score | Proposed Mitigation | Residual Effect Significance Score |
|--|---|-------------------------|--|------------------------------------|
| | Glare impacts on the Grade II Listed Princess Alexandra Hospital | Slight/ moderate | Lighting design of Compound 1 | Slight |
| | Light spill and glare impacts on the closest residential properties on Marine Drive | Moderate | Lighting design of Compound 1 | Slight |
| | Light spill and glare impacts on the closest residential properties on Garford Road and Brynheddydd Bay | Large | Lighting design of Compound 2 | Moderate |
| | Pollution to the marine environment from construction practices or disturbance of potential contaminants | Negligible | Tertiary mitigation as set out in the CEMP | Not significant |
| Sustainability & Climate Change | Impact upon climate change due to the release of GHGs during construction (climate change avoidance) | Significant | None proposed | Not Significant |
| | Impact upon local receptors as a result of the new defence offering increased protection to wave overtopping (climate change resilience) | Large (Positive) | None proposed | Large (Positive) |
| | Impact on climate change adaptation | Neutral | None proposed | Not Significant |
| | Sustainable management of waste | Not significant | Site waste management plan | Not Significant |
| Cumulative Effects | Cumulative impacts arising from the impact of the proposed development on individual receptors, together with impacts from other developments on the same receptors | Potentially Significant | None proposed | Potentially Significant |
| | Cumulative interrelationship effects arising from impacts on individual receptors when combined with other impacts on the same receptors | Temporary Large | Community Liaison Officer | Temporary Large |

13.1 Concluding remarks

- 13.1.1 The EIA Scoping Opinion response emphasised that beach recharge could give rise to unforeseen impacts on coastal processes, particularly in the context of nearby sensitive environmental designations. Therefore in order to avoid such impacts or any uncertainty surrounding the environmental effect of beach recharge, it was decided as primary environmental mitigation to remove recharge from the scheme proposals.
- 13.1.2 The extent of the construction site boundary has also been significantly reduced as part of the iterative design process, from approximately 22 ha to 13 ha to minimise the impact of construction on known archaeology identified as part of the EIA process. In addition, a commitment is made to a programme of pre-construction archaeological surveys and sampling to recover data from submerged landscape deposits in a controlled manner, prior to its partial loss during construction, together with an archaeological watching brief.
- 13.1.3 It is recognised that during severe storm events in 2013 wave overtopping of the existing seawall caused flooding of 130 residential properties, and led to 400 people being evacuated from their homes, with some having to be rescued by boat. The new defences would provide protection to 472 properties over the next sixty years, for up to a 1 in 200 year Standard of Protection taking into account future impacts of climate change. The proposals would therefore provide resilience to the effects of climate change, but could also be extended or modified at a later date to adapt to the effects of climate change.
- 13.1.4 The EIA has identified that the development proposals are compliant with national land and marine planning policies, particularly the Shoreline Management Plan policy of 'hold the line'. Overall, it is considered that as a result of improved coastal protection the proposed development would have a positive impact upon Rhyl, its residents and visitors, and its economy.
- 13.1.5 *Following up on recommendations and monitoring*
- 13.1.6 An outline Construction Environmental Management Plan (CEMP) has been produced to assist with the implementation of construction mitigation recommended herein. Environmental Clerk of Works (ECW) support would be provided to the Construction Contractor for the duration of the construction period. The role of the ECW on a construction project is to monitor compliance with CEMP together with any consent conditions and environmental legal requirements.
- 13.1.7 Given the significance of temporary construction effects on local residential receptors, a Community Liaison Officer will also be provided during the construction phase of the project. The role of the Community Liaison Officer will be to communicate and coordinate between the construction contractor and local residents. This will ensure that any disruptive construction activities are well communicated to residents in advance of works, and that the views or concerns of residents are taken into account by the construction contractor when planning the works.

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Registered Office

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Broughton Hall
SKIPTON
North Yorkshire
BD23 3AE
United Kingdom

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