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Colwyn Bay Waterfront Project Phase 2b Environmental Statement

Volume 2: Technical Appendices
Technical Appendix 2 - Need for Scheme, Assessment of Alternatives and Design Development

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Contents

Appendix 2.1 – Project Appraisal Review and Update (2018)

Project Appraisal Review and Update – May 2018

Authority Scheme Reference	
WG LDW Number	
Promoting Authority	Conwy County Borough Council
Scheme Name	Colwyn Bay Waterfront Scheme

Project Appraisal Review and Update for Colwyn Bay Waterfront Phase 2

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1.1	Draft for Client Review	A.J. Willis		20.03.18
1.2	Updated Draft	A.J. Willis		20.04.18
1.3	For submission to WG			

CONTENTS

List of Tables

List of Figures

1 EXECUTIVE SUMMARY

1.1.1 The Colwyn Bay Waterfront project was conceived in 2007 as a result of the Strategic assessment of options for future flood and coastal erosion risk management.

1.1.2 This identified that there were wider community benefits provided by a framework which combined the renewal of coastal defences with regeneration improvements to the promenade, creating a modern, sustainable and attractive waterfront.

1.1.3 Realising such an approach relies on obtaining funding from different sources and an integrated approach to funding management through development of a clear vision and programme for delivery that enables Conwy County Borough Council (CCBC) to draw upon different funding as necessary, as the scheme progresses through different phases.

1.1.4 In 2010, project appraisal was carried out to support a bid for grant aid for the first element of Phase 1 of the coastal defence works, which confirmed the business case and justification for a mixture of beach recharge and sea wall improvements across the central (phase 1) and westerly (phase 2) sections of the frontage and construction of a linear rock revetment across the easterly (phase 3) section.

1.1.5 Since that time approximately WG have grant aided £15 million of coastal defence improvements, whilst a further £9 million of funding has been secured for the associated environmental works, across the phase 1 length.

1.1.6 Concurrently work, including numerical and physical modelling of alternative beach arrangements were undertaken to improve definition of, and inform development of, proposals for the phase 2 section.

1.1.7 This report presents a review of the original business case for the coastal defence elements of the Waterfront Project based on the work carried out to date, confirms proposals for the phase 2 length and provides the basis for development and funding of all the remaining phases of the project.

1.1.8 The original PAR report considered either the construction of a linear rock revetment or recharging of the beach as the two options. The review and update presented here has considered these two options together with a further three arrangements for beach control structures.

1.1.9 The Phase 3 proposals for a linear rock revetment to be constructed between Porth Eirias and Beach Rd, Old Colwyn, remain as previously identified as no significant development of proposals in this respect has been carried out since the original PAR.

1.1.10 The update report is presented in the recently adopted 5 Case Model format for Business Case presentations, comprising:

- Strategic Case Review
- Economic Case Update;
- Commercial Case Presentation;
- Financial Case Presentation;
- Commercial Case Presentation;

1.1.11 The strategic case review has updated the legislative framework that underpins the Waterfront Project, reviewed the project's strategic objectives, identified environmental changes, considered the Sustainability and Wellbeing Strategic Fit and Context and identified the key opportunities, benefits, risks, constraints and dependencies.

1.1.12 The economic case update has updated all the project's costs and damages to a current base date of Q4 2017 and re-calculated the net present value and benefit to cost ratios. In addition, a sensitivity on the timescale to recession has ben

1.1.13 The beach recharge project options remain the most cost effective, with higher PV benefits and lower PV costs than the linear rock revetment alternative.

1.1.14 A key factor in the choice of scheme is the frequency of future topping up of beach levels. The highest frequency is for the option without control structures, whilst the lowest frequency is for the option using twin offshore breakwaters to modify beach behaviour.

1.1.15 In both cases the beach recharge without control structures is identified as being the most cost effective but under worst case conditions, the option with additional shore connected control structures provides an equivalent BCR.

1.1.16 The original PAR in 2010 demonstrated a benefit to cost ratio (BCR) of 5.36 with total estimated PV costs of £81m (including optimism bias), PV benefits of £434m and a Net Present Value of £353m.

1.1.17 The updated PAR has demonstrated updated benefit cost figures, as detailed below, for the preferred option.

Summary of Costs and Benefits (£m)					
	PV costs	**PV Benefits**	**NPV**	**BCR**	**Comments**
Predicted Behaviour					
Best Case	70.12	465.09	394.97	6.6	Max future beach topping up frequency
Worst Case	81.68	465.09	383.40	5.7	Min future beach topping up frequency
Assuming Delayed Recession Behaviour (+10 Years)					
Best Case	70.12	342.68	272.56	4.9	Max future beach topping up frequency
Worst Case	81.68	342.68	261.00	4.2	Min future beach topping up frequency

1.1.18 Environmentally due to its lowest initial intervention requirement the beach recharge only option is identified as the option with the least environmental impact and risk.

1.1.19 The Colwyn Bay Waterfront Project Board has identified that the preferred solution for the Phase 2 length at the present time is the recharge only solution (Option 3), with the option that, should the need arise, the introduction of control structures might be considered in the future.

1.1.20 Notwithstanding this, although the Waterfront Project has been through extensive public consultation and stakeholder engagement to date there may be the need to carry out further consultation to establish whether there would be support for the control option in the future.

1.1.21 Realisation of the full benefits of the Waterfront Project requires all three phases to be implemented. Without completion of Phase 2 and its on-going requirement for beach management, the risk of failure of existing defence walls will return. Similarly across the Phase 3 length, a combination of the current condition of the defences and the low standard of protection afforded to hinterland property and infrastructure, means that if works are not carried out, major disruption to local and regional transport links would ensue which would undermine the investment already made in the Colwyn Bay Waterfront.

1.1.22 Commercially, the Council will continue with the partnership approach to procurement of Consultants and Contractors, adopted for the first phase of the project, to deliver the remaining phases.

1.1.23 The estimated capital costs (including optimism bias) for the remaining phases are:

- Phase 2: £14.15 million
- Phase 3: £37.25 million

1.1.24 Financially, the Council is seeking 75% funding for the scheme from WG under the Coastal Risk Management Programme. CCBC have approval to finance their 25% allocation of the overall project budget from internal Council resources and external partners. Specifically, in relation to Phase 3 the Council would be looking to other beneficiaries of the project e.g. Network Rail, WG Highways to share the cost burden.

1.1.25 It is proposed that detailed design and project approvals for Phase 2 would take place in the 2018/19 financial year with construction following on in 2019/20 financial year. Phase 3 design and approvals would be spread over years 2018/19 and 2019/20, with construction in 2020/21.

1.1.26 Project Management will be undertaken by CCBC staff.

2 BACKGROUND AND CONTEMPORARY DEVELOPMENT

2.1 BACKGROUND

2.1.1 The Colwyn Bay coastline between Rhos Point and Tan Penmaen Head is approximately 3.5 km in length. Defences were constructed for much of the coastline in the late nineteenth century and in general comprised vertical seawalls in either masonry or concrete.

2.1.2 As a result, during the 20th century, the frontage experienced a gradual lowering of beach levels in front of the defences requiring ongoing maintenance and repairs to the toe of the defences to ensure their integrity and stability. Groynes that were constructed in response to beach lowering, to retain the wide sand beach, ultimately failed or became redundant due to a lack of ongoing maintenance. As a result, the foreshore was typically a shallow gradient, variably thin, sandy beach overlaying fluvio-glacial sands, gravel and glacial tills. To the rear of the foreshore adjacent to the seawalls, there was some sand, shingle and cobbles that were the remains of the original shingle ridge on which the defences had been built and which now formed a narrow upper beach in places.

2.1.3 In the late 20th century specific localised works were carried out to extend the life of the existing sea walls and control movement of the beach. This included a 650m rock revetment along the worst affected stretch of seawall constructed in 1987, and a series of low level rock groynes in 1990.

2.1.4 Since the 1990's routine maintenance of the existing structures was carried out to extend their residual life. This has included patch repair of the concrete and masonry walls as well as the addition of protective rock toes and revetment facings in some areas. Emergency works, comprising the addition of further piled and rock toes, were also carried out in several locations along the seawalls, notably at Old Colwyn, in response to the rapid lowering of beach levels following severe storms.

2.1.5 The Colwyn Bay Waterfront project was conceived in 2007 as a result of the Strategic assessment of options for future flood and coastal erosion risk management (Conwy CBC, 2007).

2.1.6 It was identified at an early stage of the strategic assessment process that merely improving the ageing linear defences alongside improved promenade facilities would not attract people back to the resort, as such an approach would not fully address the issue of low beach levels. Whilst this approach was functional in terms of providing a structurally stable and hydraulically efficient coastal defence and, due to the close proximity of suitable sources of rock, would probably be the most cost effective form of defence, Council officers felt that continuation of this approach across the Colwyn Bay frontage would accelerate rather than reverse the decline in the fortunes of the town. There was therefore a local determination to investigate more innovative solutions and use the improvements to the coastal defences as a catalyst for wider regeneration of Colwyn Bay.

2.1.7 The benefits of this approach were confirmed during early public consultation on potential options, when a strong desire to implement proposals that provided improved beach conditions in parts of the bay resonated with the public. Subsequently an assessment of options, including beach recharge, linear defences and other potential solutions, was carried out during the second phase of Strategy assessment in 2007, which also confirmed that, strategically, such an approach was economically justifiable.

2.1.8 In October 2008, the Welsh Government designated the North Wales coast as a Strategic Regeneration Area (SRA). Subsequently, in early 2009, and to give focus and direction to

regeneration in Colwyn Bay, Conwy County Borough Council established the Bay Life+ partnership, run by a board made up of key local business people and council officials that worked in close partnership with organisations and community groups throughout the local area.

2.1.9 The Bay Life+ Programme is more than just physical regeneration - it aims to improve and bring together all the things that make up a community. The vision for Colwyn Bay was for a thriving, attractive and vibrant town that is welcoming, safe and friendly; a place with unique character that people are proud to live in. It laid the foundations for the regeneration of the town and provided the opportunity to build an identity for Colwyn Bay that moved on from the traditional seaside town into a modern, vibrant centre for commerce, tourism, employment and leisure, making Colwyn Bay an attractive and satisfying place to live.

2.1.10 The Bay Life+ programme provided the framework for development of the Colwyn Bay Waterfront Project to combine the renewal of coastal defences with regeneration improvements to the promenade, creating a modern, sustainable and attractive waterfront, which would be an asset to the local community and an attraction for visitors - "*Integrating coastal protection with regeneration delivering innovative solutions and value for money".*

2.1.11 Realisation of the project required amalgamation of the two strands into a single, coordinated, deliverable entity, which would provide:

- "robust and resilient coastal defences to protect the town, its residents, properties, businesses and infrastructure for years to come"; and
- "an attractive, high quality and sustainable public realm along the promenade to attract visitors to the town and drive its economic redevelopment".

2.1.12 Realising the project relies on obtaining funding from different sources and an integrated approach to funding management through development of a clear vision and programme of for delivery that enables the Council to draw upon different funding as necessary, as the scheme progressed through different phases (ref Figure 1).

2.1.13 Grant Aid funding for coastal defence elements of the Waterfront project would, subject to detailed assessment, be available through Welsh Government's Flood and Coastal Defence Risk Management budget for up to 75% of the capital cost. In addition, during Strategy development European Structural Funding was identified as a potential source of funding for the regeneration elements of the proposals. Colwyn Bay is located within the 'West Wales and the Valleys' region, which qualified for Convergence Funding, the highest level of support available and the Bay life+ programme was identified as one of the major projects proposed to bid for this funding.

2.1.14 Concurrently with development of the strategy for delivery and implementation of the Waterfront numerical and physical modelling studies were carried out to determine appropriate arrangements for beach recharge and linear revetments (Royal Haskoning, 2010). This provided reasonable certainty in relation to initial beach recharge requirements, subsequent sediment movement and likely topping up requirements across the Phase 1 frontage and identified that this section could be managed without the need for additional control structures. However, there was more uncertainty in behaviour across the Phase 2 length, due to the different exposure conditions and shoreline orientation applying here, that would require more local detailed assessment.

2.1.15 In 2010, a Project Appraisal report for the scheme was produced to support a bid for grant aid for the first element of Phase 1 of the coastal defence works (Mott McDonald, 2010).

This project appraisal, supported by appropriate environmental assessment, confirmed the business case and justification for a mixture of beach recharge and sea wall improvements across the phase 1 and 2 lengths and construction of a linear rock revetment across the phase 3 length.

2.2 CONTEMPORARY DEVELOPMENT AND CURRENT POSITION

2.2.1 The first phases of the Waterfront Project comprised approximately £5.0 million of investment in a terminal beach retention structure and localised adjacent linear defence improvements at Porth Eirias, at the eastern end of the Watersports Zone, approximately 300 metres east of the Victoria Pier. In addition, £5.0 million of funds was available for the first phase of promenade regeneration enabling works.

2.2.2 As the project developed, there was a need to continually reviewed progress and opportunities, building on the benefits of the integrated approach. As detailed design was being undertaken it became clear that delivery of the works as a single package would provide significant cost savings. The initial ideas had been for a terminal groyne, required as part of the coastal works, with a promenade focal point being constructed elsewhere. Integration of coastal works with regeneration proposals identified opportunities to create a focal point at the groyne location with associated land reclamation.

2.2.3 Conwy CBC successfully convinced the funders of the benefits of this joined up approach, linking funding streams in a manner that delivered financial and wider benefits, with the Phase 1a contract to construct the "joined up" works let in January 2011. These works were completed in March 2012. This approach realised savings of £3.0 million overall with the coastal defence element comprising approximately £4.0 million of the £7.0 million overall Contract value.

2.2.4 In March 2012 a £3.5 million contract was let using regeneration funding alone, to construct a new promenade building on the completed promontory. This comprised a single storey steel frame building with accessible roof area to provide a restaurant / bistro, classroom training facilities, changing room facilities, a water sports venture and retail space and was completed in April 2013.

2.2.5 In 2012, following confirmation from Welsh Government that a further £6.0 million of capital investment would be available to provide coastal defence improvements, development of Phase 1b of the works commenced comprising the importation of approximately 300,000m^3 of sand to recharge the beach. Available sources of sea dredged material were available near to the site in areas that were already licensed for extraction. This element of the scheme was carried out during the first half of 2013, by contractor Volker Stevin.

2.2.6 This phase of the Works did not provide full level of beach protection across the Phase 1 frontage as further phases of promenade enhancement works were required before this could be completed.

2.2.7 In February 2014, a Contract was let for Phase 1c of the coastal defence works, comprising £3.0million of investment in promenade enhancement works, between the Pier and new Porth Eirias groyne and a further £4.5 million in beach recharge and associated sea wall improvement works. This work was completed in Autumn 2014.

2.2.8 In 2016, a further phase (1d) of promenade regeneration works were carried out across the western half of the Phase 1 length, on the west side of the Pier, comprising sea wall improvement works, increasing the elevation of approximately 200 metres of highway

adjacent to the Pier and associated promenade works. This work was completed in summer 2017.

2.2.9 Whilst Phase 1 of the Waterfront project was being implemented further numerical and physical modelling studies were undertaken to address the uncertainties associated with behaviour across the Phase 2 frontage. These comprised:

- Phase 2 Numerical Beach Modelling studies (ABPmer, Sept 2013); and
- Phase 2 Physical Modelling Studies (HR Wallingford, Oct 2017).

2.2.10 A layout plan showing the various locations of the different phases/elements constructed to date and programmed for the future is provided in Figure 2.

3 DEVELOPMENT OF FUTURE PROPOSALS

3.1 PHASE 2

3.1.1 The initial modelling studies (ref para. 2.1.14 above):

- confirmed appropriate arrangements for improving linear defences, between Eirias Park and Beach Rd, Old Colwyn to provide an improved standard of flood protection and prevent setback of the shoreline, and
- identified the basis for a scheme of beach recharge, with terminal control, across the frontage between Rhos Jetty and Eirias Park

3.1.2 The modelling however identified that there was uncertainty regarding behaviour at the western end (between Rhos Jetty and Marine Road), where there is a significantly different orientation to that across the central section of frontage and the shoreline is moving from a north-south orientation at the jetty to a near east-west orientation adjacent to the Pier.

3.1.3 To address this initially, a desk modelling study was carried out to develop a conceptual understanding of behaviour focussing particularly on the local scale processes operating at the western end of Colwyn Bay. This understanding then informed a detailed numerical modelling study, to provide answers to the following questions.

- Is it feasible to nourish the beach and to maintain the required SOP over time?
- What defence configuration, such as control structures, (if any) are required to maintain the desired beach level?

3.1.4 The study (ABPmer, Sept 2013) concluded that:

- A nourished beach without control structures would be subject to ongoing erosion, requiring periodic and responsive 'top ups' of beach material;
- The model predicted beach longshore losses of approximately 160,000m^3 over a 30 year timescale for beach recharge alone and approximately 150,000m^3 over the same timescale with offshore control structures;
- There may also be siltation problems at Rhos on Sea, which may require additional mitigation measures such as increasing elevation of the groyne on the south side of the harbour;
- The greatest risk with a recharge only option relates to the uncertainty associated with quantifying cross shore losses of beach material and hence the exact frequency, quantity and hence cost of top up recharge that may be required in the future;
- The construction of offshore breakwaters along the frontage may be required to optimise beach performance but this option also has several potential disadvantages, particularly:
    - Although the 2D model predicted that sediment would accumulate in the lee of the structures, it is not possible to quantify from this exactly how much sediment would be deposited in the long-term; and
    - The deposition of sediment offshore from the breakwater gaps implies that strong, offshore directed currents may form between the structures, which may be detrimental from both a coastal erosion and safety perspective.
- 3D physical modelling of the beach and proposed structures was required, to examine the impacts of control structures to be developed further. This will provide valuable data to develop further detailed understanding of their effectiveness, and the resulting changes to local scale circulation patterns, and beach evolution.

3.1.5 Further to these studies, HR Wallingford was commissioned to undertake physical modelling studies to assist in determining the optimum solution for recharging the beach along the western flank of the bay. The solutions proposed included recharging the beach to the design level, two options looking at different configurations of emergent shore-parallel breakwaters, and an option utilising emergent shore-connected fishtail groynes. A mobile bed model was used to recreate the morphological processes of the beach.

3.1.6 The model ran a morphological condition to predict the long-term plan evolution of the beach followed by sequential 1 in 5 year and 1 in 100 year return period storms.

3.1.7 The results of the physical model showed that the volume of material losses for each scheme were of a similar order of magnitude but highest for the recharge only scheme.

3.1.8 The biggest uncertainty associated with model scale effects is the timescale of the model against the timescale in the prototype. The model set up identified that an hour's model run equated to between 0.5 and 2.0 years in the prototype. Based on this the timescales for losses predicted from the Phase 2 frontage in the model were as shown in Table 1 below.

Table 1: Predicted Beach Loss Timescales

Option	Predicted timescale to beach loss of 150,000m^3 (years)	
	Minimum	Maximum
Beach Recharge only	5	19
Beach Recharge + Single Offshore Breakwater	6	24
Beach Recharge + Twin Offshore Breakwater	10	39
Beach Recharge + Shore Connected Groynes	7	26

3.1.9 The above figures show that the approximate 30 year time frame for losses of a similar magnitude, predicted by the earlier numerical modelling, equate more closely to the maximum timescales predicted by the physical modelling.

3.1.10 The modelling also showed that the location of the erosion along the frontage was different for each scheme, which could potentially impact the severity of any wave attack on a partially depleted beach.

3.1.11 For the recharge only beach, most erosion is predicted to occur along the more sheltered western flank where the waves attack the beach more obliquely. Whilst the shore-parallel breakwaters help to retain and protect the beach material in their lee, they will move the area or erosion down-drift along the beach where the beach is less sheltered and wave attack is more normal to the shoreline. The shore connected groyne option is predicted to cause two substantial areas or erosion to occur on the northern beach and down-drift of the southern groyne. These differences can be seen by reference to Figure 3 and Figure 4.

3.1.12 The down-drift beach width for the shore connected groyne scheme decreased more rapidly than for the other schemes. It is therefore likely, that beach management would be required sooner for this option. Nourishment would also be required for the up-drift areas of the beach. For the other schemes, the physical model indicated that it may only be necessary to nourish the up-drift areas where erosion was observed.

3.1.13 Overtopping of the seawall was observed in the model for the shore connected groyne option where the shoreline retreated far enough along the more exposed frontage down-

drift of the southerly groyne, once the SWL had recessed back as far as the promenade.

3.1.14 Wave induced currents were measured and observed for the different schemes with, in particular, currents observed around the offshore breakwaters. Rip currents can cause a hazard to bathers by causing them to drift in to dangerous waters. In addition, build up of fine sediment can cause a slip hazard and quick sand in which people can become stuck.

3.1.15 The different predicted rates and location of beach movement and the changes in tidal flow patterns, together with the locations of potential beach control structure provides the basis for alternative scheme review and update with the business case presented below.

3.2 PHASE 3

3.2.1 The Phase 3 proposals are for a linear rock revetment to be constructed between Porth Eirias and Beach Rd, Old Colwyn, where the public promenade finishes and the existing defences abut the Network Rail Defences to the Chester to Holyhead railway.

3.2.2 A typical cross section through the defences, identified from the modelling undertaken prior to implementation of Phase 1, is provided in Figure 5.

3.2.3 There has been no significant development of proposals in this respect however the Council are in discussion with Network Rail with a view to obtaining agreement regarding construction of the interface with the Network Rail defences and the potential for contributions to funding, as the works form the primary defences to the railway over much of the Phase 3 section of frontage.

4 STRATEGIC CASE REVIEW

4.1 STRATEGIC CONTEXT

Conwy Local Development Plan

4.1.1 The Conwy Local Development Plan (LDP) (Conwy CBC, October 2013) emphasises the importance of preserving the county's unique natural beauty, safeguarding public rights of way and allowing tourism to continue to make a vital contribution to the local economy. Relevant policies are shown in Table 2.

Table 2: Conwy Local Development Plan

Policy Details	Project Alignment
Strategic Policy STR/1 – Sustainable Transport, Development and Accessibility	*'Promote walking and cycling'* – the scheme enhances the beach promenade, protects the Wales Coastal Path and National Cycling route, whilst encouraging the use of the beach for exercise
Strategic Policy TOU/1 – Sustainable Tourism & TOU/2 – New Sustainable Tourism and Recreational Development	*Improving connectivity by supporting delivery of…Improvements to the Wales Coastal Path and Public Rights of Way Improvement Plan…'* – as per above. Scheme will enhance and protect these existing assets – allowing safe public access along the promenade and promoting tourism to the area.
Strategic Policy NTE/1 – The Natural Environment	*'safeguarding the Plan Area's biodiversity… and landscapes through the protection and enhancement of sites of… importance'* – the scheme will maintain protection of Colwyn Bay's sea walls, safeguarding the existing environment within and neighbouring the bay
Policy NTE/5 The coastal zone	*A high proportion of Conwy's coastline is protected from flood risk although breaching from the sea is a continual risk'* – the project will ensure protection to Conwy's coastline in this area is maintained within this area
Strategic Policy DP/1 Sustainable Development principles	*Developments should….take account of and address the risk of flooding'* – as noted above, the implementation of the project ensure tidal flood protection is maintained within this area
Shoreline Management Policy	`*beach management will become increasingly important to sustain beaches which are important for coastal defence, amenity, tourism and environmental conservation'* – the scheme will continue the usage of Colwyn Bay and protection of the foreshore ensuring coastal defence, amenity, tourism and environmental conservation is maintained, with the potential to improve upon in the future

Shoreline Management Plan

4.1.2 The current Shoreline Management Plan (SMP2) (Halcrow, 2011), which includes all the shoreline under Conwy County Borough Council's jurisdiction east of the Great Orme, was completed in 2011 and subsequently adopted by the Council.

The frontage is located in policy unit ref 11a PU2.2 – Rhos on Sea to Llanddulas (Colwyn Bay, with the agreed future policies and approaches for management of this frontage provided in Table 3 below:

Table 3: Sub Cell 11a SMP2 – Policy & Approach				
Location (Policy Unit)		**Policy and Approach (from 2010)**		
		0-20 years	**20-50 years**	**50-100 years**
2.2	**Rhos on Sea to Llanddulas (Colwyn Bay)**	***Hold the Line*** – By maintaining and improving / raising the existing defences. A strategy study needs to be undertaken to confirm the long term economic viability.	***Hold the Line*** – By maintaining and improving / raising the existing defences, subject to confirmation through the strategy study.	***Hold the Line*** – By maintaining and improving / raising the existing defences, subject to confirmation through the strategy study.
Note: The Shoreline Management Plan identifies what the appropriate policy should be, not how the policy will necessarily be implemented				

The justification for the policies identified are:

- Socially, the policy manages risk to the railway and other infrastructure as well as other assets in the erosion risk zone and manages risk to the cycleway and coastal path;
- Environmentally, no conservation designations are present. Local opportunities for environmental improvements and the layout and size of the groynes should be considered in a more detailed local study; and
- Economically, the viability of the policy may depend on estimated costs for relocating the railway and road which would be at long term risk.

Colwyn Bay Coastal Defence Strategy Plan

4.1.3 The Colwyn Bay Coastal Defence Strategy Plan (CEUK, 2007) recommended a Hold the Line policy for the Colwyn Bay frontage and advised that the policy be implemented through an upgrade of the coastal defences along the frontage using a combination of beach recharge, linear rock revetment and control structures.

4.1.4 Conwy CBC's regeneration strategy for the town of Colwyn Bay sets out environmental improvements to the public realm along the Colwyn Bay promenade, to create a more usable and attractive amenity space to attract increased visitor numbers to the town,

improve the visitor experience and strengthen links with the town centre. It is essential that the coastal protection options for the frontage take into consideration the needs of the wider regeneration proposals for the area.

4.1.5 The Colwyn Bay Waterfront Project accords with the aims and objectives of the Welsh Government's Coastal Risk Management Programme 2016-2022 (CRMP). Plans for CRMP are based around the use of long term borrowing and low interest rates by Welsh Government to support a programme of capital investment in coastal risk management infrastructure. Key details of the programme include:

- £150 million capital value investment;
- co-funded between Welsh Government and local authorities with Welsh Government contributing 75% of capital costs of construction;
- construction scheduled 2018-2021;
- focussed on managing coastal flood and erosion risk to properties people and infrastructure;
- enabling adaptation to climate change and implementation of SMP2 recommendations;
- achieving wider additional and community benefits alongside reduced flood and erosion risk;
- contributing across the breadth of Welsh Government Well-Being Objectives but with emphasis on Objectives 6,7 and 8, looking for wider benefits also in support of the other objectives:
  - Objective 6. Support the change to a low carbon and climate resilient economy
  - Objective 7. Connect communities through sustainable and resilient infrastructure
  - Objective 8. Support safe, cohesive and resilient communities

4.2 STRATEGIC OBJECTIVES

4.2.1 The overarching objectives for the Colwyn Bay Waterfront Project are to:

- Provide renewed coastal defences along the waterfront to protect the residents and businesses of the town from the threat of the sea;
- Integrate the renewed sea defences with environmental improvements along the promenade to provide a coordinated approach to delivery of the project which maximises the regeneration potential of the scheme while also providing the necessary level of coastal protection; and
- Provide environmental improvements to the promenade to offer a modern, robust, sustainable and attractive public realm to draw new visitors to the area and coordinate with the Bay Life Initiative's development plan.

4.3 ENVIRONMENTAL CONSIDERATIONS

4.3.1 The original PAR report for the Colwyn Bay Waterfront Project was supported by a Phase 1 Environmental Statement (Mott McDonald, October 2010).

4.3.2 As part of the project update presented here a review of environmental considerations has been undertaken and a desk study review of the relevant environmental legislation and designation framework applying at the site has been carried out, which is included in the Environmental Review Report (ref Appendix A).

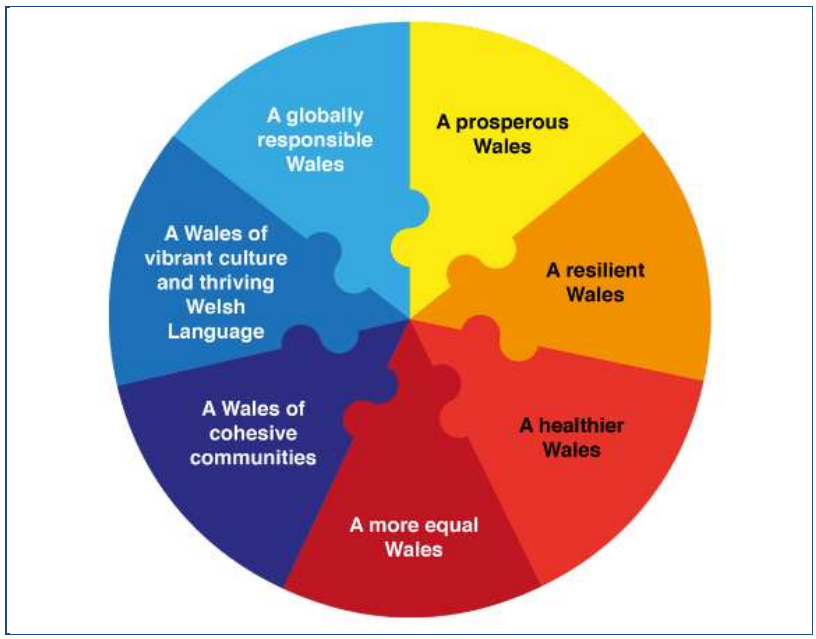
4.4 SUSTAINABILITY AND WELLBEING STRATEGIC FIT AND CONTEXT

4.4.1 The Well-being of Future Generations Act (WBFGA) was introduced in 2016 to ensure Welsh public policy and spending is sustainable and safeguards the interests of today's and

future generations. The Act features a series of overarching Well Being Goals as shown in the diagram below.

4.4.2 The Colwyn Bay objectives (detailed in Section 4.2) aim to align with the WBFGA, with clear read-across to both the acts goals and 'ways of working' The project aims to contribute to achieving all of the WBFGA objectives either through first order benefits or from spill over and wider benefits. Key examples of where this will be achieved include:

- "Long-term prevention / Prosperous, Resilient & Globally Responsible" – A scheme which manages the effects of flood risk and coastal erosion will ensure residential & commercial properties and critical infrastructure will be protected from the risk of erosion and flooding and the associated economic damages, whilst being made more resilient to climate change
- "Collaboration & Involvement / Healthier, Cohesive Communities, Thriving Culture & Heritage" – Preserving Colwyn Bay's popular beach will allow it to benefit from efforts to grow out-of-season tourism throughout Conwy. It will allow it to continue serving the local community as a popular area for regular outdoor exercise helping the older residents of Colwyn Bay in particular, with access to a local beach and its associated health and wellbeing benefits. Generally, Colwyn Bay is seen to provide a valued amenity to the local community and is considered a key asset to the area.



4.5 MAIN BENEFITS AND OPPORTUNITIES

4.5.1 The primary benefits of implementation of the Colwyn Bay Waterfront Project are:

- Provision of an economically justifiable form of coastal defence that, with appropriate maintenance and management, will provide flood and coastal erosion risk reduction throughout the 21st century;
- Opportunities to regenerate the waterfront of Colwyn Bay, improve amenity, increase local tourism income and make it an attractive destination for visitors and locals;
- Opportunities to provide a catalyst for wider regeneration of the town of Colwyn Bay and wider area.

4.6 MAIN RISKS

4.6.1 The primary risks relating to completion of the Colwyn Bay Waterfront Project are:

- Further Central and Local Government and third party funding is not forthcoming, leading to delay in implementation, which potentially undermines the investment made to date and does not realise the benefits of that investment;
- Damage to the existing defences requiring extensive and expensive remedial attention; and
- Stakeholder objection to future phases;
- Refusal of Planning permission; and
- Lack of future funding potentially does not realise the full benefits over the project lifetime.

4.7 CONSTRAINTS

4.7.1 The primary potential constraints on the successful delivery and management of the project are:

- Availability of Welsh Government Grant Aid;
- Availability/lack of CCBC contribution to on-going project costs;
- Availability of third party contributions, other grants e.g. EU funding etc.;
- Availability of future funding to maintain and manage the project.

4.8 DEPENDENCIES

4.8.1 The project is dependent on the following:

- All funding streams required to cover the cost of the project, being available within the required timescales;
- On-going flood and coastal erosion risk being effectively managed by CCBC and others;
- Incorporation of any environmental mitigation, as required.

5 ECONOMIC CASE UPDATE

5.1 INTRODUCTION

5.1.1 The original PAR Report carried out a thorough option assessment and associated economic appraisal of options for the Colwyn Bay Waterfront and demonstrated a benefit to cost ratio (BCR) of 5.36 with total estimated Present Value (PV) costs of £81m (including optimism bias), PV benefits of £434m and a Net Present Value of £353m.

5.1.2 The PAR review undertaken has not carried out an updated assessment of options but has included in the economic appraisal, options for beach recharge with control structures across the Phase 2 length, which were not assessed in the original appraisal.

5.1.3 The update does not repeat assumptions or details that have not changed since the original PAR. Where appropriate, reference to sections of the original document are included.

5.2 OPTION REVIEW AND UPDATE

5.2.1 The original option assessment identified that there were two potential alternatives to meet the requirements for coastal defence, as follows:

- A linear rock revetment incorporating a new promenade across the whole frontage (denoted as Option 4); and
- A combination of beach recharge across the Rhos on Sea to Porth Eirias section, with a terminal groyne at the eastern end of this section, together with a linear rock revetment from Porth Eirias to Beach Rd, Old Colwyn (denoted as Option 5).

5.2.2 The preferred approach for the frontage, primarily due to the added value and wider benefit it provided was the combination of beach recharge and rock structures.

5.2.3 The options therefore included in the appraisal are as follows:

- Option 1: Do-nothing;
- Option 2: Linear rock revetment;
- Option 3: Beach recharge with terminal groyne and rock revetment at east end;
- Option 4a: Option 3 with single offshore breakwater across Phase 2 frontage;
- Option 4b: Option 3 with twin offshore breakwaters across Phase 2 frontage; and
- Option 4c: Option 3 with shore connected groynes across Phase 2 frontage;

Layout plans for Options 4a - 4c are provided in Figure 6 - Figure 8.

5.2.4 All beach recharge options would include for increasing in height the existing rock groyne on the south side of the harbour, in order to prevent beach recharge sediment being washed into the harbour area.

5.3 ECONOMIC APPRAISAL UPDATE

5.3.1 Economic assessment of options has been carried out in accordance with the following key guidance documents:

- HM Treasury "Green Book" (HM Treasury, 2010) and accompanying 5 Case model guidance; and
- The Multi-Coloured Manual (MCM) and Multi-Coloured Handbook (MCH) and for the assessment of flood damages (Flood Hazard Research Centre, 2013, 2017).

In order to justify future expenditure on flood and coastal risk management the valuation of

damages that would occur in the absence of any management actions being undertaken – the Do-Nothing (or No Active Intervention) Scenario) - has been appraised against the costs of implementing each of the options across each of the frontages, over a 100 year period, providing a ratio of benefits to costs, the Benefit to Cost ratio (BCR) for each of the options. Costs and Damages have been assessed and discounted over the 100-year period to present value (PV) using the equation:

PV = (Sum in year n) / $(1 + r/100)^n$, where r is the percentage discount factor, and the base date is taken as year n = 0 and r is as follows:

- Year 0-30: 3.5%
- Year 31-74: 3.0%
- Year 75-100: 2.5%

5.3.2 The appraisal has updated scheme costs and damages from the original PAR Q3 2010 base date to a current (Q4 2017) value.

Do-Nothing scenario

5.3.3 The Do-Nothing scenario has not been revised or updated with the assumptions made in the original PAR in relation to the timing and losses of assets as previously identified (ref. section 3.2 and 5.5 of the original document).

5.3.4 The principal assumptions associated with the Do-Nothing scenario are:

- Overtopping of defences causing closure of the promenade and traffic diversion; and
- Failure of defences leading to permanent traffic diversions, loss of commercial and residential properties and loss of railway and highway infrastructure, with the following applying:
  - Defences, promenade and highway behind assumed to fail in year 5;
  - Property adjacent to highway lost at the same time;
  - Railway becomes unsafe operationally from year 10; and
  - Loss of the A55 in year 55.

All years are relative to the date of the original PAR (Q3 2010).

5.3.5 Realisation of the full benefits of the Waterfront Project requires all three phases to be implemented. Without completion of Phase 2 and its on-going requirement for beach management, the risk of failure of existing defence walls will return. Similarly, across the Phase 3 length a combination of the current condition of the defences and the low standard of protection afforded to hinterland property and infrastructure, means that if works are not carried out, major disruption to local and regional transport links would ensue and would undermine the investment already made in the Colwyn Bay Waterfront.

Option Costs

5.3.6 The costs of all phases of the works have been updated to Q4 2017, as follows:

- All Phase 1 works that would have been carried out under each of the options are assumed to place at year 0 (2017-18);
- Phase 2 works are carried out during years 1 and 2 (2018-20); and
- Phase 3 works are carried out during year 3 (2020-21).

5.3.7 The costs of Phase 1 works that have already been carried out are, where appropriate, have been updated to the Q4 2017 base date by the change in the BCIS General Civil Engineering Tender Index.

5.3.8 Cost estimates for the Phase 2 works are based on the unit rate and cost information derived from the Phase 1 tenders, updated as in 5.3.7.

5.3.9 The Phase 3 works cost estimates and the costs for Option 2 applying across the whole of the frontage have used a combination of the original PAR cost estimates, the Phase 1a Tender costs for similar types of works and current Conwy CBC framework rates for similar materials, in order to develop a robust costing for this type of works.

5.3.10 The cash costs for the future capital works for each of the options examined is identified in Table 4 below

Table 4: Capital Construction Cost Estimates for Future Phases (excl. Optimism Bias) (£k)

Option		Phase 2	Phase 3
2	Rock Revetment Phases 1, 2 and 3	15,970	32,458
3	Beach Recharge Phases 1 and 2, Rock Revetment Phase 3	12,865	32,458
4a	Beach Recharge Phase 1, Beach Recharge & Single Offshore Control Structures Phase 2, Rock Revetment Phase 3	20,561	32,458
4b	Beach Recharge Phase 1, Beach Recharge & Twin Offshore Control Structures Phase 2, Rock Revetment Phase 3	27,949	32,458
4c	Beach Recharge Phase 1, Beach Recharge & Shore Connected Control Structures Phase 2, Rock Revetment Phase 3	17,258	32,458

5.3.11 Maintenance works for rock armour structures are based on current plant and labour rates for appropriate machinery with work comprising removal and re-setting of rocks on a typical 5 yearly frequency but with local modification to maintain standards of protection on a 25 year frequency.

5.3.12 For options that include beach recharge, future costs comprise the following:

- Regular Annual Beach Management; and
- Regular topping up exercises to make up for system losses.

5.3.13 Regular beach management requires excavator, dump trucks and dozers to move material within the frontage. The estimated annual costs for this based on moving 10,000m3 per exercise is £10,400.

5.3.14 Conwy CBC's current beach management plan for Colwyn Bay (Coastal Engineering, April 2015) identifies that, for the Phase 1 length, topping up should be undertaken when beach losses from the frontage equate to approximately 10% of the total design beach volume above -2.5m AOD.

5.3.15 The total frontage volume above -2.5m AOD equates to approximately 1,900,000m^3. Calculating this for the combined Phase 1 and 2 frontage length, would require topping up when volumes were more than 175,000 m^3 below design volumes. Table 5 provides minimum and maximum estimates for the topping up frequency.

Table 5: Estimated Beach Recharge Topping Frequencies		
Option	Predicted timescale to topping up (years)	
	Minimum	Maximum
Beach Recharge only	6	22
Beach Recharge + Single Offshore Breakwater	7	28
Beach Recharge + Twin Offshore Breakwater	12	46
Beach Recharge + Shore Connected Groynes	8	31

5.3.16 The updated appraisal presents best and worst case cost streams based on the maximum and minimum frequencies defined in Table 5.

5.3.17 Spreadsheets showing the derivation of scheme costs are reproduced in Appendix B.

Project Benefits (Damages Avoided)

5.3.18 Project benefits and damages have been calculated under the following categories:

- Residential and commercial property losses;
- A55 road losses;
- Local traffic losses (road diversion costs);
- Chester to Holyhead railway losses;
- Loss of services/utilities under the promenade; and
- Tourism Losses (using contingent valuation methods)

5.3.19 The starting point for the update/review of project damages is the valuations/assumptions in the original PAR.

Residential and Commercial Property

5.3.20 Since the original PAR there has been a change in property arrangements within the identified recession zone, with several properties/plots being converted from either single residential or commercial units into flats.

5.3.21 Residential property values have been updated by reference to the Land Registry (https://www.gov.uk/search-house-prices) and commercial valuation websites e.g. https://www.zoopla.co.uk/house-prices/rhos-on-sea/west-promenade/ll28-4by/?q=ll28%204by&search_source=house-prices

5.3.22 Current commercial/industrial property values are based on the rateable value of properties (https://www.gov.uk/correct-your-business-rates) x a factor of 16.7 (cf. MCH, 2016).

5.3.23 The total current market value of property and the estimated total PV loss value under the project are provided in Table 6 below:

Table 6: Change in Property Numbers and Value		
	Original PAR	Q4 2017 Valuation
Total Market Value (£k)	23,050	44,950
PV Project Loss Value (£k)	18,150	32,320
Detached Properties	4	6
Semi-detached Properties	2	4
Flats/Apartments	162	238
Commercial Properties	4	1

A55 Road Losses

5.3.24 Values associated with the permanent diversion of vehicles following the loss of the A55 in year 55 have been updated based on updates to travel resource costs as provided in the MCM (2013).

5.3.25 The 2010 PAR identified an hourly cost of local diversion of £1,228 per hour. Based on the updated travel costs in the MCM (based date 2013), the hourly cost would rise by 7.2% to £1,317.

5.3.26 The original PAR allowed for this figure 24 hours per day, 7 days per week and 52 weeks per year. This is considered to be an over estimate. For the updated economic assessment, the hourly loss is assumed to apply for 12 hours with 50% of the loss applicable for the remaining time due to lower traffic flows during the night.

5.3.27 The original PAR identified annual losses associated with this element of £10,761k. The value for the updated assessment is £8,629k.

Local Traffic Losses

5.3.28 Values associated with the diversion of traffic due to the temporary closure of the promenade due to overtopping in years 0-5 and the permanent diversion of vehicles following the loss of highway access along the promenade in year 5 have been assessed similarly to the A55.

5.3.29 The majority of traffic using this route are cars. Based on the updated MCM data there is no change in the difference between the 40 km/hr (30 mph) and the 32km/hr (20km/hr) used in the original assessment. Accordingly, no change to the values used in the original PAR have been made in the updated assessment, with the following applying:

- Annual cost of temporary promenade diversion (year 0-4): £30k; and
- Annual cost of permanent diversion (year 5-99): £2,594k.

Chester to Holyhead railway losses

5.3.30 Values associated with the loss of the railway at Colwyn Bay, necessitating a replacement bus service, which it assumes adds 1 hour onto passengers' journey times, has been updated in accordance with the information in the MCM (base date 2013), as shown in Table 7 below.

Table 7: Calculation of Rail Delay	
Total no. of passengers travelling across the area per hour, as original PAR	170
% of passengers (Business) - MCM Table 6.22	9
% of passengers (Commuter) - MCM Table 6.22	31
% of passengers (Leisure) - MCM Table 6.22	60
Compensation payments £ per hour delay (Business) - MCM Table 6.21	£42.34
Compensation payments £ per hour delay (Commuter) - MCM Table 6.21	£5.83
Compensation payments £ per hour delay (Leisure) - MCM Table 6.21	£5.13
Cost of delay per day	£35,362
Cost of Replacement Bus Service	£4,685
Total annual cost of diversion	£14,617k

5.3.31 The annual cost of rail delay, from year 10 onwards, under the Do-nothing scenario, is £14,617k, which compares to £12,026k in the original PAR, an increase of 21.5%.

Loss of Utilities Infrastructure under the Promenade

5.3.32 The original PAR identified there were several main utilities that were located behind the sea wall under the promenade including; BT Cables, LV Electricity Supply, Water Mains; Foul Sewerage and Gas Mains.

5.3.33 The replacement cost for these items has been updated to the Q4 2017 base date by the change in the BCIS General Civil Engineering Tender Index. The replacement cost for this infrastructure has increased from £5.7m to £6.9m.

Tourism Losses

5.3.34 To establish the value of tourism to the Waterfront Project, a contingent valuation visitor survey was carried out in 2010, which identified the value of enjoyment associated with three scenarios: Do-Nothing, Rock Revetment and a combination of beach recharge (phase 1 and 2) and rock revetment (Phase 3).

5.3.35 For the updated assessment the values obtained have been updated by the change in the Consumer Price Index 09: Recreation and Culture, which equates to a 5.8% increase since the date of the original survey.

5.3.36 The changes in the value of enjoyment associated with the frontage are as shown in Table 8 below.

Table 8: Value of Enjoyment per visitor (£)			
	Do-Nothing	Option 2 – Rock Revetment	Option 3 – Recharge/ Rock Revetment
Value of Enjoyment (2010)	8.97	7.84	17.74
Value of Enjoyment (2017)	9.49	8.29	18.77

5.3.37 The survey identified that the option with beach recharge produced the highest enjoyment value and interestingly that visitors would prefer a Do-Nothing scenario compared to a linear rock revetment across the whole frontage.

5.3.38 Evaluation of tourism losses have been compared to the value for the Do-nothing scenario based on the difference in value of enjoyment per visitor, as shown in Table 8. Total PV losses (+ve) and gains (-ve) are shown in Table 9 below.

Table 9: PV Tourism Losses (£k)			
	Do-Nothing	Option 2 – Rock Revetment	Option 3 – Recharge/ Rock Revetment
PV (2010)[1]	14,221	12,430	-28,126
PV (2017)	0.00	1,895	-14,711

5.3.39 Spreadsheets showing the derivation of scheme damages are reproduced in Appendix B.

Cost Benefit Summary

5.3.40 A summary of the updated costs and benefits associated with each of the options is provided in Table 10, assuming beach topping up is carried out at the maximum frequencies identified in Table 5.

5.3.41 Table 11 provides the cost benefit summary assuming the beach topping up is carried out at the minimum frequencies identified in Table 5.

5.3.42 Optimism biases have been added to the cost estimates for the rock revetment option (15%) and beach recharge option (10%) in calculation of the benefit cost ratios in Table 10 and Table 11 respectively.

5.4 COMPARISON OF OPTIONS

5.4.1 Economically the preferred scheme is that which was identified in the original PAR in 2010.

5.4.2 The construction of linear rock armour defences around the whole bay is less economically viable and does not deliver additional benefit in terms of amenity and regeneration.

5.4.3 The use of offshore breakwaters and shore connected groynes increases the initial capital cost but reduces the future costs by decreasing the frequency of beach recharge topping up required.

5.4.4 Of the beach and control structure options considered, the use of shore connected structures is the most advantageous.

5.4.5 Under the best case (maximum frequency) recharge alone is economically better (ref Table 10). Under the worst case (minimum frequency) there is economic parity between the two options.

[1] The figures for tourism losses and gains used in the original assessment just used the no. of visitors x the value per visitor for each option, not the differences between the options. The original losses/gains were therefore incorrect, showing less losses for the rock revetment alternative compared the Do-Nothing and >3x the difference between the Do-nothing and Recharge options.

5.5 PREFERRED OPTION

Sensitivity Analysis

5.5.1 The key criterion in relation to valuation of option costs is the timing of beach topping up. Potential differences in this have been examined (see above). Changing the timing of onset of all damages by 10 years reduces the total damages and benefit cost ratios by about 25% but does not affect the overall ranking.

Environmental Considerations

5.5.2 The Environmental Review report (ref Appendix A) has reviewed the potential impacts of the Do-Nothing, Rock Revetment and Beach Recharge options identified in the original Environmental Statement (ES) produced by Mott MacDonald in 2010). In addition, the option of recharge with beach control structures across the Phase 2 frontage has been assessed, as part of the current work.

5.5.3 The report has considered changes to designated sites within the project's Zone of Influence since the ES was published in 2010. It has identified that the Liverpool Bay pSPA has since been formally classified as Liverpool Bay SPA, with an associated increase in total area and qualifying features. This change is not considered to have altered the findings of the 2010 ES significantly, as the boundaries immediately adjacent to the site have not altered and the additional qualifying features are not present in this part of the SPA. However, an updated Habitats Regulations Assessment should be completed to accompany the planning submission for the preferred option for Phase 2 of the project. The HRA should consider, in particular, any additional changes to local beach and flow processes associated with the preferred option, in-combination with completed Phase 1 and proposed Phase 3 of the project.

5.5.4 An environmental appraisal of four options (Options 3 – 4c) has also been completed.

- Overall, Option 3 (beach recharge and construction of Rhos groyne) is considered to have the lowest environmental impact/risk and is therefore the preferred option based on environmental factors only. This option would generate the smallest additional habitat loss, the lowest impact on local scale beach processes and involve the smallest amount of imported materials to the site with the lowest temporary disruption during construction. It is also likely to require a greater frequency of topping up and hence more instances of temporary construction impacts, throughout the scheme's design life, although these would be mitigated through appropriate conditions and approved methods of working;
- Options 4a and 4c are ranked second and third in terms of environmental impact/risk with Option 4b the least preferred option based on environmental factors only. This option would require the largest additional habitat loss from the beach, have the joint highest potential impact on local scale beach processes with Option 4c, involve the largest import of materials to site and take the longest to construct, and hence has the largest potential environmental impacts/risks associated with it.

5.5.5 Whichever option is chosen for Phase 2, additional site surveys and associated detailed environmental assessment, including identification of suitable avoidance/mitigation measures, are expected to be required to ensure that sufficient information is provided to inform a planning application. The scope of such surveys and assessment should be defined in agreement with relevant stakeholders for the site and planning process, including Conwy County Borough Council and Natural Resources Wales.

Table 10: Updated Project Summary assuming maximum beach topping up frequencies

Client/Authority			Prepared (date)			01/02/2018
Conwy County Borough Council			Printed			19/03/2018
Project name			Prepared by			AJW
Colwyn Bay Waterfront PAR Update			Checked by			CEUK
Project reference			Checked date			18/03/2018
Base date for estimates (year 0)	Q4 2017					
Scaling factor (e.g. £m, £k, £)	£k	(used for all costs, losses and benefits)				
Year	0	30	75			
Discount Rate	3.5%	3.00%	2.50%			
Optimism bias adjustment factor	15%	10%	10%	10%		10%
Costs and benefits of options						

	Costs and benefits £k					
Option number	**Option 1**	**Option 2**	**Option 3**	**Option 4a**	**Option 4b**	**Option 4c**
Option name	Do-nothing	Rock Revetment Phases 1, 2 and 3	Beach Recharge Phases 1 and 2, Rock Revetment Phase 3	Beach Recharge Phase 1, Beach Recharge & Single Offshore Control Structures Phase 2, Rock Revetment Phase 3	Beach Recharge Phase 1, Beach Recharge & Twin Offshore Control Structures Phase 2, Rock Revetment Phase 3	Beach Recharge Phase 1, Beach Recharge & Shore Connected Control Structures Phase 2, Rock Revetment Phase 3
AEP or SoP (where relevant)						
COSTS:						
PV Initial Capital Costs	0	79,139	57,198	63,603	70,009	60,740
PV Operation and Maintenance Costs	0	457	3,070	2,266	1,330	2,132
PV Fees	0	7,579	5,404	6,143	6,582	5,914
Optimism bias adjustment	0	13,076	4,447	5,081	5,672	4,759
PV negative costs (e.g. sales)	0	0	0	0	0	0
PV contributions						
Total PV Costs £k excluding contributions	0	100,251	70,119	77,093	83,592	73,544
Total PV Costs £k taking contributions into account	0	100,251	70,119	77,093	83,592	73,544
BENEFITS:						
PV monetised flood damages	0	0	0	0	0	0
PV monetised erosion damages	452,716	2,342	2,342	2,342	2,342	2,342
PV monetised tourism damages		1,895	-14,711	-14,711	-14,711	-14,711
Total PV damages £k	452,716	4,237	-12,369	-12,369	-12,369	-12,369
Total PV benefits £k		448,479	465,086	465,086	465,086	465,086
DECISION-MAKING CRITERIA:						
Net Present Value **NPV**		348,228	394,966	387,992	381,493	391,542
Average benefit/cost ratio **BCR**		4.5	6.6	6.0	5.6	6.3
Incremental benefit/cost ratio **IBCR**			-0.6	0.0	0.0	0.0
			Highest bcr			

Table 11: Updated Project Summary assuming minimum beach topping up frequencies

Client/Authority			Prepared (date)			01/02/2018
Conwy County Borough Council			Printed			19/03/2018
Project name			Prepared by			AJW
Colwyn Bay Waterfront PAR Update			Checked by			CEUK
Project reference			Checked date			18/03/2018
Base date for estimates (year 0)	Q4 2017					
Scaling factor (e.g. £m, £k, £)	£k	(used for all costs, losses and benefits)				
Year	0	30	75			
Discount Rate	3.5%	3.00%	2.50%			
Optimism bias adjustment factor	15%	10%	10%	10%		10%
Costs and benefits of options						

	Costs and benefits £k					
Option number	**Option 1**	**Option 2**	**Option 3**	**Option 4a**	**Option 4b**	**Option 4c**
Option name	Do-nothing	Rock Revetment Phases 1, 2 and 3	Beach Recharge Phases 1 and 2, Rock Revetment Phase 3	Beach Recharge Phase 1, Beach Recharge & Single Offshore Control Structures Phase 2, Rock Revetment Phase 3	Beach Recharge Phase 1, Beach Recharge & Twin Offshore Control Structures Phase 2, Rock Revetment Phase 3	Beach Recharge Phase 1, Beach Recharge & Shore Connected Control Structures Phase 2, Rock Revetment Phase 3
AEP or SoP (where relevant)						
COSTS:						
PV Initial Capital Costs	0	79,139	57,198	63,603	70,009	60,740
PV Operation and Maintenance Costs	0	457	13,079	10,969	6,229	9,687
PV Fees	0	7,579	5,906	6,579	6,828	6,293
Optimism bias adjustment	0	13,076	5,498	5,995	6,187	5,552
PV negative costs (e.g. sales)	0	0	0	0	0	0
PV contributions						
Total PV Costs £k excluding contributions	0	100,251	81,681	87,146	89,252	82,271
Total PV Costs £k taking contributions into account	0	100,251	81,681	87,146	89,252	82,271
BENEFITS:						
PV monetised flood damages	0	0	0	0	0	0
PV monetised erosion damages	452,716	2,342	2,342	2,342	2,342	2,342
PV monetised tourism damages		1,895	-14,711	-14,711	-14,711	-14,711
Total PV damages £k	452,716	4,237	-12,369	-12,369	-12,369	-12,369
Total PV benefits £k		448,479	465,086	465,086	465,086	465,086
DECISION-MAKING CRITERIA:						
Net Present Value **NPV**		348,228	383,404	377,939	375,833	382,814
Average benefit/cost ratio **BCR**		4.5	5.7	5.3	5.2	5.7
Incremental benefit/cost ratio **IBCR**			-0.9	0.0	0.0	0.0
			Highest bcr			

Discussion

5.5.6 The final choice of option is dependent on consideration of wider benefits and other factors, associated with the Phase 2 beach length.

5.5.7 For all the scenarios considered, the option of just recharging the beach, including local modification of the groyne at the entrance to Rhos harbour (Option 3), provides the best value for money in economic terms, apart from under the more frequent beach topping up scenario, when recharge plus shore connected control structures option (option 4c) provides the same return.

5.5.8 The primary difference, apart from the frequency of topping up between the recharge only and the recharge plus shore connected control structures options is the likely patterns of beach losses (ref sections 3.1.10 - 3.1.15 above). With recharge only, beach material will feed the beaches to the east and whilst regular beach management will be required across the whole phase 1 and 2 frontage, to minimise losses, across the phase 1 length, topping up will generally be required across the Phase 2 frontage.

5.5.9 Provision of a cross control structure will inhibit the natural passage of material from the Phase 2 to the phase 1 length. Whilst losses will be less across the Phase 2 length, erosion will take place immediately downdrift of the proposed control structure. As identified in the modelling the Phase 1 length becomes gradually more exposed moving easterly with different wave conditions applying than across the Phase 2 length, as the shoreline moves out of the shelter provided by Rhos Point.

5.5.10 This pattern of beach loss and easterly movement has already been observed, since completion of the Phase 1c works in 2014, with easterly movement of the beach at the western end of the Phase 1 length (see photos below, Dec 2017), as the western end is not receiving significant drift from the Phase 2 length, it not having been recharged yet.

5.5.11 As well as modifying beach movement patterns and topping up arrangements, the provision of a beach control structure at the Phase 1 /2 boundary there are other potential impacts (which can be considered as either positive or negative depending on your particular viewpoint), as discussed in Table 12 below.

5.5.12 Also, Option 3 is considered to have the lowest environmental impact/risk and is therefore the preferred option based on environmental factors only.

Table 12: Discussion of Issues and Impacts of Shore Connected Groyne	
Issue/Impact	Discussion/Potential Mitigation
Structure will provide a barrier to un-inhibited beach movement.	Can be mitigated by provision of ramps or steps over the structure. These would need to be suitable for pedestrians and vehicles to allow for beach management operations to take place. Access ramps would have potential additional H&S risks associated with algal growth with requirement for regular cleaning etc.
Danger from climbing on rock structures	Issue already applicable with existing rock groynes, terminal structure at Porth Eirias and existing Rhos-on-Sea offshore breakwater. Provision of appropriate warning signs and
Potential for incorporating access along crest of structure	Would add to costs but would allow public to view bay from different vantage points. Would provide modern equivalent of now dilapidated Pier.
Visual impact of structure	Would generate a large visual impact from the addition of a new groyne, which could contribute to an 'enclosed' atmosphere of the beach panorama in conjunction with the Rhos breakwater to the north.
Environmental impact of structure	Potential creation of rock pools, reef habitats, and high tide roosting sites for birds.
Habitat Loss	Would permanently reduce inter-tidal area by 2.1ha (100% more than Option 3);
Socio-Economic Impacts	No significant difference between options
Cultural Heritage Impacts	No significant difference between options
Construction Impacts	Longer time frame for construction – 1.5-2x that for recharge only with associated greater temporal impacts on amenity, noise and public access.

5.5.13 The Phase 2 frontage is designated the family zone (ref Figure 1) and overall consideration must be given to whether the construction of a large groyne is compatible with the waterfront strategy vision for this section of the frontage.

5.5.14 Following review of the draft PAR update, the Colwyn Bay Waterfront Project Board has identified that the preferred solution for the Phase 2 length at the present time is the recharge only solution (Option 3), with the option that, should the need arise, the introduction of control structures might be considered in the future.

5.5.15 Notwithstanding this, although the Waterfront Project has been through extensive public consultation and stakeholder engagement to date there may be the need to carry out further consultation to establish whether there would be support for the control option in the future.

6 COMMERCIAL CASE

The Commercial Case outlines how the preferred option has in the past and will in the future be delivered.

6.1 INTRODUCTION AND PROCUREMENT STRATEGY

Introduction

6.1.1 Phase 1 of the Colwyn Bay Waterfront Project has to date been delivered by Conwy County Borough Council through the commissioning of suitably experienced Consultants to produce appropriated designs and Contractors to construct the works as detailed using the NEC3 suite of Contracts.

6.1.2 Management of the construction of the completed works has been carried out by CCBC staff.

6.1.3 The Flood Risk and Infrastructure (FRI) Team within CCBC will project manage future phases of the project building on the experience gained in the delivery of the Phase 1 works and other WG funded coastal projects recently completed along the Conwy coastline.

6.1.4 Pending the submission and acceptance of the updated economic assessment by WG, the FRI team would seek to procure a suitably qualified and experienced Consultant to carry out the detailed designs of the future phases of the preferred and agreed option.

6.1.5 Once detailed designs have been completed, tender package(s) for the construction works will be prepared and tendered with suitably experienced contractors.

Strategy

6.1.6 The FRI team will prepare the tender documentation both for the procurement of the Consultants and Contractor on the open market and use Sell2wales and the NPS frameworks, where appropriate, taking advantage of a simplified, sustainable tendering process resulting in efficiencies in time and cost.

6.1.7 CCBC will use its extensive experience in dealing with the Marine Licencing Team and the NRW, the Crown Estate, Local Fisherman Organisations, Town Councils and resident groups to facilitate the process.

6.1.8 Procurement will be made in accordance with the European Directives and a notice will be published on the Buy4Wales website and in the Official Journal of the European Union (OJEU).

6.1.9 CCBC's recently developed draft Corporate Plan 2017-2022 specifically aligns itself with the 7 goals outlined in the Wellbeing and Future Generations Act and sustainability will be at the heart of any commissioned project.

6.1.10 CCBC will strive to achieve value for money for the WG and pursue the goals outlined in "Delivering Maximum Value for the Welsh Pound – 2014".

6.1.11 As with previous CCBC projects, additional Z clauses will be inserted in to the contracts to define the Community Benefits that will have to be achieved as part of the works. These have in the past included requirements for local spending where possible, prompt payment of suppliers and defined training for young workers.

6.2 KEY CONTRACTUAL TERMS & RISK ALLOCATION

Contract duration

6.2.1 Based on CCBC's extensive experience in delivering previous phases of the Waterfront project coastal defence works, it is proposed that further public consultation (if required), detailed design and project approvals for Phase 2 would take place in the 2018/19 financial year with construction following on in 2019/20 financial year.

6.2.2 Phase 3 design and approvals would be spread over years 2018/19 and 2019/20, with construction in 2020/21.

NEC contracts

6.2.3 CCBC will use the NEC suite of contracts to administer the projects – NEC Professional Services Contract (PSC) Option A for the detailed design and NEC Engineering and Construction Contract (ECC) Option A for the construction works. NEC contracts have been used by CCBC on all recent coastal projects and provide flexibility and standardisation in contract preparation and administration.

6.2.4 The Option A payment mechanism – i.e. priced contract with activity schedule – has been chosen to minimise the estimating risk to CCBC and it is expected that both the Scope of Services (PC) and the Works Information (ECC) will be well defined in advance of tendering.

6.2.5 The outline Activities will be prepared by CCBC with the Consultant/Contractor choosing to subdivide for payment purposes and providing a direct link between progress and payment.

6.2.6 Roles and duties are clearly defined in the NEC with the Employer, Project Manager, Supervisor, Contractor, Subcontractors and Adjudicators clearly identified. Contracts will be executed in a spirit of "mutual trust and co-operation" as defined in clause 10.1 of both contracts and early warnings and risk reduction meetings will be used to mitigate any possible compensation events.

Risk allocation

6.2.7 The NEC contract is a tool to manage risk and avoid disputes and to this end CCBC will be open and upfront with their partners. However, in the tender documentation provided, CCBC shall aim to reduce its risk and provide the Consultant/Contractor the opportunity to price any residual risk into their activity schedule.

6.2.8 Both CCBC and Consultants/Contractors will complete the sections in the contracts identifying the matters to be included in the Risk Register at the outset of the process which may be notified as early warning matters. This Risk Register is a post contract risk management tool and shall be used to avoid and reduce risk during the execution of the contract. Any risk not taken and priced by the Contractor would subsequently become a compensation event as identified in clause 60.1 of the contract documents.

6.2.9 Typical CCBC risk items would include, NRW and 3rd party approvals, planning consents, funding constraints, time constraints, exceeding time for delivery, exceeding budget etc. The Consultants/Contractors shall identify their perceived risks in the Contract Data Part 2.

6.2.10 Secondary X clauses shall also be used to allocate risk relating to inflation, law and any Contractors design.

6.3 PROCUREMENT ROUTE AND TIMESCALES

Procurement of Design Consultant

6.3.1 Using CCBC's Corporate Procurement and Contracts Team, the Design Consultant(s) for the future phases of the project will be procured using the National Procurement Service (NPS) Construction Consultancy Framework relevant to coastal schemes with tender documentation posted and managed through the Sell2wales portal. Tender documentation shall be prepared by suitably experienced Officers from the FRI team.

6.3.2 The NEC Professional Services Contract shall be used to engage the Design Consultant with the tenders being assessed on a quality and price basis. Greater bias will be given to price at this stage as the Consultants on the NPS have already satisfied extensive quality conditions to be awarded a place on the framework.

6.3.3 The Quality Submission for the Design Consultant will consist of five weighted criteria which will require responses and shall be ranked, as detailed in Table 13 below.

Table 13: Design Consultant's Quality Submission Criteria & Marking

Description	% of overall mark
Details and approach to quality management of the Contract	15
Consultant's understanding of the brief and the outputs required under the Contract including approach to working with the Employer	30
The Consultant's proposed methodology for undertaking the Contract	20
The Consultant's Key Resources to be utilised to deliver the Contract	20
Consultant's proposed delivery programme	15

6.3.4 Tender evaluation in accordance with the Instructions to Tenderers shall be carried out and the award of contract shall comply with CCBC's Contract Procurement rules and Public Contracts Regulations 2015.

Procurement of Contractor

6.3.5 Tender documentation shall be prepared by suitably experienced Officers from the FRI team using input provided by the Design Consultants. It is proposed that the NEC ECC Option A shall be used for the proposed works which reduces the risks to the employer but requires significantly detailed works information to avoid possible compensation events during the execution of the contract.

6.3.6 The following stages are proposed:

- Stage 1 - A pre-qualification phase will be run initially where Contractors are invited to submit responses to a Pre-qualification questionnaire which will focus on their economic standing and having sufficient technical ability to carry out the proposed works.
- Stage 2 - Suitably qualified Contractors will then progress to the restricted stage of tendering which would then be evaluated on a quality and price basis.

6.3.7 The Quality Submission for the Contractor will consist of seven weighted criteria, as shown in Table 14, which will require responses and shall be ranked.

6.3.8 Based on recently completed coastal schemes the period required from PQQ to contract award takes in the region of 6 months and covers PQQ period, PQQ approval, review of final tender documentation, tender period, tender appraisal, Cabinet approval and Alcatel standstill period. Once the contract is awarded for construction a minimum of 6 months will be allowed for construction for Phase 2 and 12 months for Phase 3.

Table 14: Contractor's Quality Submission Criteria & Marking	
Description	**% of overall mark**
The Contractor's proposed approach to Project Management during execution of the works (including key staff, duties and management and co-ordination of sub-contractors)	10
The Contractor's proposed approach to progress reporting and communication with Conwy County Borough Council during execution of the works, including the approach to reporting commercial issues.	30
The Contractor's approach to managing the quality of output on site, checking and supervision of the works	10
The Contractor's approach to communication with and engagement of the public during execution of the works	5
The Contractor's outline programme for the works, including details of: • Start date, access dates, key dates and completion date; • Order and timing of the works; • Provisions for risk allowance; • Health and Safety Requirements; and • Details of each planned operation (including any resourcing and sub-contractor requirements).	20
The Contractor's proposed approach and methodology for the delivery of the Coastal Defence Works – including details of the importation material sources and temporary works required to undertake the works and what positive measures could be put in place to reinforce the sustainability of the project	35
The Contractor's perceived key risks in undertaking the works and the outline mitigation measures	15

7 FINANCIAL CASE

7.1 COSTS

7.1.1 As outlined in section 5.5.13, it may be appropriate for further consultation to be undertaken by CCBC to develop a consensus whether a scheme including control structures should be preferred as the solution for the Phase 2 section of frontage, prior to that phase being progressed through detailed design and construction.

7.1.2 For the purposes of this report, Option 3 (beach recharge without control structures) is identified as the preferred option based on it having the highest BCR value of all the options examined.

7.1.3 A breakdown of the whole life cash and present value (PV) costs associated with this option are identified in Table 15.

Table 15: Detailed Costs (£k) for Preferred Option (incl. Optimism Bias)

Element	Cash Cost	Economic PV Cost	Comments/Assumptions
PHASE 1 SCHEME COSTS TO DATE (COASTAL DEFENCE)			
All Costs	**21,200**	**21,200**	Outturn Costs
PHASE 2 SCHEME DEVELOPMENT AND DESIGN			
Future Staff Costs	75	70	
Consultant Fees	190	180	
Site Investigation / Surveys	110	105	
Public Engagement	50	48	
Other Costs	50	47	
Sub-Total	**475**	**450**	
PHASE 2 CONSTRUCTION			
Construction	13,475	12,565	
Supervision & Project Management	200	185	
Environmental Enhancement	0	0	
Sub-Total	**13,675**	**12,750**	
PHASE 3			
Design Fees	3,340	3,000	
Construction	33,925	30,550	
Sub-Total	**37,265**	**32,205**	
FUTURE COSTS			
Structure Maintenance	950	3,515	
Beach Management and Topping Up	14,500		
Sub-Total	**15,450**	**3,515**	
PROJECT TOTALS	**88,065**	**70,120**	

7.2 BENEFITS

7.2.1 The original PAR in 2010 demonstrated a benefit to cost ratio (BCR) of 6.97 with total estimated PV costs of £80.59m, PV benefits of £434m and a Net Present Value of £353m.

7.2.2 The updated PAR has demonstrated updated benefit cost figures, as detailed in Table 16, for the preferred option.

Table 16: Summary of Costs and Benefits (£m)

	PV costs	PV Benefits	NPV	BCR	Comments
Predicted Behaviour					
Best Case	70.12	465.09	394.97	6.6	Max future beach topping up frequency
Worst Case	81.68	465.09	383.40	5.7	Min future beach topping up frequency
Assuming Delayed Recession Behaviour (+10 Years)					
Best Case	70.12	342.68	272.56	4.9	Max future beach topping up frequency
Worst Case	81.68	342.68	261.00	4.2	Min future beach topping up frequency

7.3 FUNDING / ASSESSMENT OF AFFORDABILITY

Welsh Government Funding

7.3.1 This document forms the basis for application for funding of 100% of the future scheme design and development costs and 75% of the future scheme construction costs under the WG Coastal Risk Management Programme 2016-22.

Local Funding

7.3.2 CCBC have approval to finance their 25% allocation of the overall project budget from internal Council resources and external partners.

7.3.3 Internally, using CCBC's Business Planning Frame work, the Head of Service would submit a request for revenue expenditure for consideration by the Cabinet emphasising the fact that the proposed project would help achieve the prioritised actions of CCBC's Corporate Plan and reduce risks identified in the Authorities Risk register. As the indicated construction cost of the remaining phases of the project option is over £40m, this contribution would be over £10m and such funding is unlikely to be available from Authority sources alone. As such, other sources of funding will be sought in parallel, including:

- The CCBC Community Development Service will investigate the possibility of securing external funding through relevant grant aided schemes such as the HLF Landscape Partnership, Wales – People and Places or from EU funding streams; and.

- In addition to the above, utility providers, Network Rail, WG Highways have assets offered protection by the proposed scheme and will be approached to contribute to the project budget.

7.3.4 Following feedback from Welsh Government, the securing of funds will be sought from the sources detailed above during the project consultation phase. The annualised funding needs are indicated in Table 17.

Table 17: Annualised Funding Needs (£k)						
	Yr 0 2017-18	Yr 1 2018-19	Yr 2 2019-20	Yr 3 2020-21	Yr 4+ 2021+	Total
Scheme Design and Development						
Welsh Government	-	450	750			1,200
CCBC and others	-	150	250			400
Construction						
Welsh Government	-		9,900	25,100	1,240	36,240
CCBC and others	-		3,300	8,370	410	12,080

7.4 ASSUMPTIONS

7.4.1 Local authorities such as CCBC are permitted to fully recover VAT incurred where this is in connection with their non-business activities such as coastal protection.

7.4.2 The economic case presented excludes VAT.

7.4.3 The contributions from 'others' is to be confirmed by CCBC during the design and approvals phases. It is assumed that all costs associated with the future maintenance of the scheme, apart from capital maintenance will be funded by local funding streams.

7.4.4 It is assumed that capital maintenance (i.e. topping of the beach recharge) will be funded by Welsh Government.

8 MANAGEMENT CASE

8.1 PROJECT MANAGEMENT

8.1.1 This section explains how CCBC will manage the procurement and delivery of the project including the detailed design, construction, wider benefits, public engagement and the approach to risk management up to and after the completion of the works.

Project structure and governance

8.1.2 Building on the experience gained in the delivery of the first phase of the Colwyn Bay Waterfront project, the FRI team will manage and deliver this project on behalf of CCBC.

8.1.3 The Project Director shall appoint the Project Manager for the proposed scheme who is responsible for day-to-day development of the project and co-ordinates the actions of the Project Team and external consultants.

8.1.4 The Project Manager is responsible for regular communication with the Project Director who in turn reports to the Councils Scrutiny Committee and ultimately the Council Cabinet.

8.1.5 The Project Manager shall be assisted by Officers from various services from Conwy County Borough Council that are affected by the proposed works (ref Table 18).

8.1.6 The Project Team reports to and is coordinated by the Project Manager and is responsible for undertaking any activities which may be necessary to advance the project and for providing feedback to the Project Manager on the effect of any proposals on Officers individual services. As required, members of the Project Team will assist with management of externally appointed consultants and contractors undertaking works relevant to their service.

Table 18: Project Staff

Role / Responsibility	Name
Project Director	Dyfed Rowlands
Project Manager	Owen Conry
Designer	TBC
Waterfront Construction Project Manager	Benjamin Poulton
Council Ecologist	Barbara Owsianka
Council Environmental Officer	Simon Cottrill
Project Liaison Officer	TBC

Project plan

8.1.7 The future phases of the Colwyn Bay Waterfront Project shall be delivered by the FRI team for CCBC using the funding provided by the WG and any external sources that may contribute.

8.1.8 The detailed design shall be carried out by an external Consultant – after competitive tendering and the FRI team will prepare the tender documentation for the construction contract. The detailed design and project approvals for Phase 2 would take place in the 2018/19 financial year with construction following on in 2019/20 financial year. Phase 3 design and approvals would be spread over years 2018/19 and 2019/20, with construction in 2020/21.

8.1.9 The FRI team will be guided by CCBC's Programme & Project Management Framework and the CAMMS Integrated Project Manager software to deliver this project with the aim of reducing risk and supporting the delivery of the Corporate and Service outcomes.

8.1.10 Key dates, activities and project milestones are identified in Table 19 below.

Table 19: Key Project Activities and Milestones		
Activity	**Date (dd/mm/yy)**	**Comment**
Submission of updated Business Case to WG	15/05/18	
Feedback from WG	30/06/18	
PHASE 2		
Tender and Appointment of Design Consultant	31/08/18	
Receipt of detailed design	31/12/18	
Planning permission granted	31/03/19	
Obtain other permits and approvals	31/03/19	
Tender for Contractor for works	01/04/19	
Appointment of Contractor for works	01/06/19	
PHASE 3		
Tender and Appointment of Design Consultant	31/03/19	
Receipt of detailed design	31/12/19	
Planning permission granted	31/01/20	
Obtain permits and approvals	31/01/20	
Tender for Contractor for works	01/02/20	
Appointment of Contractor for works	01/04/20	

8.2 COMMUNICATIONS AND STAKEHOLDER ENGAGEMENT

8.2.1 A key focus of the next stage, is to confirm the preferred selected option through Local Authority review and stakeholder engagement, if necessary. As such, following feedback from WG and at the outset of the design stage, a communications and engagement plan shall be devised. This shall include a stakeholder register which will be assembled for the project identifying all affected parties including statutory bodies, land owners, Town Council, County Councillors, residents, businesses, utility providers (e.g. DCWW, SP Energy) and infrastructure managers (e.g. Network Rail). This register, maintained by the Project Liaison Officer, will be used to track communications and record feedback.

8.2.2 CCBC will explain the options for Phase 2 at Colwyn Bay to the local community by means of an open day or public meeting. This has worked successfully in the past at the Waterfront project outset and on other projects in the area e.g. Llandudno and CCBC is well placed/experienced to undertake this process.

8.2.3 CCBC will contact the Community Council and explain the proposed works and aim to take on board their comments/concerns where possible. Local County Councillors and residents will also be consulted and the FRI team has recent relevant experience in dealing with the local community on sensitive projects such as North Shore, Llandudno and Conwy Bridge.

8.2.4 Building on the stakeholder engagement which has already taken place, the Project Liaison Officer will consult with all the relevant statutory bodies affected by the proposed schemes including the NRW, Crown Estate, Highways Department, land owners, residents and Community Council.

8.2.5 Once a Contractor for the works has been appointed and the project goes to site, the FRI team will produce a bi-weekly newsletter which shall be emailed to local stakeholders and posted on public notice boards around the works area.

8.2.6 All relevant utility providers will be contacted during the design stage to ensure that the proposed works will not have an impact on their assets and that the necessary health and safety measures are accommodated during the construction period.

8.2.7 All public communications will be in Welsh and English in line with the Local Authorities bilingual policy.

8.3 BENEFITS REALISATION AND POST PROJECT EVALUATION

8.3.1 The key long-term benefit of this scheme from a coastal defence perspective is to reduce the risk of failure of the existing sea walls that would lead to recession of the shoreline and damage/loss of infrastructure and properties. The scheme provides wider benefits of improved amenity that is linked to wider regeneration of Colwyn Bay as a whole.

8.3.2 Future management arrangements will be put in place to ensure that the project delivers its anticipated benefit. This can be done by incorporating the asset into CCBC's Infonet data base where coastal assets are inspected every year with the more critical locations reviewed every 3 months. Defects which have been identified can be addressed as part of the coastal term maintenance contract.

8.3.3 In addition, on-going beach management of the beach forms an integral party of the scheme performance and annual monitoring forms part of the Authorities beach management plan for the frontage. This document guides the Authority's management actions relating to the beach as both a coastal defence and an amenity. It was originally produced following the Phase 1b works, reviewed and updated after completion of Phase 1c and will be reviewed and updated following completion of the Phase 2 works and regularly thereafter.

8.3.4 The FRI team are responsible for this inspection regime and are well placed to carry out post project evaluation to ensure that the benefits identified in the economic case have been realised on site with the project delivery. It is anticipated that a benefits realisation strategy could be put in place for tracking purposes.

8.4 RISK MANAGEMENT

8.4.1 CCBC will aim to identify, assess and control the risks that arise during the delivery of the project and use the CAMMS project management tools to this end.

8.4.2 CCBC will put in place a Risk Management Strategy to identify and record risks in advance of materialisation and provide appropriate mitigation measures where needed.

8.4.3 Where possible risks shall be mitigated through early consultation, considered contractual drafting including detailed works/site information, possible use of non-traditional construction methods such as pre-cast concrete and commencing works in a favourable time of the year i.e. spring through to autumn.

8.4.4 The results of the risk analysis are presented in Appendix C. A high level risk schedule and mitigation of those risk were mitigation actions are specifically required is provided in Table 20 below for the design stages of the project.

Table 20: High Level Risk Schedule

Key Project Risk	Risk Grade	Owner	Mitigation Measure

	(A-C)		
Procurement Risks			
Delay in Programme	C	Client	Ensure on-going liaison with all parties and early identification of matters that could increase risk
Project Specific Risks			
Delay/Refusal of approval for future funding from WG	C	Client	Ensure that WG kept fully informed of progress. Need for early funding decision.
Potential for further coastal erosion/ reduction in beach levels and damage to seawall/ promenade before further phases of the works begin	B	Client	The funding will need to be approved as soon as possible to minimise losses from completed phases and prevent further damage to currently unprotected lengths. Carry out beach management and structure maintenance in interim to reduce risk
Potential for further coastal erosion/ reduction in beach levels and damage to seawall/ promenade during the works	C	Contractor	This risk can be mitigated by working practices and onsite sequencing. If the works can be carried out by summer/early autumn, then the likelihood of erosion is reduced compared to the work being undertaken in autumn/winter
Client Specific Risks			
Balance of funding not available from CCBC and external partners	B	Client	Ensure appropriate communication between CCBC departments and that Council members are fully briefed regarding funding requirements. Continued urgent liaison with external partners to obtain contributions.
Refusal of Planning Consent	C	Client	Ensure robust case for implementation of proposals is made
Stakeholder objections	C	Client	Early and robust stakeholder engagement

Recommended actions for grades of risk

Grade	Risk mitigation actions
A	Mitigation actions, to reduce the likelihood and consequences, to be identified and implemented as soon as the project commences as a priority.
B	Mitigation actions, to reduce the likelihood and s consequences, to be identified and appropriate actions implemented during project execution.
C	Mitigation actions, to reduce the likelihood and consequences, to be identified and costed, if appropriate, for possible action if required.

Change Management

8.4.5 Any changes proposed / required to the project shall be treated through the project's hierarchical structure. The instigator of the change shall discuss the requirements with the Project Manager in the first instance and the details of the change recorded.

8.4.6 The details shall include the nature of the change, the extent of the change, the reason for the change, the implications of not making the change and any other consequences of making the change (e.g. any effect on Project Risks).

8.4.7 Once finalised the change shall be requested through the Project Director who shall consider the change request and liaise as necessary with the Project Manager.

8.5 CONTRACT MANAGEMENT

8.5.1 The FRI team will manage this project on behalf of CCBC and a Project Manager with relevant experience will be appointed to implement the scheme from initial detailed design through to tendering, construction and completion. The Project Manager will report to the Project Director who sits on the Local Authorities SLT.

8.5.2 The NEC suite of contracts shall be used to procure Professional Services and Construction works with the aim of working "in the spirit of mutual trust and Co-operation."

8.5.3 The Project Manager shall be proactive and actively support the use of early warnings, risk reduction meetings, implementation of the contract.

8.6 ASSURANCE

Welsh Government

8.6.1 Welsh Government reviews of the project will be conducted at key decision points for approval of further funding. These will be:

- Progress to Detailed Design;
- Progress from Detailed Design to Construction.

Local Authority

8.6.2 During the review and update of the economic case for the Waterfront Project CCBC has been, and continues to be, fully involved providing ongoing feedback to the Consultant through site meetings, internal review, teleconferences and email correspondence. This has ensured that the proposals remain fully aligned with CCBC's goals and objectives. This approach and engagement will continue through to the subsequent stages of detailed design and construction.

8.6.3 The CCBC project manager will be responsible for progressing the scheme and ensuring the approved programme is met through the project board meetings. During the construction phase, the Construction Supervisor will ensure that the works are carried out in accordance to the works information and specification with site visits recorded.

8.7 POST PROJECT EVALUATION

8.7.1 Once the construction project has been completed the coastal defence arrangements will be entered into CCBC's Coast Inspection Area defence length register which will be monitored on an ongoing basis by the FRI team as part of the routine inspection regime.

8.7.2 The post project evaluation shall be carried out initially by the PM and in the long term by the Flood Risk and Infrastructure Manager who will confirm that the benefits identified in

the economic case have been realised and that the project has delivered on its objectives. This will feed into the Lessons Learnt Vault hosted by CCBC.

8.8 CONTINGENCY PLANS

8.8.1 CCBC has established emergency plans, including the monitoring of Colwyn Bay promenade frontages and breakwaters during stormy weather.

8.8.2 Annual monitoring and on-going maintenance activities will continue if the required outputs of this project are not achieved.

9 REFERENCES

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FIGURES

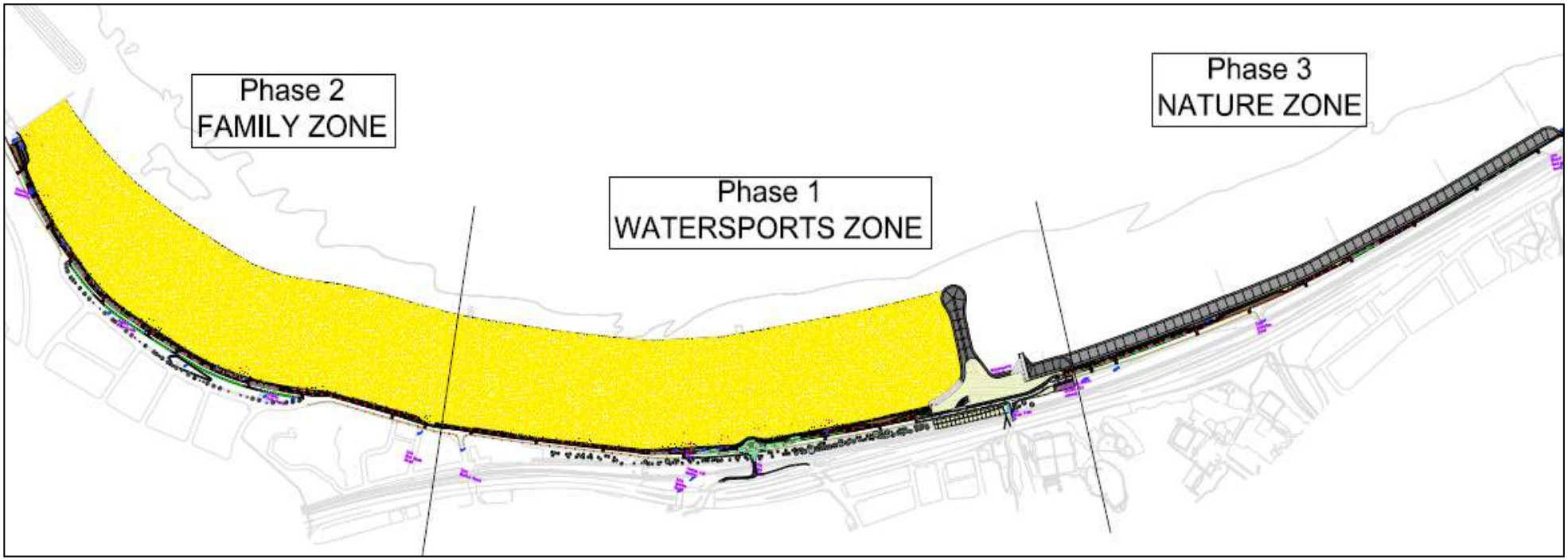


Figure 1: Colwyn Bay Waterfront Project Phasing

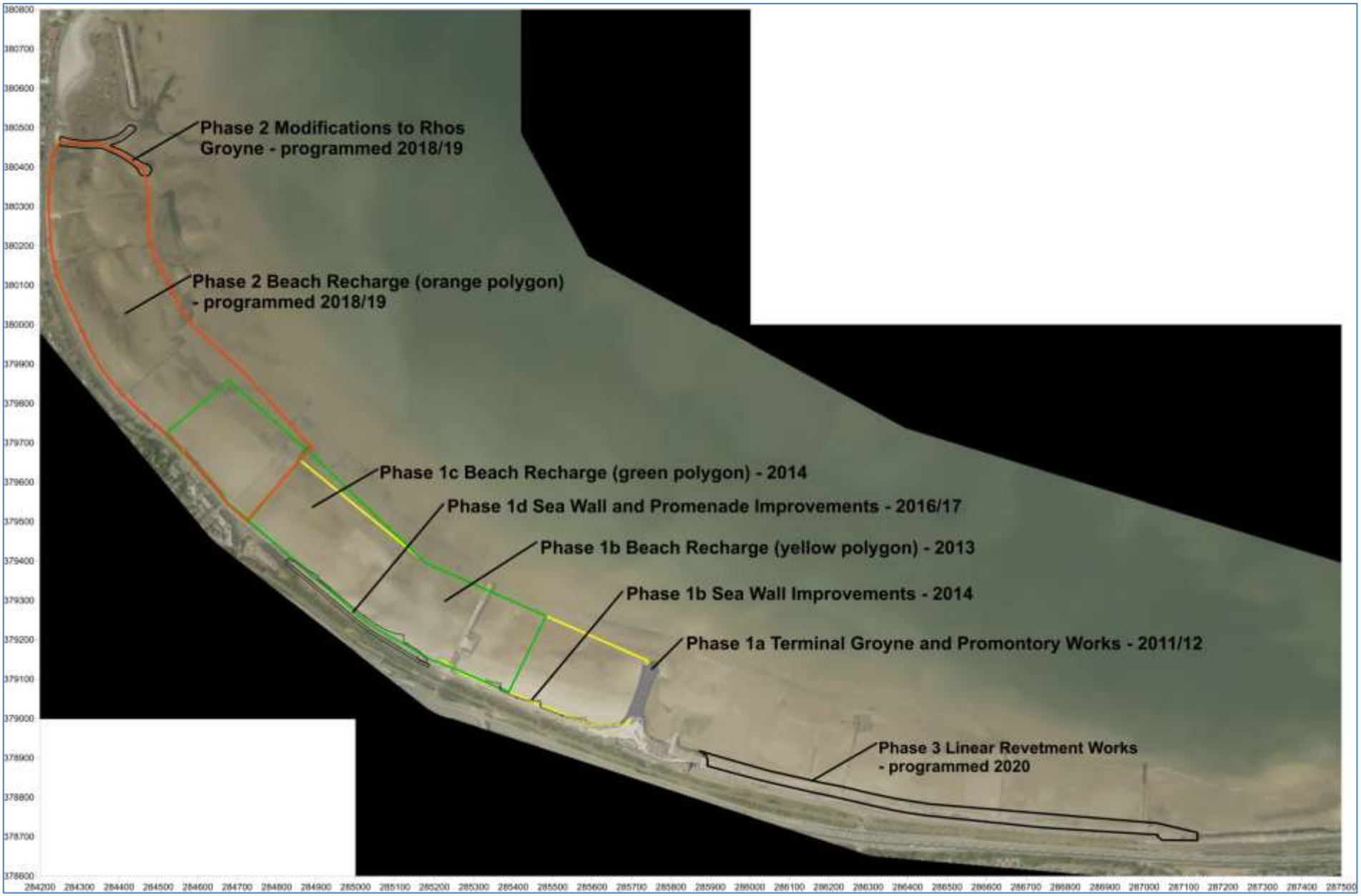


Figure 2: Colwyn Bay Waterfront Project - Elements completed to date and programmed

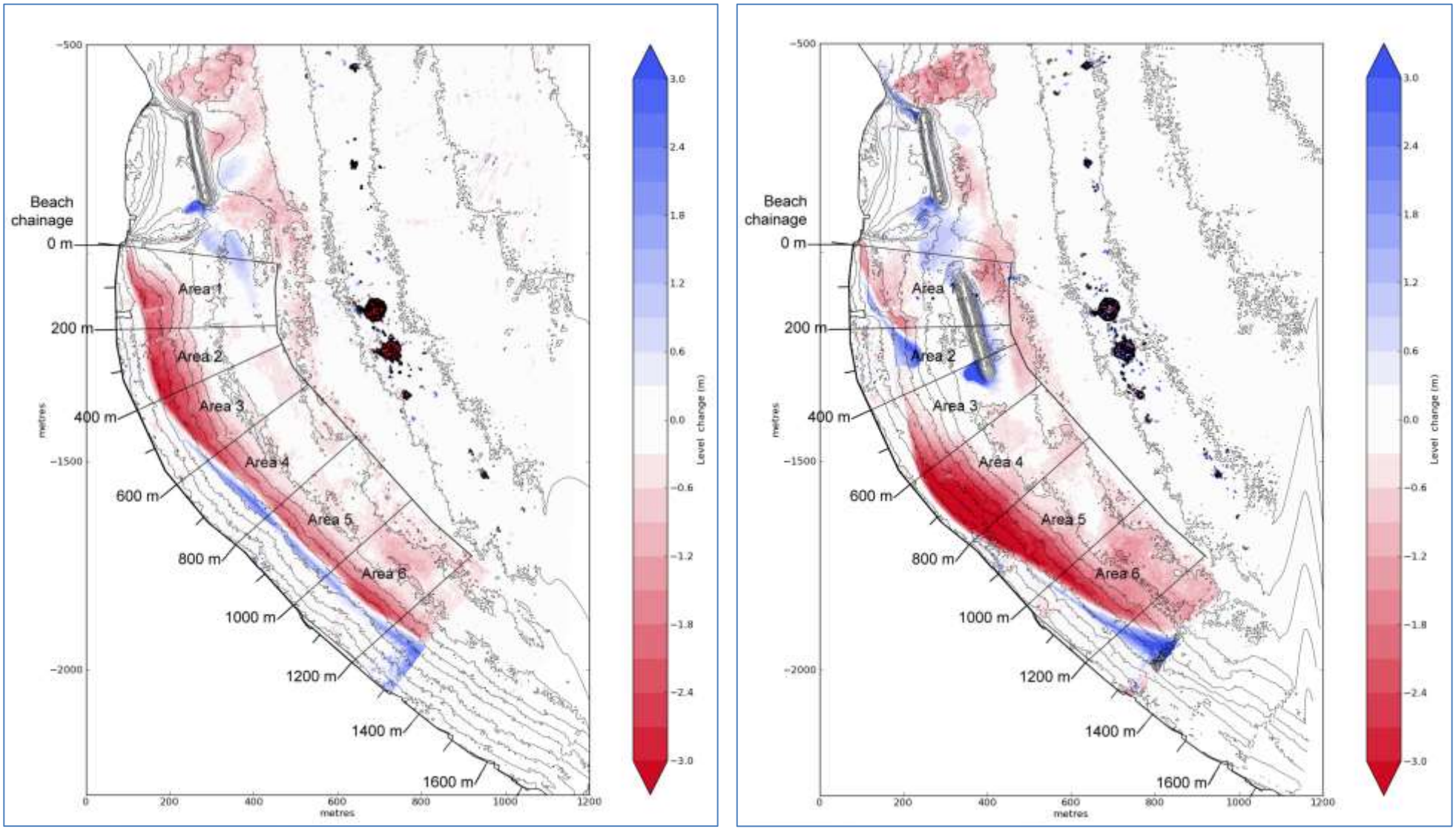


Figure 3: Erosion (red) and Accretion (blue) patterns predicted by physical model for beach recharge only option (left) and single offshore breakwater option (right)

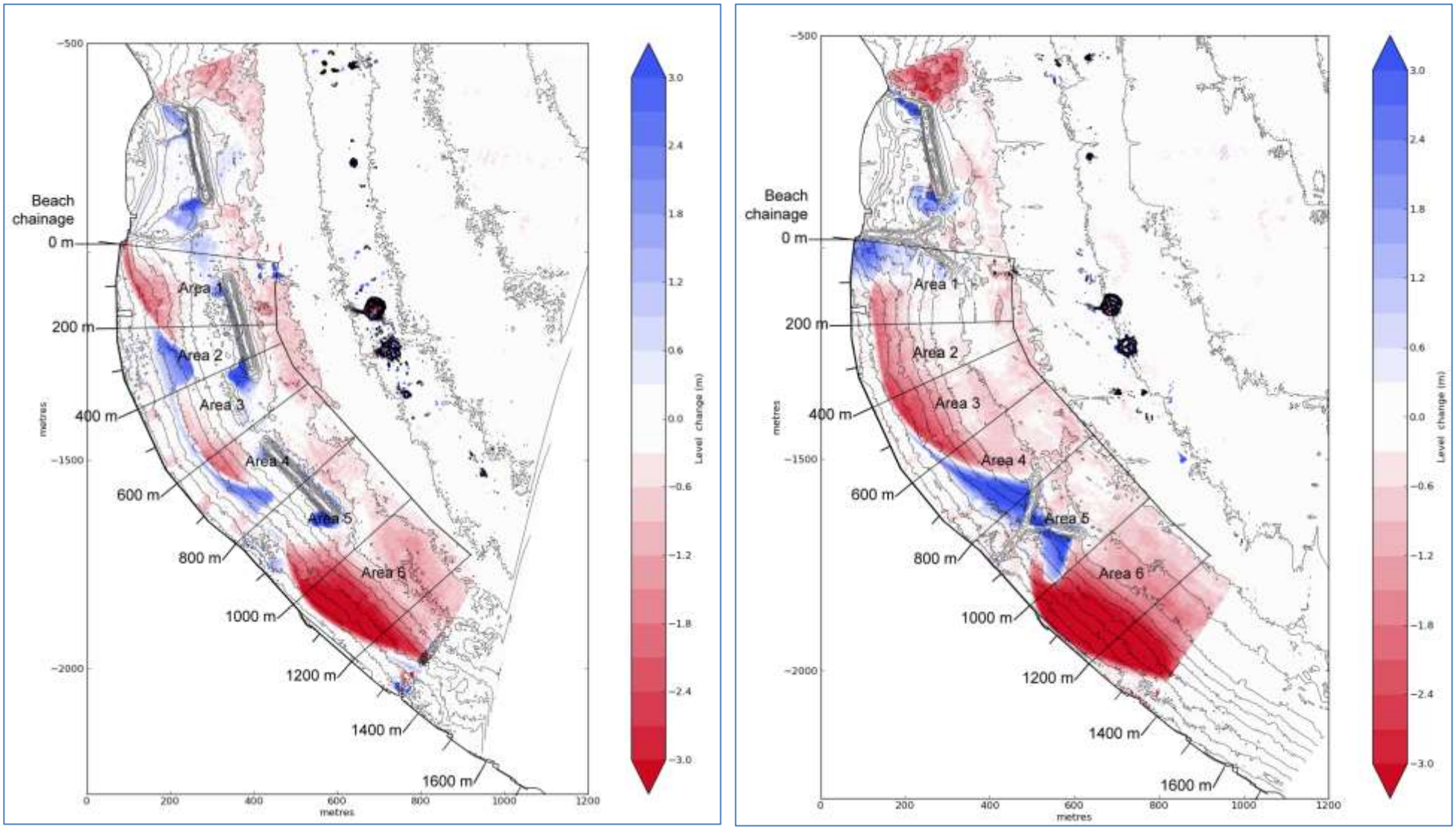


Figure 4: Erosion (red) and Accretion (blue) patterns predicted by physical model for twin offshore breakwater option (left) and shore connected groynes option (right)

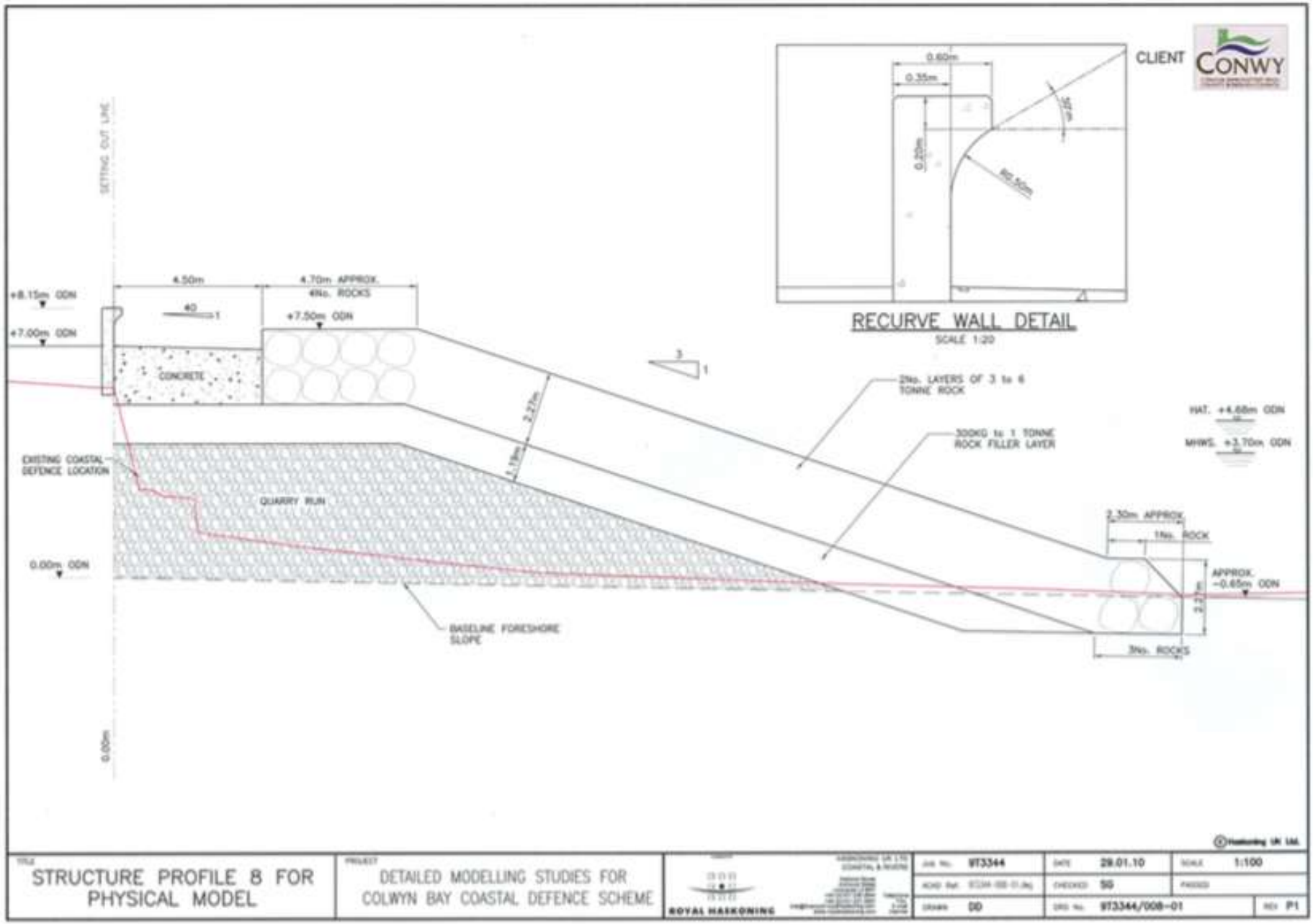


Figure 5: Typical Phase 3 Cross Section

Figure 6: Option 4a: Proposed Control Structure Layout

Figure 7: Option 4b: Proposed Control Structure Layout

Figure 8: Option 4c: Proposed Control Structure Layout

10 APPENDICES

10.1 APPENDIX A: ENVIRONMENTAL REVIEW REPORT

10.1.1 See separate pdf file ref Colwyn Bay Phase 2_Environmental Review and Update Report_YGC_Final.pdf

10.2 APPENDIX B: ECONOMIC ASSESSMENT – SUPPORTING SPREADSHEETS

Colwyn Bay Waterfront - Phase 2 / Phase 3 PAR Update Estimate

Activity Schedule for the Whole of the Works

WBS	Activity Description			Phase 2	Phase 3
1	Preliminaries				
1.1	Supervision of the Works (Rev A)			£200,000	£300,000
1.2	Insurances for the Works			inc	
1.3	Temporary Accommodation			inc	
1.4	Security			inc	
1.5	Traffic Management (Rev A)			£30,000	£100,000
1.6	Services			inc	
1.7	Information Boards			inc	
1.8	Progress Photographs			inc	
Add	Overheads (@5%)	3	%	£333,967	£808,543
Add	Profit (@5%)	5	%	£556,612	£1,347,572
	Preliminaries for Whole of the Works: SUB-TOTAL			**£1,120,579**	**£2,556,115**

Activity Schedule for the Phase 2 Coastal Defence Works

WBS	Activity Description	Quantity	Rate	Sum	
17	**Site Clearance – Coastal Defence Works**				
17.1	General site clearance	1	5,000	£5,000	
17.2	Rock Groyne Removal	1	10,000.00	£10,000	
17.3	Armour Toe Removal	1	30,000.00	£30,000	
17.4	Ancillary Items Removal	1	10,000.00	£10,000	
18	**Terminal Groyne Modification – Coastal Defence Works**				
18.1	Excavation & Disposal	2,250	5.00	£11,250	
18.2	Geotextile	9,653	12.00	£115,841	
18.3	Armouring	28,331	100.00	£2,833,076	
21	**Highway Drainage Outfall Modifications – Coastal Defence Works**				
21.1	Gabions as per phase 1c	10	1,000	£10,000	
23	**Beach Recharge – Coastal Defence Works**				
23.1	Mobilisation and temporary works	1	1,500,000	£1,500,000	
23.2	Provide and place to place to profile imported sea dredged sand	470,000	11.76	£5,526,552	
24	**Beach Recharge – Coastal Defence Works**				
24.2	Windblown sand control fencing	685	100.00	£68,500	
	Contingency	0.10		£1,012,022	
	Phase 2 Coastal Defences: SUB-TOTAL			**£11,132,240**	

	Optional Offshore Breakwater – Coastal Defence Works	**Quant**	**Rate**	**Sum**	
	Excavation & Disposal	2,500	5.00	£12,500	
	Geotextile	12,580	12.00	£150,954	
	Armouring	58,134	100.00	£5,813,364	
	Contingency	0.15		£896,523	
				£6,873,341	

	Optional East Groyne – Coastal Defence Works	**Quant**	**Rate**	**Sum**	
	Excavation & Disposal	2,550	5.00	£12,750	
	Geotextile	11,019	12.00	£132,228	
	Armouring	31,604	100.00	£3,160,370	
	Contingency	0.15		£495,802	
				£3,801,149	

	Phase 3 Rock Revetment – Coastal Defence Works	**Quant**	**Rate**	**Sum**	
	Length	**1200**			
	Armour Depth	**3.2**			
	Excavation & Disposal	10,343	5.00	£51,713	
	Geotextile	29,363	12.00	£352,350	
	Armouring	113,760	100.00	£11,376,000	
	RevetmentFill	37,678	50.00	£1,883,895	
	Concrete Wall	1,200	1,500.00	£1,800,000	
	Concrete Walkway	2,700	200.00	£540,000	
	Dealing with DC Infrastructure	1	1,000,000.00	£1,000,000	
	Contingency	0.15		£2,550,594	
				£19,554,551	

	Phase 3 Rock Revetment – Promenade Works	**Quant**	**Rate**	**Sum**	
	Length	**1200**			
	Prom Rasing ex 2010 PAR	1,200	4,495.54	£5,394,646	
	Inflation	1	19.23	£1,037,432	
	Contingency	0.15		£964,812	Phase 3 Total Est Cost
				£7,396,890	**£29,507,555**

Erosion Loss Calculation Sheet with delay options

Sheet Nr.

Client/Authority						
Conwy County Borough Council						
Project name		**Option:**		**Delay (yrs)**	Prepared (date)	01/02/2018
Colwyn Bay Waterfront PAR Update		Option 1		10	Printed	13/02/2018
Project reference	-	Option 2		100	Prepared by	AJW
Base date for estimates (year 0)	Q4 2017	Option 3		100	Checked by	CEUK
Scaling factor (e.g. £m, £k, £)	£k	Option 4a, 4b & 4c		100	Checked date	43143
Discount rate	3.5%					

Ref		Asset Description	Type	Risk free market value (£)	Year when the asset is expected to be lost	Prob of loss in year	Expected value of asset losses £k				
							Do-nothing	Do-Nothing Delayed	Rock Revetment Phases 1, 2 and 3	Beach Recharge Phases 1 and 2, Rock Revetment Phase 3	Beach Recharge Phase 1, Beach Recharge & Single Offshore Control Structures Phase 2, Rock Revetment Phase 3
1		Westbury Flats 1-18	Flat	3,420.00	3	0.1	308.46	218.68	17.81	17.81	17.81
2		Westbury Flats 1-18	Flat	3,420.00	5	0.8	2,303.64	1,633.09	142.51	142.51	142.51
3		Westbury Flats 1-18	Flat	3,420.00	7	0.1	268.81	190.56	17.81	17.81	17.81
4		Seagulls	Det	460.00	3	0.1	41.49	29.41	2.40	2.40	2.40
5		Seagulls	Det	460.00	5	0.8	309.85	219.66	19.17	19.17	19.17
6		Seagulls	Det	460.00	7	0.1	36.16	25.63	2.40	2.40	2.40
7		Newstead	Semi	440.00	3	0.1	39.69	28.13	2.29	2.29	2.29
8		Newstead	Semi	440.00	5	0.8	296.37	210.11	18.34	18.34	18.34
9		Newstead	Semi	440.00	7	0.1	34.58	24.52	2.29	2.29	2.29
10		Sandside	Semi	280.00	3	0.1	25.25	17.90	1.46	1.46	1.46
11		Sandside	Semi	280.00	5	0.8	188.60	133.70	11.67	11.67	11.67
12		Sandside	Semi	280.00	7	0.1	22.01	15.60	1.46	1.46	1.46
13		Sea Crest Flats 1-5	Flat	450.00	3	0.1	40.59	28.77	2.34	2.34	2.34
14		Sea Crest Flats 1-5	Flat	450.00	5	0.8	303.11	214.88	18.75	18.75	18.75
15		Sea Crest Flats 1-5	Flat	450.00	7	0.1	35.37	25.07	2.34	2.34	2.34
16		Stafford House Flats 1-10	Flat	1,350.00	3	0.1	121.76	86.32	7.03	7.03	7.03
17		Stafford House Flats 1-10	Flat	1,350.00	5	0.8	909.33	644.64	56.26	56.26	56.26
18		Stafford House Flats 1-10	Flat	1,350.00	7	0.1	106.11	75.22	7.03	7.03	7.03
19		12 Penrhos Road	Det	300.00	80	0.8	19.99	15.61	12.50	12.50	12.50
20		12 Penrhos Road	Det	300.00	85	0.1	2.21	1.72	1.56	1.56	1.56
21		12 Penrhos Road	Det	300.00	90	0.1	1.95	1.56	1.56	1.56	1.56
22		Ocean View Flats 1-18	Flat	10,250.00	3	0.1	924.49	655.39	53.39	53.39	53.39
23		Ocean View Flats 1-18	Flat	10,250.00	5	0.8	6,904.18	4,894.50	427.13	427.13	427.13
24		Ocean View Flats 1-18	Flat	10,250.00	7	0.1	805.64	571.13	53.39	53.39	53.39
25		Continental Flats 1-10	Flat	1,020.00	3	0.1	92.00	65.22	5.31	5.31	5.31
26		Continental Flats 1-10	Flat	1,020.00	5	0.8	687.05	487.06	42.50	42.50	42.50
27		Continental Flats 1-10	Flat	1,020.00	7	0.1	80.17	56.83	5.31	5.31	5.31
28		8 Seabank Rd	Det	225.00	60	0.8	26.42	19.66	9.38	9.38	9.38
29		8 Seabank Rd	Det	225.00	65	0.1	2.85	2.12	1.17	1.17	1.17
30		8 Seabank Rd	Det	225.00	70	0.1	2.46	1.87	1.17	1.17	1.17
31		5 Seabank Rd	Det	210.00	60	0.8	24.66	18.35	8.75	8.75	8.75
32		5 Seabank Rd	Det	210.00	65	0.1	2.66	1.98	1.09	1.09	1.09
33		5 Seabank Rd	Det	210.00	70	0.1	2.29	1.75	1.09	1.09	1.09
34		The Majestic Flats 1-5	Flat	850.00	3	0.8	613.32	434.79	35.42	35.42	35.42
35		The Majestic Flats 1-5	Flat	850.00	5	0.1	71.57	50.74	4.43	4.43	4.43
36		The Majestic Flats 1-5	Flat	850.00	7	0.1	66.81	47.36	4.43	4.43	4.43
37		Balmoral Flats 1-15	Flat	3,525.00	3	0.1	317.93	225.39	18.36	18.36	18.36
38		Balmoral Flats 1-15	Flat	3,525.00	5	0.8	2,374.36	1,683.23	146.89	146.89	146.89
39		Balmoral Flats 1-15	Flat	3,525.00	7	0.1	277.06	196.41	18.36	18.36	18.36
40		Toad Hall PH	Com	655.48	3	0.8	472.96	335.29	27.31	27.31	27.31
41		Toad Hall PH	Com	655.48	5	0.1	55.19	39.12	3.41	3.41	3.41
42		Toad Hall PH	Com	655.48	7	0.1	51.52	36.52	3.41	3.41	3.41
43		The Waterfront Flats 1-24	Flat	5,405.00	3	0.1	487.50	345.60	28.15	28.15	28.15
44		The Waterfront Flats 1-24	Flat	5,405.00	5	0.8	3,640.69	2,580.96	225.23	225.23	225.23
45		The Waterfront Flats 1-24	Flat	5,405.00	7	0.1	424.83	301.17	28.15	28.15	28.15
46		Princess Court Flats 1-128	Flat	14,650.00	15	0.8	6,995.56	4,959.28	610.48	610.48	610.48
47		Princess Court Flats 1-128	Flat	14,650.00	20	0.1	736.26	521.95	76.31	76.31	76.31
48		Princess Court Flats 1-128	Flat	14,650.00	25	0.1	619.91	450.24	76.31	76.31	76.31
49		4 Seabank Rd	Det	170.00	70	0.8	14.85	11.32	7.08	7.08	7.08
50		4 Seabank Rd	Det	170.00	75	0.1	1.60	1.25	0.89	0.89	0.89
51		4 Seabank Rd	Det	170.00	80	0.1	1.42	1.11	0.89	0.89	0.89
52		6 Seabank Rd	Det	225.00	70	0.8	19.66	14.99	9.38	9.38	9.38
53		6 Seabank Rd	Det	225.00	75	0.1	2.12	1.66	1.17	1.17	1.17
54		6 Seabank Rd	Det	225.00	80	0.1	1.87	1.46	1.17	1.17	1.17
55		1 Seabank Rd	Semi	175.00	80	0.8	11.66	9.11	7.29	7.29	7.29
56		1 Seabank Rd	Semi	175.00	85	0.1	1.29	1.01	0.91	0.91	0.91
57		1 Seabank Rd	Semi	175.00	90	0.1	1.14	0.91	0.91	0.91	0.91
58		1a Seabank Rd	Semi	175.00	80	0.8	11.66	9.11	7.29	7.29	7.29
59		1a Seabank Rd	Semi	175.00	85	0.1	1.29	1.01	0.91	0.91	0.91
60		1a Seabank Rd	Semi	175.00	90	0.1	1.14	0.91	0.91	0.91	0.91
61		3 Seabank Rd Flats 1-6	Flat	720.00	70	0.8	62.91	47.96	30.00	30.00	30.00
62		3 Seabank Rd Flats 1-6	Flat	720.00	75	0.1	6.78	5.30	3.75	3.75	3.75
63		3 Seabank Rd Flats 1-6	Flat	720.00	80	0.1	6.00	4.68	3.75	3.75	3.75
Totals				134866.43			32321.05	22936.52	2341.66	2341.66	2341.66

Present Value Losses and Benefits
Original Assessment

Sheet Nr.

Client/Authority: Conwy County Borough Council
Project name: Colwyn Bay Waterfront PAR Update
Project reference
Base date for estimates (year 0): Q4 2017
Scaling factor (e.g. £m, £k, £): £k
Discount rate: 3.5% 3.0% 2.5%

Prepared (date) 01/02/2018
Printed 13/02/2018
Prepared by AJW
Checked by CEUK
Checked date 12/02/2018

Results £k

	Option 1	Option 2	Option 3	Option 4a, 4b and 4c
PV losses	420395	1895	-14711	-14711
PV benefits		418500	435106	435106

		Option 1								Option 2					Option 3					Option 4a, 4b and 4c				
		loss of A55 in year 55	loss of Prom in year 5	loss of Railway in year 10	Loss of services in year 5	Loss of Tourism	TOTALS	Tourism PV	PV	loss	loss	tourism loss	TOTALS	PV	loss	loss	tourism loss	TOTALS	PV	loss	loss	loss	TOTALS	PV
	cash sum	397963.307	249216.435	1330141.36	6906.50192	0	1984227.61	0.00	420395.26	0	0	6410.62753	6410.63	1895.47	0	0	-49753.277	-49753.28	-14710.89	0	0	-49753.277	-49753.28	-14710.89
year	Discount Factor																							
0	1.000		30.42			0.00	30.42	0.00	30.42			63.47	63.47	63.47			-492.61	-492.61	-492.61			-492.61	-492.61	-492.61
1	0.966		30.42			0.00	30.42	0.00	29.39			63.47	63.47	61.33			-492.61	-492.61	-475.95			-492.61	-492.61	-475.95
2	0.934		30.42			0.00	30.42	0.00	28.40			63.47	63.47	59.25			-492.61	-492.61	-459.85			-492.61	-492.61	-459.85
3	0.902		30.42			0.00	30.42	0.00	27.44			63.47	63.47	57.25			-492.61	-492.61	-444.30			-492.61	-492.61	-444.30
4	0.871		30.42			0.00	30.42	0.00	26.51			63.47	63.47	55.31			-492.61	-492.61	-429.28			-492.61	-492.61	-429.28
5	0.842		2594.42		6906.50	0.00	9500.92	0.00	7999.52			63.47	63.47	53.44			-492.61	-492.61	-414.76			-492.61	-492.61	-414.76
6	0.814		2594.42			0.00	2594.42	0.00	2110.56			63.47	63.47	51.63			-492.61	-492.61	-400.74			-492.61	-492.61	-400.74
7	0.786		2594.42			0.00	2594.42	0.00	2039.19			63.47	63.47	49.89			-492.61	-492.61	-387.18			-492.61	-492.61	-387.18
8	0.759		2594.42			0.00	2594.42	0.00	1970.23			63.47	63.47	48.20			-492.61	-492.61	-374.09			-492.61	-492.61	-374.09
9	0.734		2594.42			0.00	2594.42	0.00	1903.61			63.47	63.47	46.57			-492.61	-492.61	-361.44			-492.61	-492.61	-361.44
10	0.709		2594.42	14616.94		0.00	17211.36	0.00	12201.46			63.47	63.47	45.00			-492.61	-492.61	-349.22			-492.61	-492.61	-349.22
11	0.685		2594.42	14616.94		0.00	17211.36	0.00	11788.85			63.47	63.47	43.47			-492.61	-492.61	-337.41			-492.61	-492.61	-337.41
12	0.662		2594.42	14616.94		0.00	17211.36	0.00	11390.19			63.47	63.47	42.00			-492.61	-492.61	-326.00			-492.61	-492.61	-326.00
13	0.639		2594.42	14616.94		0.00	17211.36	0.00	11005.01			63.47	63.47	40.58			-492.61	-492.61	-314.97			-492.61	-492.61	-314.97
14	0.618		2594.42	14616.94		0.00	17211.36	0.00	10632.86			63.47	63.47	39.21			-492.61	-492.61	-304.32			-492.61	-492.61	-304.32
15	0.597		2594.42	14616.94		0.00	17211.36	0.00	10273.30			63.47	63.47	37.89			-492.61	-492.61	-294.03			-492.61	-492.61	-294.03
16	0.577		2594.42	14616.94		0.00	17211.36	0.00	9925.89			63.47	63.47	36.60			-492.61	-492.61	-284.09			-492.61	-492.61	-284.09
17	0.557		2594.42	14616.94		0.00	17211.36	0.00	9590.23			63.47	63.47	35.37			-492.61	-492.61	-274.48			-492.61	-492.61	-274.48
18	0.538		2594.42	14616.94		0.00	17211.36	0.00	9265.93			63.47	63.47	34.17			-492.61	-492.61	-265.20			-492.61	-492.61	-265.20
19	0.520		2594.42	14616.94		0.00	17211.36	0.00	8952.59			63.47	63.47	33.02			-492.61	-492.61	-256.23			-492.61	-492.61	-256.23
20	0.503		2594.42	14616.94		0.00	17211.36	0.00	8649.84			63.47	63.47	31.90			-492.61	-492.61	-247.57			-492.61	-492.61	-247.57
21	0.486		2594.42	14616.94		0.00	17211.36	0.00	8357.33			63.47	63.47	30.82			-492.61	-492.61	-239.20			-492.61	-492.61	-239.20
22	0.469		2594.42	14616.94		0.00	17211.36	0.00	8074.72			63.47	63.47	29.78			-492.61	-492.61	-231.11			-492.61	-492.61	-231.11
23	0.453		2594.42	14616.94		0.00	17211.36	0.00	7801.66			63.47	63.47	28.77			-492.61	-492.61	-223.29			-492.61	-492.61	-223.29
24	0.438		2594.42	14616.94		0.00	17211.36	0.00	7537.84			63.47	63.47	27.80			-492.61	-492.61	-215.74			-492.61	-492.61	-215.74
25	0.423		2594.42	14616.94		0.00	17211.36	0.00	7282.93			63.47	63.47	26.86			-492.61	-492.61	-208.45			-492.61	-492.61	-208.45
26	0.409		2594.42	14616.94		0.00	17211.36	0.00	7036.65			63.47	63.47	25.95			-492.61	-492.61	-201.40			-492.61	-492.61	-201.40
27	0.395		2594.42	14616.94		0.00	17211.36	0.00	6798.70			63.47	63.47	25.07			-492.61	-492.61	-194.59			-492.61	-492.61	-194.59
28	0.382		2594.42	14616.94		0.00	17211.36	0.00	6568.79			63.47	63.47	24.22			-492.61	-492.61	-188.01			-492.61	-492.61	-188.01
29	0.369		2594.42	14616.94		0.00	17211.36	0.00	6346.66			63.47	63.47	23.41			-492.61	-492.61	-181.65			-492.61	-492.61	-181.65
30	0.356		2594.42	14616.94		0.00	17211.36	0.00	6132.04			63.47	63.47	22.61			-492.61	-492.61	-175.51			-492.61	-492.61	-175.51
31	0.346		2594.42	14616.94		0.00	17211.36	0.00	5853.43			63.47	63.47	21.95			-492.61	-492.61	-170.39			-492.61	-492.61	-170.39
32	0.336		2594.42	14616.94		0.00	17211.36	0.00	5780.03			63.47	63.47	21.32			-492.61	-492.61	-165.43			-492.61	-492.61	-165.43
33	0.326		2594.42	14616.94		0.00	17211.36	0.00	5611.68			63.47	63.47	20.69			-492.61	-492.61	-160.61			-492.61	-492.61	-160.61
34	0.317		2594.42	14616.94		0.00	17211.36	0.00	5448.23			63.47	63.47	20.09			-492.61	-492.61	-155.93			-492.61	-492.61	-155.93
35	0.307		2594.42	14616.94		0.00	17211.36	0.00	5289.55			63.47	63.47	19.51			-492.61	-492.61	-151.39			-492.61	-492.61	-151.39
36	0.298		2594.42	14616.94		0.00	17211.36	0.00	5135.48			63.47	63.47	18.94			-492.61	-492.61	-146.98			-492.61	-492.61	-146.98
37	0.290		2594.42	14616.94		0.00	17211.36	0.00	4985.91			63.47	63.47	18.39			-492.61	-492.61	-142.70			-492.61	-492.61	-142.70
38	0.281		2594.42	14616.94		0.00	17211.36	0.00	4840.69			63.47	63.47	17.85			-492.61	-492.61	-138.55			-492.61	-492.61	-138.55
39	0.273		2594.42	14616.94		0.00	17211.36	0.00	4699.69			63.47	63.47	17.33			-492.61	-492.61	-134.51			-492.61	-492.61	-134.51
40	0.265		2594.42	14616.94		0.00	17211.36	0.00	4562.81			63.47	63.47	16.83			-492.61	-492.61	-130.59			-492.61	-492.61	-130.59
41	0.257		2594.42	14616.94		0.00	17211.36	0.00	4429.91			63.47	63.47	16.34			-492.61	-492.61	-126.79			-492.61	-492.61	-126.79
42	0.250		2594.42	14616.94		0.00	17211.36	0.00	4300.89			63.47	63.47	15.86			-492.61	-492.61	-123.10			-492.61	-492.61	-123.10
43	0.243		2594.42	14616.94		0.00	17211.36	0.00	4175.62			63.47	63.47	15.40			-492.61	-492.61	-119.51			-492.61	-492.61	-119.51
44	0.236		2594.42	14616.94		0.00	17211.36	0.00	4054.00			63.47	63.47	14.95			-492.61	-492.61	-116.03			-492.61	-492.61	-116.03
45	0.229		2594.42	14616.94		0.00	17211.36	0.00	3935.92			63.47	63.47	14.51			-492.61	-492.61	-112.65			-492.61	-492.61	-112.65
46	0.222		2594.42	14616.94		0.00	17211.36	0.00	3821.28			63.47	63.47	14.09			-492.61	-492.61	-109.37			-492.61	-492.61	-109.37
47	0.216		2594.42	14616.94		0.00	17211.36	0.00	3709.98			63.47	63.47	13.68			-492.61	-492.61	-106.18			-492.61	-492.61	-106.18
48	0.209		2594.42	14616.94		0.00	17211.36	0.00	3601.92			63.47	63.47	13.28			-492.61	-492.61	-103.09			-492.61	-492.61	-103.09
49	0.203		2594.42	14616.94		0.00	17211.36	0.00	3497.01			63.47	63.47	12.90			-492.61	-492.61	-100.09			-492.61	-492.61	-100.09
50	0.197		2594.42	14616.94		0.00	17211.36	0.00	3395.16			63.47	63.47	12.52			-492.61	-492.61	-97.17			-492.61	-492.61	-97.17
51	0.192		2594.42	14616.94		0.00	17211.36	0.00	3296.27			63.47	63.47	12.16			-492.61	-492.61	-94.34			-492.61	-492.61	-94.34
52	0.186		2594.42	14616.94		0.00	17211.36	0.00	3200.26			63.47	63.47	11.80			-492.61	-492.61	-91.59			-492.61	-492.61	-91.59
53	0.181		2594.42	14616.94		0.00	17211.36	0.00	3107.05			63.47	63.47	11.46			-492.61	-492.61	-88.93			-492.61	-492.61	-88.93
54	0.175		2594.42	14616.94		0.00	17211.36	0.00	3016.56			63.47	63.47	11.12			-492.61	-492.61	-86.34			-492.61	-492.61	-86.34
55	0.170	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	4400.82			63.47	63.47	10.80			-492.61	-492.61	-83.82			-492.61	-492.61	-83.82
56	0.165	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	4272.64			63.47	63.47	10.49			-492.61	-492.61	-81.38			-492.61	-492.61	-81.38
57	0.160	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	4148.19			63.47	63.47	10.18			-492.61	-492.61	-79.01			-492.61	-492.61	-79.01
58	0.156	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	4027.37			63.47	63.47	9.88			-492.61	-492.61	-76.71			-492.61	-492.61	-76.71
59	0.151	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3910.07			63.47	63.47	9.60			-492.61	-492.61	-74.47			-492.61	-492.61	-74.47
60	0.147	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3796.18			63.47	63.47	9.32			-492.61	-492.61	-72.31			-492.61	-492.61	-72.31
61	0.143	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3685.62			63.47	63.47	9.05			-492.61	-492.61	-70.20			-492.61	-492.61	-70.20
62	0.138	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3578.27			63.47	63.47	8.78			-492.61	-492.61	-68.16			-492.61	-492.61	-68.16
63	0.134	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3474.05			63.47	63.47	8.53			-492.61	-492.61	-66.17			-492.61	-492.61	-66.17
64	0.130	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3372.86			63.47	63.47	8.29			-492.61	-492.61	-64.24			-492.61	-492.61	-64.24
65	0.127	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3274.62			63.47	63.47	8.04			-492.61	-492.61	-62.37			-492.61	-492.61	-62.37
66	0.123	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3179.24			63.47	63.47	7.80			-492.61	-492.61	-60.55			-492.61	-492.61	-60.55
67	0.119	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3086.64			63.47	63.47	7.58			-492.61	-492.61	-58.79			-492.61	-492.61	-58.79
68	0.116	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2996.74			63.47	63.47	7.35			-492.61	-492.61	-57.08			-492.61	-492.61	-57.08
69	0.112	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2909.46			63.47	63.47	7.14			-492.61	-492.61	-55.42			-492.61	-492.61	-55.42
70	0.109	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2824.72			63.47	63.47	6.93			-492.61	-492.61	-53.80			-492.61	-492.61	-53.80
71	0.106	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2742.44			63.47	63.47	6.73			-492.61	-492.61	-52.24			-492.61	-492.61	-52.24
72	0.103	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2662.57			63.47	63.47	6.53			-492.61	-492.61	-50.71			-492.61	-492.61	-50.71
73	0.100	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2585.02			63.47	63.47	6.34			-492.61	-492.61	-49.24			-492.61	-492.61	-49.24
74	0.097	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2509.72			63.47	63.47	6.16			-492.61	-492.61	-47.80			-492.61	-492.61	-47.80
75	0.094	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2436.63			63.47	63.47	5.98			-492.61	-492.61	-46.41			-492.61	-492.61	-46.41
76	0.092	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2377.20			63.47	63.47	5.83			-492.61	-492.61	-45.28			-492.61	-492.61	-45.28
77	0.090	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2319.22			63.47	63.47	5.69			-492.61	-492.61	-44.17			-492.61	-492.61	-44.17
78	0.087	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2262.65			63.47	63.47	5.55			-492.61	-492.61	-43.10			-492.61	-492.61	-43.10
79	0.085	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2207.46			63.47	63.47	5.42			-492.61	-492.61	-42.05			-492.61	-492.61	-42.05
80	0.083	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2153.62			63.47	63.47	5.29			-492.61	-492.61	-41.02			-492.61	-492.61	-41.02
81	0.081	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2101.09			63.47	63.47	5.16			-492.61	-492.61	-40.02			-492.61	-492.61	-40.02
82	0.079	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2049.85			63.47	63.47	5.03			-492.61	-492.61	-39.04			-492.61	-492.61	-39.04
83	0.077	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1999.85			63.47	63.47	4.91			-492.61	-492.61	-38.09			-492.61	-492.61	-38.09
84	0.075	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1951.08			63.47	63.47	4.79			-492.61	-492.61	-37.16			-492.61	-492.61	-37.16
85	0.074	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1903.49			63.47	63.47	4.67			-492.61	-492.61	-36.26			-492.61	-492.61	-36.26
86	0.072	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1857.06			63.47	63.47	4.56			-492.61	-492.61	-35.37			-492.61	-492.61	-35.37
87	0.070	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1811.77			63.47	63.47	4.45			-492.61	-492.61	-34.51			-492.61	-492.61	-34.51
88	0.068	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1767.58			63.47	63.47	4.34			-492.61	-492.61	-33.67			-492.61	-492.61	-33.67
89	0.067	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1724.47			63.47	63.47	4.23			-492.61	-492.61	-32.85			-492.61	-492.61	-32.85
90	0.065	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1682.41			63.47	63.47	4.13			-492.61	-492.61	-32.04			-492.61	-492.61	-32.04
91	0.063	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1641.37			63.47	63.47	4.03			-492.61	-492.61	-31.26			-492.61	-492.61	-31.26
92	0.062	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1601.34			63.47	63.47	3.93			-492.61	-492.61	-30.50			-492.61	-492.61	-30.50
93	0.060	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1562.28			63.47	63.47	3.83			-492.61	-492.61	-29.76			-492.61	-492.61	-29.76
94	0.059	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1524.18			63.47	63.47	3.74			-492.61	-492.61	-29.03			-492.61	-492.61	-29.03
95	0.057	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1487.00			63.47	63.47	3.65			-492.61	-492.61	-28.32			-492.61	-492.61	-28.32
96	0.056	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1450.73			63.47	63.47	3.56			-492.61	-492.61	-27.63			-492.61	-492.61	-27.63
97	0.055	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1415.35			63.47	63.47	3.47			-492.61	-492.61	-26.96			-492.61	-492.61	-26.96
98	0.053	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1380.83			63.47	63.47	3.39			-492.61	-492.61	-26.30			-492.61	-492.61	-26.30
99	0.052	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1347.15			63.47	63.47	3.31			-492.61	-492.61	-25.66			-492.61	-492.61	-25.66
100	0.051	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1314.29			63.47	63.47	3.23			-492.61	-492.61	-25.03			-492.61	-492.61	-25.03

Present Value Losses and Benefits
Delayed Erosion Assessment

Sheet Nr.

Client/Authority: Conwy County Borough Council
Project name: Colwyn Bay Waterfront PAR Update
Project reference
Base date for estimates (year 0): Q4 2017
Scaling factor (e.g. £m, £k, £): £k
Discount rate: 3.5% 3.0% 2.5%

Prepared (date) 01/02/2018
Printed 13/02/2018
Prepared by AJW
Checked by CEUK
Checked date 12/02/2018

Results £k

	Option 1	Option 2	Option 3	Option 4a, 4b and 4c
PV losses	297991	1895	-14711	-14711
PV benefits		296096	312702	312702

		Option 1								Option 2					Option 3					Option 4a, 4b and 4c					
		loss of A55 in year 55	loss of Prom in year 5	loss of Railway in year 10	Loss of services in year 5	Loss of Tourism	TOTALS	Tourism PV	PV	loss	loss	tourism loss	TOTALS	PV	loss	loss	tourism loss	TOTALS	PV	loss	loss	loss	TOTALS	PV
	cash sum	311449.545	223576.465	1183971.98	6906.50192	0	1725904.49	0.00	297991.19	0	0	6410.62753	6410.63	1895.47	0	0	-49753.277	-49753.28	-14710.89	0	0	-49753.277	-49753.28	-14710.89
year	Discount Factor																							
0	1.000		30.42			0.00	30.42	0.00	30.42			63.47	63.47	63.47			-492.61	-492.61	-492.61			-492.61	-492.61	-492.61
1	0.966		30.42			0.00	30.42	0.00	29.39			63.47	63.47	61.33			-492.61	-492.61	-475.95			-492.61	-492.61	-475.95
2	0.934		30.42			0.00	30.42	0.00	28.40			63.47	63.47	59.25			-492.61	-492.61	-459.85			-492.61	-492.61	-459.85
3	0.902		30.42			0.00	30.42	0.00	27.44			63.47	63.47	57.25			-492.61	-492.61	-444.30			-492.61	-492.61	-444.30
4	0.871		30.42			0.00	30.42	0.00	26.51			63.47	63.47	55.31			-492.61	-492.61	-429.28			-492.61	-492.61	-429.28
5	0.842		30.42			0.00	30.42	0.00	25.62			63.47	63.47	53.44			-492.61	-492.61	-414.76			-492.61	-492.61	-414.76
6	0.814		30.42			0.00	30.42	0.00	24.75			63.47	63.47	51.63			-492.61	-492.61	-400.74			-492.61	-492.61	-400.74
7	0.786		30.42			0.00	30.42	0.00	23.91			63.47	63.47	49.89			-492.61	-492.61	-387.18			-492.61	-492.61	-387.18
8	0.759		30.42			0.00	30.42	0.00	23.10			63.47	63.47	48.20			-492.61	-492.61	-374.09			-492.61	-492.61	-374.09
9	0.734		30.42			0.00	30.42	0.00	22.32			63.47	63.47	46.57			-492.61	-492.61	-361.44			-492.61	-492.61	-361.44
10	0.709		30.42			0.00	30.42	0.00	21.57			63.47	63.47	45.00			-492.61	-492.61	-349.22			-492.61	-492.61	-349.22
11	0.685		30.42			0.00	30.42	0.00	20.84			63.47	63.47	43.47			-492.61	-492.61	-337.41			-492.61	-492.61	-337.41
12	0.662		30.42			0.00	30.42	0.00	20.13			63.47	63.47	42.00			-492.61	-492.61	-326.00			-492.61	-492.61	-326.00
13	0.639		30.42			0.00	30.42	0.00	19.45			63.47	63.47	40.58			-492.61	-492.61	-314.97			-492.61	-492.61	-314.97
14	0.618		30.42			0.00	30.42	0.00	18.79			63.47	63.47	39.21			-492.61	-492.61	-304.32			-492.61	-492.61	-304.32
15	0.597		2594.42		6906.50	0.00	9500.92	0.00	5671.01			63.47	63.47	37.89			-492.61	-492.61	-294.03			-492.61	-492.61	-294.03
16	0.577		2594.42			0.00	2594.42	0.00	1496.22			63.47	63.47	36.60			-492.61	-492.61	-284.09			-492.61	-492.61	-284.09
17	0.557		2594.42			0.00	2594.42	0.00	1445.62			63.47	63.47	35.37			-492.61	-492.61	-274.48			-492.61	-492.61	-274.48
18	0.538		2594.42			0.00	2594.42	0.00	1396.73			63.47	63.47	34.17			-492.61	-492.61	-265.20			-492.61	-492.61	-265.20
19	0.520		2594.42			0.00	2594.42	0.00	1349.50			63.47	63.47	33.02			-492.61	-492.61	-256.23			-492.61	-492.61	-256.23
20	0.503		2594.42	14616.94		0.00	17211.36	0.00	8649.84			63.47	63.47	31.90			-492.61	-492.61	-247.57			-492.61	-492.61	-247.57
21	0.486		2594.42	14616.94		0.00	17211.36	0.00	8357.33			63.47	63.47	30.82			-492.61	-492.61	-239.20			-492.61	-492.61	-239.20
22	0.469		2594.42	14616.94		0.00	17211.36	0.00	8074.72			63.47	63.47	29.78			-492.61	-492.61	-231.11			-492.61	-492.61	-231.11
23	0.453		2594.42	14616.94		0.00	17211.36	0.00	7801.66			63.47	63.47	28.77			-492.61	-492.61	-223.29			-492.61	-492.61	-223.29
24	0.438		2594.42	14616.94		0.00	17211.36	0.00	7537.84			63.47	63.47	27.80			-492.61	-492.61	-215.74			-492.61	-492.61	-215.74
25	0.423		2594.42	14616.94		0.00	17211.36	0.00	7282.93			63.47	63.47	26.86			-492.61	-492.61	-208.45			-492.61	-492.61	-208.45
26	0.409		2594.42	14616.94		0.00	17211.36	0.00	7036.65			63.47	63.47	25.95			-492.61	-492.61	-201.40			-492.61	-492.61	-201.40
27	0.395		2594.42	14616.94		0.00	17211.36	0.00	6798.70			63.47	63.47	25.07			-492.61	-492.61	-194.59			-492.61	-492.61	-194.59
28	0.382		2594.42	14616.94		0.00	17211.36	0.00	6568.79			63.47	63.47	24.22			-492.61	-492.61	-188.01			-492.61	-492.61	-188.01
29	0.369		2594.42	14616.94		0.00	17211.36	0.00	6346.66			63.47	63.47	23.41			-492.61	-492.61	-181.65			-492.61	-492.61	-181.65
30	0.356		2594.42	14616.94		0.00	17211.36	0.00	6132.04			63.47	63.47	22.61			-492.61	-492.61	-175.51			-492.61	-492.61	-175.51
31	0.346		2594.42	14616.94		0.00	17211.36	0.00	5953.43			63.47	63.47	21.95			-492.61	-492.61	-170.39			-492.61	-492.61	-170.39
32	0.336		2594.42	14616.94		0.00	17211.36	0.00	5780.03			63.47	63.47	21.32			-492.61	-492.61	-165.43			-492.61	-492.61	-165.43
33	0.326		2594.42	14616.94		0.00	17211.36	0.00	5611.68			63.47	63.47	20.69			-492.61	-492.61	-160.61			-492.61	-492.61	-160.61
34	0.317		2594.42	14616.94		0.00	17211.36	0.00	5448.23			63.47	63.47	20.09			-492.61	-492.61	-155.93			-492.61	-492.61	-155.93
35	0.307		2594.42	14616.94		0.00	17211.36	0.00	5289.55			63.47	63.47	19.51			-492.61	-492.61	-151.39			-492.61	-492.61	-151.39
36	0.298		2594.42	14616.94		0.00	17211.36	0.00	5135.48			63.47	63.47	18.94			-492.61	-492.61	-146.98			-492.61	-492.61	-146.98
37	0.290		2594.42	14616.94		0.00	17211.36	0.00	4985.91			63.47	63.47	18.39			-492.61	-492.61	-142.70			-492.61	-492.61	-142.70
38	0.281		2594.42	14616.94		0.00	17211.36	0.00	4840.69			63.47	63.47	17.85			-492.61	-492.61	-138.55			-492.61	-492.61	-138.55
39	0.273		2594.42	14616.94		0.00	17211.36	0.00	4699.69			63.47	63.47	17.33			-492.61	-492.61	-134.51			-492.61	-492.61	-134.51
40	0.265		2594.42	14616.94		0.00	17211.36	0.00	4562.81			63.47	63.47	16.83			-492.61	-492.61	-130.59			-492.61	-492.61	-130.59
41	0.257		2594.42	14616.94		0.00	17211.36	0.00	4429.91			63.47	63.47	16.34			-492.61	-492.61	-126.79			-492.61	-492.61	-126.79
42	0.250		2594.42	14616.94		0.00	17211.36	0.00	4300.89			63.47	63.47	15.86			-492.61	-492.61	-123.10			-492.61	-492.61	-123.10
43	0.243		2594.42	14616.94		0.00	17211.36	0.00	4175.62			63.47	63.47	15.40			-492.61	-492.61	-119.51			-492.61	-492.61	-119.51
44	0.236		2594.42	14616.94		0.00	17211.36	0.00	4054.00			63.47	63.47	14.95			-492.61	-492.61	-116.03			-492.61	-492.61	-116.03
45	0.229		2594.42	14616.94		0.00	17211.36	0.00	3935.92			63.47	63.47	14.51			-492.61	-492.61	-112.65			-492.61	-492.61	-112.65
46	0.222		2594.42	14616.94		0.00	17211.36	0.00	3821.28			63.47	63.47	14.09			-492.61	-492.61	-109.37			-492.61	-492.61	-109.37
47	0.216		2594.42	14616.94		0.00	17211.36	0.00	3709.98			63.47	63.47	13.68			-492.61	-492.61	-106.18			-492.61	-492.61	-106.18
48	0.209		2594.42	14616.94		0.00	17211.36	0.00	3601.92			63.47	63.47	13.28			-492.61	-492.61	-103.09			-492.61	-492.61	-103.09
49	0.203		2594.42	14616.94		0.00	17211.36	0.00	3497.01			63.47	63.47	12.90			-492.61	-492.61	-100.09			-492.61	-492.61	-100.09
50	0.197		2594.42	14616.94		0.00	17211.36	0.00	3395.16			63.47	63.47	12.52			-492.61	-492.61	-97.17			-492.61	-492.61	-97.17
51	0.192		2594.42	14616.94		0.00	17211.36	0.00	3296.27			63.47	63.47	12.16			-492.61	-492.61	-94.34			-492.61	-492.61	-94.34
52	0.186		2594.42	14616.94		0.00	17211.36	0.00	3200.26			63.47	63.47	11.80			-492.61	-492.61	-91.59			-492.61	-492.61	-91.59
53	0.181		2594.42	14616.94		0.00	17211.36	0.00	3107.05			63.47	63.47	11.46			-492.61	-492.61	-88.93			-492.61	-492.61	-88.93
54	0.175		2594.42	14616.94		0.00	17211.36	0.00	3016.56			63.47	63.47	11.12			-492.61	-492.61	-86.34			-492.61	-492.61	-86.34
55	0.170		2594.42	14616.94		0.00	17211.36	0.00	2928.69			63.47	63.47	10.80			-492.61	-492.61	-83.82			-492.61	-492.61	-83.82
56	0.165		2594.42	14616.94		0.00	17211.36	0.00	2843.39			63.47	63.47	10.49			-492.61	-492.61	-81.38			-492.61	-492.61	-81.38
57	0.160		2594.42	14616.94		0.00	17211.36	0.00	2760.58			63.47	63.47	10.18			-492.61	-492.61	-79.01			-492.61	-492.61	-79.01
58	0.156		2594.42	14616.94		0.00	17211.36	0.00	2680.17			63.47	63.47	9.88			-492.61	-492.61	-76.71			-492.61	-492.61	-76.71
59	0.151		2594.42	14616.94		0.00	17211.36	0.00	2602.11			63.47	63.47	9.60			-492.61	-492.61	-74.47			-492.61	-492.61	-74.47
60	0.147		2594.42	14616.94		0.00	17211.36	0.00	2526.32			63.47	63.47	9.32			-492.61	-492.61	-72.31			-492.61	-492.61	-72.31
61	0.143		2594.42	14616.94		0.00	17211.36	0.00	2452.74			63.47	63.47	9.05			-492.61	-492.61	-70.20			-492.61	-492.61	-70.20
62	0.138		2594.42	14616.94		0.00	17211.36	0.00	2381.30			63.47	63.47	8.78			-492.61	-492.61	-68.16			-492.61	-492.61	-68.16
63	0.134		2594.42	14616.94		0.00	17211.36	0.00	2311.94			63.47	63.47	8.53			-492.61	-492.61	-66.17			-492.61	-492.61	-66.17
64	0.130		2594.42	14616.94		0.00	17211.36	0.00	2244.60			63.47	63.47	8.28			-492.61	-492.61	-64.24			-492.61	-492.61	-64.24
65	0.127	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3274.62			63.47	63.47	8.04			-492.61	-492.61	-62.37			-492.61	-492.61	-62.37
66	0.123	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3179.24			63.47	63.47	7.80			-492.61	-492.61	-60.55			-492.61	-492.61	-60.55
67	0.119	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	3086.64			63.47	63.47	7.58			-492.61	-492.61	-58.79			-492.61	-492.61	-58.79
68	0.116	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2996.74			63.47	63.47	7.35			-492.61	-492.61	-57.06			-492.61	-492.61	-57.06
69	0.112	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2909.46			63.47	63.47	7.14			-492.61	-492.61	-55.42			-492.61	-492.61	-55.42
70	0.109	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2824.72			63.47	63.47	6.93			-492.61	-492.61	-53.80			-492.61	-492.61	-53.80
71	0.106	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2742.44			63.47	63.47	6.72			-492.61	-492.61	-52.24			-492.61	-492.61	-52.24
72	0.103	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2662.57			63.47	63.47	6.53			-492.61	-492.61	-50.71			-492.61	-492.61	-50.71
73	0.100	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2585.02			63.47	63.47	6.34			-492.61	-492.61	-49.24			-492.61	-492.61	-49.24
74	0.097	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2509.72			63.47	63.47	6.16			-492.61	-492.61	-47.80			-492.61	-492.61	-47.80
75	0.094	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2436.63			63.47	63.47	5.98			-492.61	-492.61	-46.41			-492.61	-492.61	-46.41
76	0.092	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2377.20			63.47	63.47	5.83			-492.61	-492.61	-45.26			-492.61	-492.61	-45.26
77	0.090	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2319.22			63.47	63.47	5.69			-492.61	-492.61	-44.17			-492.61	-492.61	-44.17
78	0.087	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2262.65			63.47	63.47	5.55			-492.61	-492.61	-43.10			-492.61	-492.61	-43.10
79	0.085	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2207.46			63.47	63.47	5.42			-492.61	-492.61	-42.05			-492.61	-492.61	-42.05
80	0.083	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2153.62			63.47	63.47	5.29			-492.61	-492.61	-41.02			-492.61	-492.61	-41.02
81	0.081	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2101.09			63.47	63.47	5.16			-492.61	-492.61	-40.02			-492.61	-492.61	-40.02
82	0.079	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	2049.85			63.47	63.47	5.03			-492.61	-492.61	-39.04			-492.61	-492.61	-39.04
83	0.077	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1999.85			63.47	63.47	4.91			-492.61	-492.61	-38.09			-492.61	-492.61	-38.09
84	0.075	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1951.08			63.47	63.47	4.79			-492.61	-492.61	-37.16			-492.61	-492.61	-37.16
85	0.074	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1903.49			63.47	63.47	4.67			-492.61	-492.61	-36.26			-492.61	-492.61	-36.26
86	0.072	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1857.05			63.47	63.47	4.56			-492.61	-492.61	-35.37			-492.61	-492.61	-35.37
87	0.070	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1811.77			63.47	63.47	4.45			-492.61	-492.61	-34.51			-492.61	-492.61	-34.51
88	0.068	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1767.58			63.47	63.47	4.34			-492.61	-492.61	-33.67			-492.61	-492.61	-33.67
89	0.067	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1724.47			63.47	63.47	4.23			-492.61	-492.61	-32.85			-492.61	-492.61	-32.85
90	0.065	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1682.41			63.47	63.47	4.13			-492.61	-492.61	-32.04			-492.61	-492.61	-32.04
91	0.063	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1641.37			63.47	63.47	4.03			-492.61	-492.61	-31.26			-492.61	-492.61	-31.26
92	0.062	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1601.34			63.47	63.47	3.93			-492.61	-492.61	-30.50			-492.61	-492.61	-30.50
93	0.060	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1562.28			63.47	63.47	3.83			-492.61	-492.61	-29.76			-492.61	-492.61	-29.76
94	0.059	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1524.18			63.47	63.47	3.74			-492.61	-492.61	-29.03			-492.61	-492.61	-29.03
95	0.057	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1487.00			63.47	63.47	3.65			-492.61	-492.61	-28.32			-492.61	-492.61	-28.32
96	0.056	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1450.73			63.47	63.47	3.56			-492.61	-492.61	-27.63			-492.61	-492.61	-27.63
97	0.055	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1415.35			63.47	63.47	3.47			-492.61	-492.61	-26.96			-492.61	-492.61	-26.96
98	0.053	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1380.83			63.47	63.47	3.39			-492.61	-492.61	-26.30			-492.61	-492.61	-26.30
99	0.052	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1347.15			63.47	63.47	3.31			-492.61	-492.61	-25.66			-492.61	-492.61	-25.66
100	0.051	8651.37625	2594.42	14616.94		0.00	25862.73	0.00	1314.29			63.47	63.47	3.23			-492.61	-492.61	-25.03			-492.61	-492.61	-25.03

Present Value Costs for all options
Maximum Beach Topping Up Frequency

Sheet Nr. 10

Client/Authority
Conwy County Borough Council
Project name
Colwyn Bay Waterfront PAR Update
Project reference -
Base date for estimates (yea Q4 2017
Scaling factor (e.g. £m, £k, £ £k
Initial discount rate 3.5%

		Scheme	Fees
Phase 2 Split	Year 1	0%	40%
	Year 2	95%	59%
	Year 3	5%	1%
	Year 4	0%	0%
Phase 3 Split	Year 1	0%	10%
	Year 2	0%	30%
	Year 3	95%	59%
	Year 4	5%	1%

Results £k

	Option 1	Option 2	Option 3	Option 4	Option 5
	Do-nothing	ck Revetment Phases 1, 2 an	charge Phases 1 and 2, Rock Revetmer	& Single Offshore Control St	& Single Offshore Control St
PV total costs	0	87,175	65,672	72,012	77920

Prepared (date)	01/02/2018
Printed	20/03/2018
Prepared by	AJW
Checked by	CEUK
Checked date	19/03/2018

Option 1 Do-nothing

year	Discount Factor	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum		0	0		0	0	0.0	0.0	0.0	0.0	0.0
0	1.000						0.0	0.0	0.0	0.0	0.0
1	0.966						0.0	0.0	0.0	0.0	0.0
2	0.934						0.0	0.0	0.0	0.0	0.0
3	0.902						0.0	0.0	0.0	0.0	0.0
4	0.871						0.0	0.0	0.0	0.0	0.0
5	0.842						0.0	0.0	0.0	0.0	0.0
6	0.814						0.0	0.0	0.0	0.0	0.0
7	0.786						0.0	0.0	0.0	0.0	0.0
8	0.759						0.0	0.0	0.0	0.0	0.0
9	0.734						0.0	0.0	0.0	0.0	0.0
10	0.709						0.0	0.0	0.0	0.0	0.0
11	0.685						0.0	0.0	0.0	0.0	0.0
12	0.662						0.0	0.0	0.0	0.0	0.0
13	0.639						0.0	0.0	0.0	0.0	0.0
14	0.618						0.0	0.0	0.0	0.0	0.0
15	0.597						0.0	0.0	0.0	0.0	0.0
16	0.577						0.0	0.0	0.0	0.0	0.0
17	0.557						0.0	0.0	0.0	0.0	0.0
18	0.538						0.0	0.0	0.0	0.0	0.0
19	0.520						0.0	0.0	0.0	0.0	0.0
20	0.503						0.0	0.0	0.0	0.0	0.0
21	0.486						0.0	0.0	0.0	0.0	0.0
22	0.469						0.0	0.0	0.0	0.0	0.0
23	0.453						0.0	0.0	0.0	0.0	0.0
24	0.438						0.0	0.0	0.0	0.0	0.0
25	0.423						0.0	0.0	0.0	0.0	0.0
26	0.409						0.0	0.0	0.0	0.0	0.0
27	0.395						0.0	0.0	0.0	0.0	0.0
28	0.382						0.0	0.0	0.0	0.0	0.0
29	0.369						0.0	0.0	0.0	0.0	0.0
30	0.356						0.0	0.0	0.0	0.0	0.0
31	0.346						0.0	0.0	0.0	0.0	0.0
32	0.336						0.0	0.0	0.0	0.0	0.0
33	0.326						0.0	0.0	0.0	0.0	0.0
34	0.317						0.0	0.0	0.0	0.0	0.0
35	0.307						0.0	0.0	0.0	0.0	0.0
36	0.298						0.0	0.0	0.0	0.0	0.0
37	0.290						0.0	0.0	0.0	0.0	0.0
38	0.281						0.0	0.0	0.0	0.0	0.0
39	0.273						0.0	0.0	0.0	0.0	0.0
40	0.265						0.0	0.0	0.0	0.0	0.0
41	0.257						0.0	0.0	0.0	0.0	0.0
42	0.250						0.0	0.0	0.0	0.0	0.0
43	0.243						0.0	0.0	0.0	0.0	0.0
44	0.236						0.0	0.0	0.0	0.0	0.0
45	0.229						0.0	0.0	0.0	0.0	0.0
46	0.222						0.0	0.0	0.0	0.0	0.0
47	0.216						0.0	0.0	0.0	0.0	0.0
48	0.209						0.0	0.0	0.0	0.0	0.0
49	0.203						0.0	0.0	0.0	0.0	0.0
50	0.197						0.0	0.0	0.0	0.0	0.0
51	0.192						0.0	0.0	0.0	0.0	0.0
52	0.186						0.0	0.0	0.0	0.0	0.0
53	0.181						0.0	0.0	0.0	0.0	0.0
54	0.175						0.0	0.0	0.0	0.0	0.0
55	0.170						0.0	0.0	0.0	0.0	0.0
56	0.165						0.0	0.0	0.0	0.0	0.0
57	0.160						0.0	0.0	0.0	0.0	0.0
58	0.156						0.0	0.0	0.0	0.0	0.0
59	0.151						0.0	0.0	0.0	0.0	0.0
60	0.147						0.0	0.0	0.0	0.0	0.0
61	0.143						0.0	0.0	0.0	0.0	0.0
62	0.138						0.0	0.0	0.0	0.0	0.0
63	0.134						0.0	0.0	0.0	0.0	0.0
64	0.130						0.0	0.0	0.0	0.0	0.0
65	0.127						0.0	0.0	0.0	0.0	0.0
66	0.123						0.0	0.0	0.0	0.0	0.0
67	0.119						0.0	0.0	0.0	0.0	0.0
68	0.116						0.0	0.0	0.0	0.0	0.0
69	0.112						0.0	0.0	0.0	0.0	0.0
70	0.109						0.0	0.0	0.0	0.0	0.0
71	0.106						0.0	0.0	0.0	0.0	0.0
72	0.103						0.0	0.0	0.0	0.0	0.0
73	0.100						0.0	0.0	0.0	0.0	0.0
74	0.097						0.0	0.0	0.0	0.0	0.0
75	0.094						0.0	0.0	0.0	0.0	0.0
76	0.092						0.0	0.0	0.0	0.0	0.0
77	0.090						0.0	0.0	0.0	0.0	0.0
78	0.087						0.0	0.0	0.0	0.0	0.0
79	0.085						0.0	0.0	0.0	0.0	0.0
80	0.083						0.0	0.0	0.0	0.0	0.0
81	0.081						0.0	0.0	0.0	0.0	0.0
82	0.079						0.0	0.0	0.0	0.0	0.0
83	0.077						0.0	0.0	0.0	0.0	0.0
84	0.075						0.0	0.0	0.0	0.0	0.0
85	0.074						0.0	0.0	0.0	0.0	0.0
86	0.072						0.0	0.0	0.0	0.0	0.0
87	0.070						0.0	0.0	0.0	0.0	0.0
88	0.068						0.0	0.0	0.0	0.0	0.0
89	0.067						0.0	0.0	0.0	0.0	0.0
90	0.065						0.0	0.0	0.0	0.0	0.0
91	0.063						0.0	0.0	0.0	0.0	0.0
92	0.062						0.0	0.0	0.0	0.0	0.0
93	0.060						0.0	0.0	0.0	0.0	0.0
94	0.059						0.0	0.0	0.0	0.0	0.0
95	0.057						0.0	0.0	0.0	0.0	0.0
96	0.056						0.0	0.0	0.0	0.0	0.0
97	0.055						0.0	0.0	0.0	0.0	0.0
98	0.053						0.0	0.0	0.0	0.0	0.0
99	0.052						0.0	0.0	0.0	0.0	0.0

Option 2 Rock Revetment Phases 1, 2 and 3

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	83066.1	1722.6		7871.1	0.0	92659.8	79139.4	456.7	7579.1	0.0
0	39040.3			3904.0		42944.3	39040.3	0.0	3904.0	0.0
1	0.0			1151.7		1151.7	0.0	0.0	1112.7	0.0
2	13792.3			899.7		14692.1	12875.3	0.0	839.9	0.0
3	28758.1			1740.9		30499.0	25938.1	0.0	1570.2	0.0
4	1475.4			174.7		1650.1	1285.7	0.0	152.2	0.0
5		55.9				55.9	0.0	47.1	0.0	0.0
6						0.0	0.0	0.0	0.0	0.0
7						0.0	0.0	0.0	0.0	0.0
8						0.0	0.0	0.0	0.0	0.0
9						0.0	0.0	0.0	0.0	0.0
10		55.9				55.9	0.0	39.6	0.0	0.0
11						0.0	0.0	0.0	0.0	0.0
12						0.0	0.0	0.0	0.0	0.0
13						0.0	0.0	0.0	0.0	0.0
14						0.0	0.0	0.0	0.0	0.0
15		55.9				55.9	0.0	33.4	0.0	0.0
16						0.0	0.0	0.0	0.0	0.0
17						0.0	0.0	0.0	0.0	0.0
18						0.0	0.0	0.0	0.0	0.0
19						0.0	0.0	0.0	0.0	0.0
20		55.9				55.9	0.0	28.1	0.0	0.0
21						0.0	0.0	0.0	0.0	0.0
22						0.0	0.0	0.0	0.0	0.0
23						0.0	0.0	0.0	0.0	0.0
24						0.0	0.0	0.0	0.0	0.0
25		276.0				276.0	0.0	116.8	0.0	0.0
26						0.0	0.0	0.0	0.0	0.0
27						0.0	0.0	0.0	0.0	0.0
28						0.0	0.0	0.0	0.0	0.0
29						0.0	0.0	0.0	0.0	0.0
30		55.9				55.9	0.0	19.9	0.0	0.0
31						0.0	0.0	0.0	0.0	0.0
32						0.0	0.0	0.0	0.0	0.0
33						0.0	0.0	0.0	0.0	0.0
34						0.0	0.0	0.0	0.0	0.0
35		55.9				55.9	0.0	17.2	0.0	0.0
36						0.0	0.0	0.0	0.0	0.0
37						0.0	0.0	0.0	0.0	0.0
38						0.0	0.0	0.0	0.0	0.0
39						0.0	0.0	0.0	0.0	0.0
40		55.9				55.9	0.0	14.8	0.0	0.0
41						0.0	0.0	0.0	0.0	0.0
42						0.0	0.0	0.0	0.0	0.0
43						0.0	0.0	0.0	0.0	0.0
44						0.0	0.0	0.0	0.0	0.0
45		55.9				55.9	0.0	12.8	0.0	0.0
46						0.0	0.0	0.0	0.0	0.0
47						0.0	0.0	0.0	0.0	0.0
48						0.0	0.0	0.0	0.0	0.0
49						0.0	0.0	0.0	0.0	0.0
50		276.0				276.0	0.0	54.5	0.0	0.0
51						0.0	0.0	0.0	0.0	0.0
52						0.0	0.0	0.0	0.0	0.0
53						0.0	0.0	0.0	0.0	0.0
54						0.0	0.0	0.0	0.0	0.0
55		55.9				55.9	0.0	9.5	0.0	0.0
56						0.0	0.0	0.0	0.0	0.0
57						0.0	0.0	0.0	0.0	0.0
58						0.0	0.0	0.0	0.0	0.0
59						0.0	0.0	0.0	0.0	0.0
60		55.9				55.9	0.0	8.2	0.0	0.0
61						0.0	0.0	0.0	0.0	0.0
62						0.0	0.0	0.0	0.0	0.0
63						0.0	0.0	0.0	0.0	0.0
64						0.0	0.0	0.0	0.0	0.0
65		55.9				55.9	0.0	7.1	0.0	0.0
66						0.0	0.0	0.0	0.0	0.0
67						0.0	0.0	0.0	0.0	0.0
68						0.0	0.0	0.0	0.0	0.0
69						0.0	0.0	0.0	0.0	0.0
70		55.9				55.9	0.0	6.1	0.0	0.0
71						0.0	0.0	0.0	0.0	0.0
72						0.0	0.0	0.0	0.0	0.0
73						0.0	0.0	0.0	0.0	0.0
74						0.0	0.0	0.0	0.0	0.0
75		276.0				276.0	0.0	26.0	0.0	0.0
76						0.0	0.0	0.0	0.0	0.0
77						0.0	0.0	0.0	0.0	0.0
78						0.0	0.0	0.0	0.0	0.0
79						0.0	0.0	0.0	0.0	0.0
80		55.9				55.9	0.0	4.7	0.0	0.0
81						0.0	0.0	0.0	0.0	0.0
82						0.0	0.0	0.0	0.0	0.0
83						0.0	0.0	0.0	0.0	0.0
84						0.0	0.0	0.0	0.0	0.0
85		55.9				55.9	0.0	4.1	0.0	0.0
86						0.0	0.0	0.0	0.0	0.0
87						0.0	0.0	0.0	0.0	0.0
88						0.0	0.0	0.0	0.0	0.0
89						0.0	0.0	0.0	0.0	0.0
90		55.9				55.9	0.0	3.6	0.0	0.0
91						0.0	0.0	0.0	0.0	0.0
92						0.0	0.0	0.0	0.0	0.0
93						0.0	0.0	0.0	0.0	0.0
94						0.0	0.0	0.0	0.0	0.0
95		55.9				55.9	0.0	3.2	0.0	0.0
96						0.0	0.0	0.0	0.0	0.0
97						0.0	0.0	0.0	0.0	0.0
98						0.0	0.0	0.0	0.0	0.0
99						0.0	0.0	0.0	0.0	0.0

Option 3 Beach Recharge Phases 1 and 2, Rock R

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	60970.0	859.7	13198.2	6163.2	0.0	81191.1	57197.6	3070.3	5403.9	0.0
0	19209.7			1988.2		21197.9	19209.7	0.0	1988.2	0.0
1	0.0			540.1		540.1	0.0	0.0	521.9	0.0
2	11640.2			1246.7		12886.9	10866.2	0.0	1163.8	0.0
3	28644.8		10.4	1747.1		30402.3	25836.0	9.4	1575.8	0.0
4	1475.4		10.4	29.5		1515.3	1285.7	9.1	25.7	0.0
5		27.9	10.4			38.3	0.0	32.2	0.0	0.0
6			10.4			10.4	0.0	8.5	0.0	0.0
7			10.4			10.4	0.0	8.2	0.0	0.0
8			10.4			10.4	0.0	7.9	0.0	0.0
9			10.4			10.4	0.0	7.6	0.0	0.0
10		27.9	10.4			38.3	0.0	27.2	0.0	0.0
11			10.4			10.4	0.0	7.1	0.0	0.0
12			10.4			10.4	0.0	6.9	0.0	0.0
13			10.4			10.4	0.0	6.6	0.0	0.0
14			10.4			10.4	0.0	6.4	0.0	0.0
15		27.9	10.4			38.3	0.0	22.9	0.0	0.0
16			10.4			10.4	0.0	6.0	0.0	0.0
17			10.4			10.4	0.0	5.8	0.0	0.0
18			10.4			10.4	0.0	5.6	0.0	0.0
19			10.4			10.4	0.0	5.4	0.0	0.0
20		27.9	10.4			38.3	0.0	19.2	0.0	0.0
21			10.4			10.4	0.0	5.0	0.0	0.0
22			10.4			10.4	0.0	4.9	0.0	0.0
23			10.4			10.4	0.0	4.7	0.0	0.0
24			3057.8	152.9		3210.6	0.0	1339.2	67.0	0.0
25		137.8	10.4			148.2	0.0	62.7	0.0	0.0
26			10.4			10.4	0.0	4.3	0.0	0.0
27			10.4			10.4	0.0	4.1	0.0	0.0
28			10.4			10.4	0.0	4.0	0.0	0.0
29			10.4			10.4	0.0	3.8	0.0	0.0
30		27.9	10.4			38.3	0.0	13.6	0.0	0.0
31			10.4			10.4	0.0	3.6	0.0	0.0
32			10.4			10.4	0.0	3.5	0.0	0.0
33			10.4			10.4	0.0	3.4	0.0	0.0
34			10.4			10.4	0.0	3.3	0.0	0.0
35		27.9	10.4			38.3	0.0	11.8	0.0	0.0
36			10.4			10.4	0.0	3.1	0.0	0.0
37			10.4			10.4	0.0	3.0	0.0	0.0
38			10.4			10.4	0.0	2.9	0.0	0.0
39			10.4			10.4	0.0	2.8	0.0	0.0
40		27.9	10.4			38.3	0.0	10.2	0.0	0.0
41			10.4			10.4	0.0	2.7	0.0	0.0
42			10.4			10.4	0.0	2.6	0.0	0.0
43			10.4			10.4	0.0	2.5	0.0	0.0
44			10.4			10.4	0.0	2.4	0.0	0.0
45		27.9	10.4			38.3	0.0	8.8	0.0	0.0
46			3057.8	152.9		3210.6	0.0	678.9	33.9	0.0
47			10.4			10.4	0.0	2.2	0.0	0.0
48			10.4			10.4	0.0	2.2	0.0	0.0
49			10.4			10.4	0.0	2.1	0.0	0.0
50		137.8	10.4			148.2	0.0	29.2	0.0	0.0
51			10.4			10.4	0.0	2.0	0.0	0.0
52			10.4			10.4	0.0	1.9	0.0	0.0
53			10.4			10.4	0.0	1.9	0.0	0.0
54			10.4			10.4	0.0	1.8	0.0	0.0
55		27.9	10.4			38.3	0.0	6.5	0.0	0.0
56			10.4			10.4	0.0	1.7	0.0	0.0
57			10.4			10.4	0.0	1.7	0.0	0.0
58			10.4			10.4	0.0	1.6	0.0	0.0
59			10.4			10.4	0.0	1.6	0.0	0.0
60		27.9	10.4			38.3	0.0	5.6	0.0	0.0
61			10.4			10.4	0.0	1.5	0.0	0.0
62			10.4			10.4	0.0	1.4	0.0	0.0
63			10.4			10.4	0.0	1.4	0.0	0.0
64			10.4			10.4	0.0	1.4	0.0	0.0
65		27.9	10.4			38.3	0.0	4.8	0.0	0.0
66			10.4			10.4	0.0	1.3	0.0	0.0
67			10.4			10.4	0.0	1.2	0.0	0.0
68			3057.8	152.9		3210.6	0.0	354.3	17.7	0.0
69			10.4			10.4	0.0	1.2	0.0	0.0
70		27.9	10.4			38.3	0.0	4.2	0.0	0.0
71			10.4			10.4	0.0	1.1	0.0	0.0
72			10.4			10.4	0.0	1.1	0.0	0.0
73			10.4			10.4	0.0	1.0	0.0	0.0
74			10.4			10.4	0.0	1.0	0.0	0.0
75		137.8	10.4			148.2	0.0	14.0	0.0	0.0
76			10.4			10.4	0.0	1.0	0.0	0.0
77			10.4			10.4	0.0	0.9	0.0	0.0
78			10.4			10.4	0.0	0.9	0.0	0.0
79			10.4			10.4	0.0	0.9	0.0	0.0
80		27.9	10.4			38.3	0.0	3.2	0.0	0.0
81			10.4			10.4	0.0	0.8	0.0	0.0
82			10.4			10.4	0.0	0.8	0.0	0.0
83			10.4			10.4	0.0	0.8	0.0	0.0
84			10.4			10.4	0.0	0.8	0.0	0.0
85		27.9	10.4			38.3	0.0	2.8	0.0	0.0
86			10.4			10.4	0.0	0.7	0.0	0.0
87			10.4			10.4	0.0	0.7	0.0	0.0
88			10.4			10.4	0.0	0.7	0.0	0.0
89			10.4			10.4	0.0	0.7	0.0	0.0
90		27.9	3057.8	152.9		3238.5	0.0	200.7	9.9	0.0
91			10.4			10.4	0.0	0.7	0.0	0.0
92			10.4			10.4	0.0	0.6	0.0	0.0
93			10.4			10.4	0.0	0.6	0.0	0.0
94			10.4			10.4	0.0	0.6	0.0	0.0
95		27.9	10.4			38.3	0.0	2.2	0.0	0.0
96			10.4			10.4	0.0	0.6	0.0	0.0
97			10.4			10.4	0.0	0.6	0.0	0.0
98			10.4			10.4	0.0	0.6	0.0	0.0
99			10.4			10.4	0.0	0.5	0.0	0.0

Single BW — Option 4 Beach Recharge Phase 1, Beach Recharg

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	67843.4	782.5		6832.6	0.0	85609.4	63603.1	2266.4	6142.6	0.0
0	19209.7			1988.2		21197.9	19209.7	0.0	1988.2	0.0
1	0.0			868.9		868.9	0.0	0.0	839.5	0.0
2	18169.9			1731.6		19901.4	16961.8	0.0	1616.4	0.0
3	28988.5		10.4	1755.3		30754.2	26146.0	9.4	1583.2	0.0
4	1475.4		10.4	29.5		1515.3	1285.7	9.1	25.7	0.0
5		25.4	10.4			35.8	0.0	30.1	0.0	0.0
6			10.4			10.4	0.0	8.5	0.0	0.0
7			10.4			10.4	0.0	8.2	0.0	0.0
8			10.4			10.4	0.0	7.9	0.0	0.0
9			10.4			10.4	0.0	7.6	0.0	0.0
10		25.4	10.4			35.8	0.0	25.4	0.0	0.0
11			10.4			10.4	0.0	7.1	0.0	0.0
12			10.4			10.4	0.0	6.9	0.0	0.0
13			10.4			10.4	0.0	6.6	0.0	0.0
14			10.4			10.4	0.0	6.4	0.0	0.0
15		25.4	10.4	0.5		36.3	0.0	21.4	0.3	0.0
16			10.4			10.4	0.0	6.0	0.0	0.0
17			10.4			10.4	0.0	5.8	0.0	0.0
18			10.4			10.4	0.0	5.6	0.0	0.0
19			10.4			10.4	0.0	5.4	0.0	0.0
20		25.4	10.4			35.8	0.0	18.0	0.0	0.0
21			10.4			10.4	0.0	5.0	0.0	0.0
22			10.4			10.4	0.0	4.9	0.0	0.0
23			10.4			10.4	0.0	4.7	0.0	0.0
24			10.4			10.4	0.0	4.6	0.0	0.0
25		125.4	10.4			135.8	0.0	57.5	0.0	0.0
26			10.4			10.4	0.0	4.3	0.0	0.0
27			10.4			10.4	0.0	4.1	0.0	0.0
28			10.4			10.4	0.0	4.0	0.0	0.0
29			10.4			10.4	0.0	3.8	0.0	0.0
30		25.4	3057.8	152.9		3236.0	0.0	1098.5	54.5	0.0
31			10.4			10.4	0.0	3.6	0.0	0.0
32			10.4			10.4	0.0	3.5	0.0	0.0
33			10.4			10.4	0.0	3.4	0.0	0.0
34			10.4			10.4	0.0	3.3	0.0	0.0
35		25.4	10.4			35.8	0.0	11.0	0.0	0.0
36			10.4			10.4	0.0	3.1	0.0	0.0
37			10.4			10.4	0.0	3.0	0.0	0.0
38			10.4			10.4	0.0	2.9	0.0	0.0
39			10.4			10.4	0.0	2.8	0.0	0.0
40		25.4	10.4			35.8	0.0	9.5	0.0	0.0
41			10.4			10.4	0.0	2.7	0.0	0.0
42			10.4			10.4	0.0	2.6	0.0	0.0
43			10.4			10.4	0.0	2.5	0.0	0.0
44			10.4			10.4	0.0	2.4	0.0	0.0
45		25.4	10.4			35.8	0.0	8.2	0.0	0.0
46			10.4			10.4	0.0	2.3	0.0	0.0
47			10.4			10.4	0.0	2.2	0.0	0.0
48			10.4			10.4	0.0	2.2	0.0	0.0
49			10.4			10.4	0.0	2.1	0.0	0.0
50		125.4	10.4			135.8	0.0	26.8	0.0	0.0
51			10.4			10.4	0.0	2.0	0.0	0.0
52			10.4			10.4	0.0	1.9	0.0	0.0
53			10.4			10.4	0.0	1.9	0.0	0.0
54			10.4			10.4	0.0	1.8	0.0	0.0
55		25.4	10.4			35.8	0.0	6.1	0.0	0.0
56			10.4			10.4	0.0	1.7	0.0	0.0
57			10.4			10.4	0.0	1.7	0.0	0.0
58			3057.8	152.9		3210.6	0.0	476.2	23.8	0.0
59			10.4			10.4	0.0	1.6	0.0	0.0
60		25.4	10.4			35.8	0.0	5.3	0.0	0.0
61			10.4			10.4	0.0	1.5	0.0	0.0
62			10.4			10.4	0.0	1.4	0.0	0.0
63			10.4			10.4	0.0	1.4	0.0	0.0
64			10.4			10.4	0.0	1.4	0.0	0.0
65		25.4	10.4			35.8	0.0	4.5	0.0	0.0
66			10.4			10.4	0.0	1.3	0.0	0.0
67			10.4			10.4	0.0	1.2	0.0	0.0
68			10.4			10.4	0.0	1.2	0.0	0.0
69			10.4			10.4	0.0	1.2	0.0	0.0
70		25.4	10.4			35.8	0.0	3.9	0.0	0.0
71			10.4			10.4	0.0	1.1	0.0	0.0
72			10.4			10.4	0.0	1.1	0.0	0.0
73			10.4			10.4	0.0	1.0	0.0	0.0
74			10.4			10.4	0.0	1.0	0.0	0.0
75		125.4	10.4			135.8	0.0	12.8	0.0	0.0
76			10.4			10.4	0.0	1.0	0.0	0.0
77			10.4			10.4	0.0	0.9	0.0	0.0
78			10.4			10.4	0.0	0.9	0.0	0.0
79			10.4			10.4	0.0	0.9	0.0	0.0
80		25.4	10.4			35.8	0.0	3.0	0.0	0.0
81			10.4			10.4	0.0	0.8	0.0	0.0
82			10.4			10.4	0.0	0.8	0.0	0.0
83			10.4			10.4	0.0	0.8	0.0	0.0
84			10.4			10.4	0.0	0.8	0.0	0.0
85		25.4	10.4			35.8	0.0	2.6	0.0	0.0
86			3057.8	152.9		3210.6	0.0	219.6	11.0	0.0
87			10.4			10.4	0.0	0.7	0.0	0.0
88			10.4			10.4	0.0	0.7	0.0	0.0
89			10.4			10.4	0.0	0.7	0.0	0.0
90		25.4	10.4			35.8	0.0	2.3	0.0	0.0
91			10.4			10.4	0.0	0.7	0.0	0.0
92			10.4			10.4	0.0	0.6	0.0	0.0
93			10.4			10.4	0.0	0.6	0.0	0.0
94			10.4			10.4	0.0	0.6	0.0	0.0
95		25.4	10.4			35.8	0.0	2.1	0.0	0.0
96			10.4			10.4	0.0	0.6	0.0	0.0
97			10.4			10.4	0.0	0.6	0.0	0.0
98			10.4			10.4	0.0	0.6	0.0	0.0
99			10.4			10.4	0.0	0.5	0.0	0.0

Twin BW — Option 4 (Beach Recharge Phase 1, Beach Recharg

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	74716.7	877.3		7194.7	0.0	89892.2	70008.6	1329.8	6581.8	0.0
0	19209.7			1988.2		21197.9	19209.7	0.0	1988.2	0.0
1	0.0			1075.1		1075.1	0.0	0.0	1038.7	0.0
2	24699.5			2035.7		26735.2	23057.3	0.0	1900.4	0.0
3	29332.2		10.4	1760.4		31103.0	26455.9	9.4	1587.8	0.0
4	1475.4		10.4	29.5		1515.3	1285.7	9.1	25.7	0.0
5		28.5	10.4			38.9	0.0	32.7	0.0	0.0
6			10.4			10.4	0.0	8.5	0.0	0.0
7			10.4			10.4	0.0	8.2	0.0	0.0
8			10.4			10.4	0.0	7.9	0.0	0.0
9			10.4			10.4	0.0	7.6	0.0	0.0
10		28.5	10.4			38.9	0.0	27.6	0.0	0.0
11			10.4			10.4	0.0	7.1	0.0	0.0
12			10.4			10.4	0.0	6.9	0.0	0.0
13			10.4			10.4	0.0	6.6	0.0	0.0
14			10.4			10.4	0.0	6.4	0.0	0.0
15		28.5	10.4			38.9	0.0	23.2	0.0	0.0
16			10.4			10.4	0.0	6.0	0.0	0.0
17			10.4			10.4	0.0	5.8	0.0	0.0
18			10.4			10.4	0.0	5.6	0.0	0.0
19			10.4			10.4	0.0	5.4	0.0	0.0
20		28.5	10.4			38.9	0.0	19.5	0.0	0.0
21			10.4			10.4	0.0	5.0	0.0	0.0
22			10.4			10.4	0.0	4.9	0.0	0.0
23			10.4			10.4	0.0	4.7	0.0	0.0
24			10.4			10.4	0.0	4.6	0.0	0.0
25		140.6	10.4			151.0	0.0	63.9	0.0	0.0
26			10.4			10.4	0.0	4.3	0.0	0.0
27			10.4			10.4	0.0	4.1	0.0	0.0
28			10.4			10.4	0.0	4.0	0.0	0.0
29			10.4			10.4	0.0	3.8	0.0	0.0
30		28.5	10.4			38.9	0.0	13.8	0.0	0.0
31			10.4			10.4	0.0	3.6	0.0	0.0
32			10.4			10.4	0.0	3.5	0.0	0.0
33			10.4			10.4	0.0	3.4	0.0	0.0
34			10.4			10.4	0.0	3.3	0.0	0.0
35		28.5	10.4			38.9	0.0	11.9	0.0	0.0
36			10.4			10.4	0.0	3.1	0.0	0.0
37			10.4			10.4	0.0	3.0	0.0	0.0
38			10.4			10.4	0.0	2.9	0.0	0.0
39			10.4			10.4	0.0	2.8	0.0	0.0
40		28.5	10.4			38.9	0.0	10.3	0.0	0.0
41			10.4			10.4	0.0	2.7	0.0	0.0
42			10.4			10.4	0.0	2.6	0.0	0.0
43			10.4			10.4	0.0	2.5	0.0	0.0
44			10.4			10.4	0.0	2.4	0.0	0.0
45		28.5	10.4			38.9	0.0	8.9	0.0	0.0
46			10.4			10.4	0.0	2.3	0.0	0.0
47			10.4			10.4	0.0	2.2	0.0	0.0
48			3057.8	152.9		3210.6	0.0	639.9	32.0	0.0
49			10.4			10.4	0.0	2.1	0.0	0.0
50		140.6	10.4			151.0	0.0	29.8	0.0	0.0
51			10.4			10.4	0.0	2.0	0.0	0.0
52			10.4			10.4	0.0	1.9	0.0	0.0
53			10.4			10.4	0.0	1.9	0.0	0.0
54			10.4			10.4	0.0	1.8	0.0	0.0
55		28.5	10.4			38.9	0.0	6.6	0.0	0.0
56			10.4			10.4	0.0	1.7	0.0	0.0
57			10.4			10.4	0.0	1.7	0.0	0.0
58			10.4			10.4	0.0	1.6	0.0	0.0
59			10.4			10.4	0.0	1.6	0.0	0.0
60		28.5	10.4			38.9	0.0	5.7	0.0	0.0
61			10.4			10.4	0.0	1.5	0.0	0.0
62			10.4			10.4	0.0	1.4	0.0	0.0
63			10.4			10.4	0.0	1.4	0.0	0.0
64			10.4			10.4	0.0	1.4	0.0	0.0
65		28.5	10.4			38.9	0.0	4.9	0.0	0.0
66			10.4			10.4	0.0	1.3	0.0	0.0
67			10.4			10.4	0.0	1.2	0.0	0.0
68			10.4			10.4	0.0	1.2	0.0	0.0
69			10.4			10.4	0.0	1.2	0.0	0.0
70		28.5	10.4			38.9	0.0	4.2	0.0	0.0
71			10.4			10.4	0.0	1.1	0.0	0.0
72			10.4			10.4	0.0	1.1	0.0	0.0
73			10.4			10.4	0.0	1.0	0.0	0.0
74			10.4			10.4	0.0	1.0	0.0	0.0
75		140.6	10.4			151.0	0.0	14.2	0.0	0.0
76			10.4			10.4	0.0	1.0	0.0	0.0
77			10.4			10.4	0.0	0.9	0.0	0.0
78			10.4			10.4	0.0	0.9	0.0	0.0
79			10.4			10.4	0.0	0.9	0.0	0.0
80		28.5	10.4			38.9	0.0	3.2	0.0	0.0
81			10.4			10.4	0.0	0.8	0.0	0.0
82			10.4			10.4	0.0	0.8	0.0	0.0
83			10.4			10.4	0.0	0.8	0.0	0.0
84			10.4			10.4	0.0	0.8	0.0	0.0
85		28.5	10.4			38.9	0.0	2.9	0.0	0.0
86			10.4			10.4	0.0	0.7	0.0	0.0
87			10.4			10.4	0.0	0.7	0.0	0.0
88			10.4			10.4	0.0	0.7	0.0	0.0
89			10.4			10.4	0.0	0.7	0.0	0.0
90		28.5	10.4			38.9	0.0	2.5	0.0	0.0
91			10.4			10.4	0.0	0.7	0.0	0.0
92			10.4			10.4	0.0	0.6	0.0	0.0
93			10.4			10.4	0.0	0.6	0.0	0.0
94			3057.8	152.9		3210.6	0.0	180.2	9.0	0.0
95		28.5	10.4			38.9	0.0	2.2	0.0	0.0
96			10.4			10.4	0.0	0.6	0.0	0.0
97			10.4			10.4	0.0	0.6	0.0	0.0
98			10.4			10.4	0.0	0.6	0.0	0.0
99			10.4			10.4	0.0	0.5	0.0	0.0

SC Groynes — Option 4 (Beach Recharge Phase 1, Beach Recharg

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	64771.2	1076.9		6601.7	0.0	82600.7	60740.0	2131.6	5913.6	0.0
0	19209.7			1988.2		21197.9	19209.7	0.0	1988.2	0.0
1	0.0			776.7		776.7	0.0	0.0	750.4	0.0
2	15251.3			1595.6		16846.9	14237.2	0.0	1489.5	0.0
3	28834.9		10.4	1753.0		30598.3	26007.4	9.4	1581.1	0.0
4	1475.4		10.4	29.5		1515.3	1285.7	9.1	25.7	0.0
5		35.0	10.4			45.4	0.0	38.2	0.0	0.0
6			10.4			10.4	0.0	8.5	0.0	0.0
7			10.4			10.4	0.0	8.2	0.0	0.0
8			10.4			10.4	0.0	7.9	0.0	0.0
9			10.4			10.4	0.0	7.6	0.0	0.0
10		35.0	10.4			45.4	0.0	32.1	0.0	0.0
11			10.4			10.4	0.0	7.1	0.0	0.0
12			10.4			10.4	0.0	6.9	0.0	0.0
13			10.4			10.4	0.0	6.6	0.0	0.0
14			10.4			10.4	0.0	6.4	0.0	0.0
15		35.0	10.4			45.4	0.0	27.1	0.0	0.0
16			10.4			10.4	0.0	6.0	0.0	0.0
17			10.4			10.4	0.0	5.8	0.0	0.0
18			10.4			10.4	0.0	5.6	0.0	0.0
19			10.4			10.4	0.0	5.4	0.0	0.0
20		35.0	10.4			45.4	0.0	22.8	0.0	0.0
21			10.4			10.4	0.0	5.0	0.0	0.0
22			10.4			10.4	0.0	4.9	0.0	0.0
23			10.4			10.4	0.0	4.7	0.0	0.0
24			10.4			10.4	0.0	4.6	0.0	0.0
25		172.6	10.4			183.0	0.0	77.4	0.0	0.0
26			10.4			10.4	0.0	4.3	0.0	0.0
27			10.4			10.4	0.0	4.1	0.0	0.0
28			10.4			10.4	0.0	4.0	0.0	0.0
29			10.4			10.4	0.0	3.8	0.0	0.0
30		35.0	10.4			45.4	0.0	16.2	0.0	0.0
31			10.4			10.4	0.0	3.6	0.0	0.0
32			10.4			10.4	0.0	3.5	0.0	0.0
33			3057.8	152.9		3210.6	0.0	997.0	49.8	0.0
34			10.4			10.4	0.0	3.3	0.0	0.0
35		35.0	10.4			45.4	0.0	13.9	0.0	0.0
36			10.4			10.4	0.0	3.1	0.0	0.0
37			10.4			10.4	0.0	3.0	0.0	0.0
38			10.4			10.4	0.0	2.9	0.0	0.0
39			10.4			10.4	0.0	2.8	0.0	0.0
40		35.0	10.4			45.4	0.0	12.0	0.0	0.0
41			10.4			10.4	0.0	2.7	0.0	0.0
42			10.4			10.4	0.0	2.6	0.0	0.0
43			10.4			10.4	0.0	2.5	0.0	0.0
44			10.4			10.4	0.0	2.4	0.0	0.0
45		35.0	10.4			45.4	0.0	10.4	0.0	0.0
46			10.4			10.4	0.0	2.3	0.0	0.0
47			10.4			10.4	0.0	2.2	0.0	0.0
48			10.4			10.4	0.0	2.2	0.0	0.0
49			10.4			10.4	0.0	2.1	0.0	0.0
50		172.6	10.4			183.0	0.0	36.1	0.0	0.0
51			10.4			10.4	0.0	2.0	0.0	0.0
52			10.4			10.4	0.0	1.9	0.0	0.0
53			10.4			10.4	0.0	1.9	0.0	0.0
54			10.4			10.4	0.0	1.8	0.0	0.0
55		35.0	10.4			45.4	0.0	7.7	0.0	0.0
56			10.4			10.4	0.0	1.7	0.0	0.0
57			10.4			10.4	0.0	1.7	0.0	0.0
58			10.4			10.4	0.0	1.6	0.0	0.0
59			10.4			10.4	0.0	1.6	0.0	0.0
60		35.0	10.4			45.4	0.0	6.7	0.0	0.0
61			10.4			10.4	0.0	1.5	0.0	0.0
62			10.4			10.4	0.0	1.4	0.0	0.0
63			10.4			10.4	0.0	1.4	0.0	0.0
64			3057.8	152.9		3210.6	0.0	398.8	19.9	0.0
65		35.0	10.4			45.4	0.0	5.7	0.0	0.0
66			10.4			10.4	0.0	1.3	0.0	0.0
67			10.4			10.4	0.0	1.2	0.0	0.0
68			10.4			10.4	0.0	1.2	0.0	0.0
69			10.4			10.4	0.0	1.2	0.0	0.0
70		35.0	10.4			45.4	0.0	5.0	0.0	0.0
71			10.4			10.4	0.0	1.1	0.0	0.0
72			10.4			10.4	0.0	1.1	0.0	0.0
73			10.4			10.4	0.0	1.0	0.0	0.0
74			10.4			10.4	0.0	1.0	0.0	0.0
75		172.6	10.4			183.0	0.0	17.2	0.0	0.0
76			10.4			10.4	0.0	1.0	0.0	0.0
77			10.4			10.4	0.0	0.9	0.0	0.0
78			10.4			10.4	0.0	0.9	0.0	0.0
79			10.4			10.4	0.0	0.9	0.0	0.0
80		35.0	10.4			45.4	0.0	3.8	0.0	0.0
81			10.4			10.4	0.0	0.8	0.0	0.0
82			10.4			10.4	0.0	0.8	0.0	0.0
83			10.4			10.4	0.0	0.8	0.0	0.0
84			10.4			10.4	0.0	0.8	0.0	0.0
85		35.0	10.4			45.4	0.0	3.3	0.0	0.0
86			10.4			10.4	0.0	0.7	0.0	0.0
87			10.4			10.4	0.0	0.7	0.0	0.0
88			10.4			10.4	0.0	0.7	0.0	0.0
89			10.4			10.4	0.0	0.7	0.0	0.0
90		35.0	10.4			45.4	0.0	3.0	0.0	0.0
91			10.4			10.4	0.0	0.7	0.0	0.0
92			10.4			10.4	0.0	0.6	0.0	0.0
93			10.4			10.4	0.0	0.6	0.0	0.0
94			10.4			10.4	0.0	0.6	0.0	0.0
95		35.0	3057.8	152.9		3245.6	0.0	177.8	8.8	0.0
96			10.4			10.4	0.0	0.6	0.0	0.0
97			10.4			10.4	0.0	0.6	0.0	0.0
98			10.4			10.4	0.0	0.6	0.0	0.0
99			10.4			10.4	0.0	0.5	0.0	0.0

Present Value Costs for all options
Minimum Beach Topping Up Frequency

				Fees
Client/Authority		Phase 2 S Year1	0%	40%
Conwy County Borough Council		Year 2	95%	59%
Project name		Year 3	5%	1%
Colwyn Bay Waterfront PAR Update		Year 4	0%	0%
Project reference	-	Phase 3 S Year1	0%	10%
Base date for estimates (yea	Q4 2017	Year 2	0%	30%
Scaling factor (e.g. £m, £k, £	£k	Year 3	95%	59%
Initial discount rate	3.5%	Year 4	5%	1%

Sheet Nr. 10

Results £k	Option 1	Option 2	Option 3	Option 4	Option 5
	Do-nothing	ck Revetment Phases 1, 2 an	charge Phases 1 and 2, Rock Revetmer	& Single Offshore Control St	& Single Offshore Control St
PV total costs	0	87,175	76,183	81,151	83065

Prepared (date)	01/02/2018
Printed	20/03/2018
Prepared by	AJW
Checked by	CEUK
Checked date	19/03/2018

Option 1 – Do-nothing

year	Discount Factor	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum		0	0		0	0	0.0	0.0	0.0	0.0	0.0
0	1.000						0.0	0.0	0.0	0.0	0.0
1	0.966						0.0	0.0	0.0	0.0	0.0
2	0.934						0.0	0.0	0.0	0.0	0.0
3	0.902						0.0	0.0	0.0	0.0	0.0
4	0.871						0.0	0.0	0.0	0.0	0.0
5	0.842						0.0	0.0	0.0	0.0	0.0
6	0.814						0.0	0.0	0.0	0.0	0.0
7	0.786						0.0	0.0	0.0	0.0	0.0
8	0.759						0.0	0.0	0.0	0.0	0.0
9	0.734						0.0	0.0	0.0	0.0	0.0
10	0.709						0.0	0.0	0.0	0.0	0.0
11	0.685						0.0	0.0	0.0	0.0	0.0
12	0.662						0.0	0.0	0.0	0.0	0.0
13	0.639						0.0	0.0	0.0	0.0	0.0
14	0.618						0.0	0.0	0.0	0.0	0.0
15	0.597						0.0	0.0	0.0	0.0	0.0
16	0.577						0.0	0.0	0.0	0.0	0.0
17	0.557						0.0	0.0	0.0	0.0	0.0
18	0.538						0.0	0.0	0.0	0.0	0.0
19	0.520						0.0	0.0	0.0	0.0	0.0
20	0.503						0.0	0.0	0.0	0.0	0.0
21	0.486						0.0	0.0	0.0	0.0	0.0
22	0.469						0.0	0.0	0.0	0.0	0.0
23	0.453						0.0	0.0	0.0	0.0	0.0
24	0.438						0.0	0.0	0.0	0.0	0.0
25	0.423						0.0	0.0	0.0	0.0	0.0
26	0.409						0.0	0.0	0.0	0.0	0.0
27	0.395						0.0	0.0	0.0	0.0	0.0
28	0.382						0.0	0.0	0.0	0.0	0.0
29	0.369						0.0	0.0	0.0	0.0	0.0
30	0.356						0.0	0.0	0.0	0.0	0.0
31	0.346						0.0	0.0	0.0	0.0	0.0
32	0.336						0.0	0.0	0.0	0.0	0.0
33	0.326						0.0	0.0	0.0	0.0	0.0
34	0.317						0.0	0.0	0.0	0.0	0.0
35	0.307						0.0	0.0	0.0	0.0	0.0
36	0.298						0.0	0.0	0.0	0.0	0.0
37	0.290						0.0	0.0	0.0	0.0	0.0
38	0.281						0.0	0.0	0.0	0.0	0.0
39	0.273						0.0	0.0	0.0	0.0	0.0
40	0.265						0.0	0.0	0.0	0.0	0.0
41	0.257						0.0	0.0	0.0	0.0	0.0
42	0.250						0.0	0.0	0.0	0.0	0.0
43	0.243						0.0	0.0	0.0	0.0	0.0
44	0.236						0.0	0.0	0.0	0.0	0.0
45	0.229						0.0	0.0	0.0	0.0	0.0
46	0.222						0.0	0.0	0.0	0.0	0.0
47	0.216						0.0	0.0	0.0	0.0	0.0
48	0.209						0.0	0.0	0.0	0.0	0.0
49	0.203						0.0	0.0	0.0	0.0	0.0
50	0.197						0.0	0.0	0.0	0.0	0.0
51	0.192						0.0	0.0	0.0	0.0	0.0
52	0.186						0.0	0.0	0.0	0.0	0.0
53	0.181						0.0	0.0	0.0	0.0	0.0
54	0.175						0.0	0.0	0.0	0.0	0.0
55	0.170						0.0	0.0	0.0	0.0	0.0
56	0.165						0.0	0.0	0.0	0.0	0.0
57	0.160						0.0	0.0	0.0	0.0	0.0
58	0.156						0.0	0.0	0.0	0.0	0.0
59	0.151						0.0	0.0	0.0	0.0	0.0
60	0.147						0.0	0.0	0.0	0.0	0.0
61	0.143						0.0	0.0	0.0	0.0	0.0
62	0.138						0.0	0.0	0.0	0.0	0.0
63	0.134						0.0	0.0	0.0	0.0	0.0
64	0.130						0.0	0.0	0.0	0.0	0.0
65	0.127						0.0	0.0	0.0	0.0	0.0
66	0.123						0.0	0.0	0.0	0.0	0.0
67	0.119						0.0	0.0	0.0	0.0	0.0
68	0.116						0.0	0.0	0.0	0.0	0.0
69	0.112						0.0	0.0	0.0	0.0	0.0
70	0.109						0.0	0.0	0.0	0.0	0.0
71	0.106						0.0	0.0	0.0	0.0	0.0
72	0.103						0.0	0.0	0.0	0.0	0.0
73	0.100						0.0	0.0	0.0	0.0	0.0
74	0.097						0.0	0.0	0.0	0.0	0.0
75	0.094						0.0	0.0	0.0	0.0	0.0
76	0.092						0.0	0.0	0.0	0.0	0.0
77	0.090						0.0	0.0	0.0	0.0	0.0
78	0.087						0.0	0.0	0.0	0.0	0.0
79	0.085						0.0	0.0	0.0	0.0	0.0
80	0.083						0.0	0.0	0.0	0.0	0.0
81	0.081						0.0	0.0	0.0	0.0	0.0
82	0.079						0.0	0.0	0.0	0.0	0.0
83	0.077						0.0	0.0	0.0	0.0	0.0
84	0.075						0.0	0.0	0.0	0.0	0.0
85	0.074						0.0	0.0	0.0	0.0	0.0
86	0.072						0.0	0.0	0.0	0.0	0.0
87	0.070						0.0	0.0	0.0	0.0	0.0
88	0.068						0.0	0.0	0.0	0.0	0.0
89	0.067						0.0	0.0	0.0	0.0	0.0
90	0.065						0.0	0.0	0.0	0.0	0.0
91	0.063						0.0	0.0	0.0	0.0	0.0
92	0.062						0.0	0.0	0.0	0.0	0.0
93	0.060						0.0	0.0	0.0	0.0	0.0
94	0.059						0.0	0.0	0.0	0.0	0.0
95	0.057						0.0	0.0	0.0	0.0	0.0
96	0.056						0.0	0.0	0.0	0.0	0.0
97	0.055						0.0	0.0	0.0	0.0	0.0
98	0.053						0.0	0.0	0.0	0.0	0.0
99	0.052						0.0	0.0	0.0	0.0	0.0

Option 2 – Rock Revetment Phases 1, 2 and 3

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	83066.1	1722.6		7871.1	0.0	92659.8	79139.4	456.7	7579.1	0.0
0	39040.3			3904.0		42944.3	39040.3	0.0	3904.0	0.0
1	0.0			1151.7		1151.7	0.0	0.0	1112.7	0.0
2	13792.3			899.7		14692.1	12875.3	0.0	839.9	0.0
3	28758.1			1740.9		30499.0	25938.1	0.0	1570.2	0.0
4	1475.4			174.7		1650.1	1285.7	0.0	152.2	0.0
5		55.9				55.9	0.0	47.1	0.0	0.0
6						0.0	0.0	0.0	0.0	0.0
7						0.0	0.0	0.0	0.0	0.0
8						0.0	0.0	0.0	0.0	0.0
9						0.0	0.0	0.0	0.0	0.0
10		55.9				55.9	0.0	39.6	0.0	0.0
11						0.0	0.0	0.0	0.0	0.0
12						0.0	0.0	0.0	0.0	0.0
13						0.0	0.0	0.0	0.0	0.0
14						0.0	0.0	0.0	0.0	0.0
15		55.9				55.9	0.0	33.4	0.0	0.0
16						0.0	0.0	0.0	0.0	0.0
17						0.0	0.0	0.0	0.0	0.0
18						0.0	0.0	0.0	0.0	0.0
19						0.0	0.0	0.0	0.0	0.0
20		55.9				55.9	0.0	28.1	0.0	0.0
21						0.0	0.0	0.0	0.0	0.0
22						0.0	0.0	0.0	0.0	0.0
23						0.0	0.0	0.0	0.0	0.0
24						0.0	0.0	0.0	0.0	0.0
25		276.0				276.0	0.0	116.8	0.0	0.0
26						0.0	0.0	0.0	0.0	0.0
27						0.0	0.0	0.0	0.0	0.0
28						0.0	0.0	0.0	0.0	0.0
29						0.0	0.0	0.0	0.0	0.0
30		55.9				55.9	0.0	19.9	0.0	0.0
31						0.0	0.0	0.0	0.0	0.0
32						0.0	0.0	0.0	0.0	0.0
33						0.0	0.0	0.0	0.0	0.0
34						0.0	0.0	0.0	0.0	0.0
35		55.9				55.9	0.0	17.2	0.0	0.0
36						0.0	0.0	0.0	0.0	0.0
37						0.0	0.0	0.0	0.0	0.0
38						0.0	0.0	0.0	0.0	0.0
39						0.0	0.0	0.0	0.0	0.0
40		55.9				55.9	0.0	14.8	0.0	0.0
41						0.0	0.0	0.0	0.0	0.0
42						0.0	0.0	0.0	0.0	0.0
43						0.0	0.0	0.0	0.0	0.0
44						0.0	0.0	0.0	0.0	0.0
45		55.9				55.9	0.0	12.8	0.0	0.0
46						0.0	0.0	0.0	0.0	0.0
47						0.0	0.0	0.0	0.0	0.0
48						0.0	0.0	0.0	0.0	0.0
49						0.0	0.0	0.0	0.0	0.0
50		276.0				276.0	0.0	54.5	0.0	0.0
51						0.0	0.0	0.0	0.0	0.0
52						0.0	0.0	0.0	0.0	0.0
53						0.0	0.0	0.0	0.0	0.0
54						0.0	0.0	0.0	0.0	0.0
55		55.9				55.9	0.0	9.5	0.0	0.0
56						0.0	0.0	0.0	0.0	0.0
57						0.0	0.0	0.0	0.0	0.0
58						0.0	0.0	0.0	0.0	0.0
59						0.0	0.0	0.0	0.0	0.0
60		55.9				55.9	0.0	8.2	0.0	0.0
61						0.0	0.0	0.0	0.0	0.0
62						0.0	0.0	0.0	0.0	0.0
63						0.0	0.0	0.0	0.0	0.0
64						0.0	0.0	0.0	0.0	0.0
65		55.9				55.9	0.0	7.1	0.0	0.0
66						0.0	0.0	0.0	0.0	0.0
67						0.0	0.0	0.0	0.0	0.0
68						0.0	0.0	0.0	0.0	0.0
69						0.0	0.0	0.0	0.0	0.0
70		55.9				55.9	0.0	6.1	0.0	0.0
71						0.0	0.0	0.0	0.0	0.0
72						0.0	0.0	0.0	0.0	0.0
73						0.0	0.0	0.0	0.0	0.0
74						0.0	0.0	0.0	0.0	0.0
75		276.0				276.0	0.0	26.0	0.0	0.0
76						0.0	0.0	0.0	0.0	0.0
77						0.0	0.0	0.0	0.0	0.0
78						0.0	0.0	0.0	0.0	0.0
79						0.0	0.0	0.0	0.0	0.0
80		55.9				55.9	0.0	4.7	0.0	0.0
81						0.0	0.0	0.0	0.0	0.0
82						0.0	0.0	0.0	0.0	0.0
83						0.0	0.0	0.0	0.0	0.0
84						0.0	0.0	0.0	0.0	0.0
85		55.9				55.9	0.0	4.1	0.0	0.0
86						0.0	0.0	0.0	0.0	0.0
87						0.0	0.0	0.0	0.0	0.0
88						0.0	0.0	0.0	0.0	0.0
89						0.0	0.0	0.0	0.0	0.0
90		55.9				55.9	0.0	3.6	0.0	0.0
91						0.0	0.0	0.0	0.0	0.0
92						0.0	0.0	0.0	0.0	0.0
93						0.0	0.0	0.0	0.0	0.0
94						0.0	0.0	0.0	0.0	0.0
95		55.9				55.9	0.0	3.2	0.0	0.0
96						0.0	0.0	0.0	0.0	0.0
97						0.0	0.0	0.0	0.0	0.0
98						0.0	0.0	0.0	0.0	0.0
99						0.0	0.0	0.0	0.0	0.0

Option 3 – Beach Recharge Phases 1 and 2, Rock R

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	60970.0	859.7		7997.8	0.0	119594.1	57197.6	13079.2	5906.1	0.0
0	19209.7			1988.2		21197.9	19209.7	0.0	1988.2	0.0
1	0.0			540.1		540.1	0.0	0.0	521.9	0.0
2	11640.2			1246.7		12886.9	10866.2	0.0	1163.8	0.0
3	28644.8		10.4	1747.1		30402.3	25836.0	9.4	1575.8	0.0
4	1475.4		10.4	29.5		1515.3	1285.7	9.1	25.7	0.0
5		27.9	10.4			38.3	0.0	32.2	0.0	0.0
6			10.4			10.4	0.0	8.5	0.0	0.0
7			10.4			10.4	0.0	8.2	0.0	0.0
8			3057.8	152.9		3210.6	0.0	2322.1	116.1	0.0
9			10.4			10.4	0.0	7.6	0.0	0.0
10		27.9	10.4			38.3	0.0	27.2	0.0	0.0
11			10.4			10.4	0.0	7.1	0.0	0.0
12			10.4			10.4	0.0	6.9	0.0	0.0
13			10.4			10.4	0.0	6.6	0.0	0.0
14			3057.8	152.9		3210.6	0.0	1889.0	94.5	0.0
15		27.9	10.4			38.3	0.0	22.9	0.0	0.0
16			10.4			10.4	0.0	6.0	0.0	0.0
17			10.4			10.4	0.0	5.8	0.0	0.0
18			10.4			10.4	0.0	5.6	0.0	0.0
19			10.4			10.4	0.0	5.4	0.0	0.0
20		27.9	3057.8	152.9		3238.5	0.0	1550.7	76.8	0.0
21			10.4			10.4	0.0	5.0	0.0	0.0
22			10.4			10.4	0.0	4.9	0.0	0.0
23			10.4			10.4	0.0	4.7	0.0	0.0
24			10.4			10.4	0.0	4.6	0.0	0.0
25		137.8	10.4			148.2	0.0	62.7	0.0	0.0
26			3057.8	152.9		3210.6	0.0	1250.1	62.5	0.0
27			10.4			10.4	0.0	4.1	0.0	0.0
28			10.4			10.4	0.0	4.0	0.0	0.0
29			10.4			10.4	0.0	3.8	0.0	0.0
30		27.9	10.4			38.3	0.0	13.6	0.0	0.0
31			10.4			10.4	0.0	3.6	0.0	0.0
32			3057.8	152.9		3210.6	0.0	1026.9	51.3	0.0
33			10.4			10.4	0.0	3.4	0.0	0.0
34			10.4			10.4	0.0	3.3	0.0	0.0
35		27.9	10.4			38.3	0.0	11.8	0.0	0.0
36			10.4			10.4	0.0	3.1	0.0	0.0
37			10.4			10.4	0.0	3.0	0.0	0.0
38			3057.8	152.9		3210.6	0.0	860.0	43.0	0.0
39			10.4			10.4	0.0	2.8	0.0	0.0
40		27.9	10.4			38.3	0.0	10.2	0.0	0.0
41			10.4			10.4	0.0	2.7	0.0	0.0
42			10.4			10.4	0.0	2.6	0.0	0.0
43			10.4			10.4	0.0	2.5	0.0	0.0
44			3057.8	152.9		3210.6	0.0	720.2	36.0	0.0
45		27.9	10.4			38.3	0.0	8.8	0.0	0.0
46			10.4			10.4	0.0	2.3	0.0	0.0
47			10.4			10.4	0.0	2.2	0.0	0.0
48			10.4			10.4	0.0	2.2	0.0	0.0
49			10.4			10.4	0.0	2.1	0.0	0.0
50		137.8	3057.8	152.9		3348.4	0.0	630.4	30.2	0.0
51			10.4			10.4	0.0	2.0	0.0	0.0
52			10.4			10.4	0.0	1.9	0.0	0.0
53			10.4			10.4	0.0	1.9	0.0	0.0
54			10.4			10.4	0.0	1.8	0.0	0.0
55		27.9	10.4			38.3	0.0	6.5	0.0	0.0
56			3057.8	152.9		3210.6	0.0	505.2	25.3	0.0
57			10.4			10.4	0.0	1.7	0.0	0.0
58			10.4			10.4	0.0	1.6	0.0	0.0
59			10.4			10.4	0.0	1.6	0.0	0.0
60		27.9	10.4			38.3	0.0	5.6	0.0	0.0
61			10.4			10.4	0.0	1.5	0.0	0.0
62			3057.8	152.9		3210.6	0.0	423.1	21.2	0.0
63			10.4			10.4	0.0	1.4	0.0	0.0
64			10.4			10.4	0.0	1.4	0.0	0.0
65		27.9	10.4			38.3	0.0	4.8	0.0	0.0
66			10.4			10.4	0.0	1.3	0.0	0.0
67			10.4			10.4	0.0	1.2	0.0	0.0
68			3057.8	152.9		3210.6	0.0	354.3	17.7	0.0
69			10.4			10.4	0.0	1.2	0.0	0.0
70		27.9	10.4			38.3	0.0	4.2	0.0	0.0
71			10.4			10.4	0.0	1.1	0.0	0.0
72			10.4			10.4	0.0	1.1	0.0	0.0
73			10.4			10.4	0.0	1.0	0.0	0.0
74			3057.8	152.9		3210.6	0.0	296.7	14.8	0.0
75		137.8	10.4			148.2	0.0	14.0	0.0	0.0
76			10.4			10.4	0.0	1.0	0.0	0.0
77			10.4			10.4	0.0	0.9	0.0	0.0
78			10.4			10.4	0.0	0.9	0.0	0.0
79			10.4			10.4	0.0	0.9	0.0	0.0
80		27.9	3057.8	152.9		3238.5	0.0	256.9	12.7	0.0
81			10.4			10.4	0.0	0.8	0.0	0.0
82			10.4			10.4	0.0	0.8	0.0	0.0
83			10.4			10.4	0.0	0.8	0.0	0.0
84			10.4			10.4	0.0	0.8	0.0	0.0
85		27.9	10.4			38.3	0.0	2.8	0.0	0.0
86			3057.8	152.9		3210.6	0.0	219.6	11.0	0.0
87			10.4			10.4	0.0	0.7	0.0	0.0
88			10.4			10.4	0.0	0.7	0.0	0.0
89			10.4			10.4	0.0	0.7	0.0	0.0
90		27.9	10.4			38.3	0.0	2.5	0.0	0.0
91			10.4			10.4	0.0	0.7	0.0	0.0
92			3057.8	152.9		3210.6	0.0	189.3	9.5	0.0
93			10.4			10.4	0.0	0.6	0.0	0.0
94			10.4			10.4	0.0	0.6	0.0	0.0
95		27.9	10.4			38.3	0.0	2.2	0.0	0.0
96			10.4			10.4	0.0	0.6	0.0	0.0
97			10.4			10.4	0.0	0.6	0.0	0.0
98			3057.8	152.9		3210.6	0.0	163.3	8.2	0.0
99			10.4			10.4	0.0	0.5	0.0	0.0

Option 4 – Beach Recharge Phase 1, Beach Recharg… (Single BW)

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	67843.4	782.5	40624.5	8361.0	0.0	117611.3	63603.1	10969.0	6578.9	0.0
0	19209.7			1988.2		21197.9	19209.7	0.0	1988.2	0.0
1	0.0			868.9		868.9	0.0	0.0	839.5	0.0
2	18169.9			1731.6		19901.4	16961.8	0.0	1616.4	0.0
3	28988.5		10.4	1755.3		30754.2	26146.0	9.4	1583.2	0.0
4	1475.4		10.4	29.5		1515.3	1285.7	9.1	25.7	0.0
5		25.4	10.4			35.8	0.0	30.1	0.0	0.0
6			10.4			10.4	0.0	8.5	0.0	0.0
7			10.4			10.4	0.0	8.2	0.0	0.0
8			10.4			10.4	0.0	7.9	0.0	0.0
9			3057.8	152.9		3210.6	0.0	2243.6	112.2	0.0
10		25.4	10.4			35.8	0.0	25.4	0.0	0.0
11			10.4			10.4	0.0	7.1	0.0	0.0
12			10.4			10.4	0.0	6.9	0.0	0.0
13			10.4			10.4	0.0	6.6	0.0	0.0
14			10.4			10.4	0.0	6.4	0.0	0.0
15		25.4	10.4			35.8	0.0	21.4	0.0	0.0
16			3057.8	152.9		3210.6	0.0	1763.4	88.2	0.0
17			10.4			10.4	0.0	5.8	0.0	0.0
18			10.4			10.4	0.0	5.6	0.0	0.0
19			10.4			10.4	0.0	5.4	0.0	0.0
20		25.4	10.4			35.8	0.0	18.0	0.0	0.0
21			10.4			10.4	0.0	5.0	0.0	0.0
22			10.4			10.4	0.0	4.9	0.0	0.0
23			3057.8	152.9		3210.6	0.0	1386.0	69.3	0.0
24			10.4			10.4	0.0	4.6	0.0	0.0
25		125.4	10.4			135.8	0.0	57.5	0.0	0.0
26			10.4			10.4	0.0	4.3	0.0	0.0
27			10.4			10.4	0.0	4.1	0.0	0.0
28			10.4			10.4	0.0	4.0	0.0	0.0
29			10.4			10.4	0.0	3.8	0.0	0.0
30		25.4	3057.8	152.9		3236.0	0.0	1098.5	54.5	0.0
31			10.4			10.4	0.0	3.6	0.0	0.0
32			10.4			10.4	0.0	3.5	0.0	0.0
33			10.4			10.4	0.0	3.4	0.0	0.0
34			10.4			10.4	0.0	3.3	0.0	0.0
35		25.4	10.4			35.8	0.0	11.0	0.0	0.0
36			10.4			10.4	0.0	3.1	0.0	0.0
37			3057.8	152.9		3210.6	0.0	885.8	44.3	0.0
38			10.4			10.4	0.0	2.9	0.0	0.0
39			10.4			10.4	0.0	2.8	0.0	0.0
40		25.4	10.4			35.8	0.0	9.5	0.0	0.0
41			10.4			10.4	0.0	2.7	0.0	0.0
42			10.4			10.4	0.0	2.6	0.0	0.0
43			10.4			10.4	0.0	2.5	0.0	0.0
44			3057.8	152.9		3210.6	0.0	720.2	36.0	0.0
45		25.4	10.4			35.8	0.0	8.2	0.0	0.0
46			10.4			10.4	0.0	2.3	0.0	0.0
47			10.4			10.4	0.0	2.2	0.0	0.0
48			10.4			10.4	0.0	2.2	0.0	0.0
49			10.4			10.4	0.0	2.1	0.0	0.0
50		125.4	10.4			135.8	0.0	26.8	0.0	0.0
51			3057.8	152.9		3210.6	0.0	585.6	29.3	0.0
52			10.4			10.4	0.0	1.9	0.0	0.0
53			10.4			10.4	0.0	1.9	0.0	0.0
54			10.4			10.4	0.0	1.8	0.0	0.0
55		25.4	10.4			35.8	0.0	6.1	0.0	0.0
56			10.4			10.4	0.0	1.7	0.0	0.0
57			10.4			10.4	0.0	1.7	0.0	0.0
58			3057.8	152.9		3210.6	0.0	476.2	23.8	0.0
59			10.4			10.4	0.0	1.6	0.0	0.0
60		25.4	10.4			35.8	0.0	5.3	0.0	0.0
61			10.4			10.4	0.0	1.5	0.0	0.0
62			10.4			10.4	0.0	1.4	0.0	0.0
63			10.4			10.4	0.0	1.4	0.0	0.0
64			10.4			10.4	0.0	1.4	0.0	0.0
65		25.4	3057.8	152.9		3236.0	0.0	390.4	19.4	0.0
66			10.4			10.4	0.0	1.3	0.0	0.0
67			10.4			10.4	0.0	1.2	0.0	0.0
68			10.4			10.4	0.0	1.2	0.0	0.0
69			10.4			10.4	0.0	1.2	0.0	0.0
70		25.4	10.4			35.8	0.0	3.9	0.0	0.0
71			10.4			10.4	0.0	1.1	0.0	0.0
72			3057.8	152.9		3210.6	0.0	314.8	15.7	0.0
73			10.4			10.4	0.0	1.0	0.0	0.0
74			10.4			10.4	0.0	1.0	0.0	0.0
75		125.4	10.4			135.8	0.0	12.8	0.0	0.0
76			10.4			10.4	0.0	1.0	0.0	0.0
77			10.4			10.4	0.0	0.9	0.0	0.0
78			10.4			10.4	0.0	0.9	0.0	0.0
79			3057.8	152.9		3210.6	0.0	261.0	13.0	0.0
80		25.4	10.4			35.8	0.0	3.0	0.0	0.0
81			10.4			10.4	0.0	0.8	0.0	0.0
82			10.4			10.4	0.0	0.8	0.0	0.0
83			10.4			10.4	0.0	0.8	0.0	0.0
84			10.4			10.4	0.0	0.8	0.0	0.0
85		25.4	10.4			35.8	0.0	2.6	0.0	0.0
86			3057.8	152.9		3210.6	0.0	219.6	11.0	0.0
87			10.4			10.4	0.0	0.7	0.0	0.0
88			10.4			10.4	0.0	0.7	0.0	0.0
89			10.4			10.4	0.0	0.7	0.0	0.0
90		25.4	10.4			35.8	0.0	2.3	0.0	0.0
91			10.4			10.4	0.0	0.7	0.0	0.0
92			10.4			10.4	0.0	0.6	0.0	0.0
93			3057.8	152.9		3210.6	0.0	184.7	9.2	0.0
94			10.4			10.4	0.0	0.6	0.0	0.0
95		25.4	10.4			35.8	0.0	2.1	0.0	0.0
96			10.4			10.4	0.0	0.6	0.0	0.0
97			10.4			10.4	0.0	0.6	0.0	0.0
98			10.4			10.4	0.0	0.6	0.0	0.0
99			10.4			10.4	0.0	0.5	0.0	0.0

Option 4 (Beach Recharge Phase 1, Beach Recharg… (Twin BW)

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	74716.7	877.3	25387.7	8112.0	0.0	109093.7	70008.6	6229.2	6827.6	0.0
0	19209.7			1988.2		21197.9	19209.7	0.0	1988.2	0.0
1	0.0			1075.1		1075.1	0.0	0.0	1038.7	0.0
2	24699.5			2035.7		26735.2	23057.3	0.0	1900.4	0.0
3	29332.2		10.4	1760.4		31103.0	26455.9	9.4	1587.8	0.0
4	1475.4		10.4	29.5		1515.3	1285.7	9.1	25.7	0.0
5		28.5	10.4			38.9	0.0	32.7	0.0	0.0
6			10.4			10.4	0.0	8.5	0.0	0.0
7			10.4			10.4	0.0	8.2	0.0	0.0
8			10.4			10.4	0.0	7.9	0.0	0.0
9			10.4			10.4	0.0	7.6	0.0	0.0
10		28.5	10.4			38.9	0.0	27.6	0.0	0.0
11			10.4			10.4	0.0	7.1	0.0	0.0
12			10.4			10.4	0.0	6.9	0.0	0.0
13			10.4			10.4	0.0	6.6	0.0	0.0
14			3057.8	152.9		3210.6	0.0	1889.0	94.5	0.0
15		28.5	10.4			38.9	0.0	23.2	0.0	0.0
16			10.4			10.4	0.0	6.0	0.0	0.0
17			10.4			10.4	0.0	5.8	0.0	0.0
18			10.4			10.4	0.0	5.6	0.0	0.0
19			10.4			10.4	0.0	5.4	0.0	0.0
20		28.5	10.4			38.9	0.0	19.5	0.0	0.0
21			10.4			10.4	0.0	5.0	0.0	0.0
22			10.4			10.4	0.0	4.9	0.0	0.0
23			10.4			10.4	0.0	4.7	0.0	0.0
24			10.4			10.4	0.0	4.6	0.0	0.0
25		140.6	10.4			151.0	0.0	63.9	0.0	0.0
26			3057.8	152.9		3210.6	0.0	1250.1	62.5	0.0
27			10.4			10.4	0.0	4.1	0.0	0.0
28			10.4			10.4	0.0	4.0	0.0	0.0
29			10.4			10.4	0.0	3.8	0.0	0.0
30		28.5	10.4			38.9	0.0	13.8	0.0	0.0
31			10.4			10.4	0.0	3.6	0.0	0.0
32			10.4			10.4	0.0	3.5	0.0	0.0
33			10.4			10.4	0.0	3.4	0.0	0.0
34			10.4			10.4	0.0	3.3	0.0	0.0
35		28.5	10.4			38.9	0.0	11.9	0.0	0.0
36			10.4			10.4	0.0	3.1	0.0	0.0
37			3057.8	152.9		3210.6	0.0	885.8	44.3	0.0
38			10.4			10.4	0.0	2.9	0.0	0.0
39			10.4			10.4	0.0	2.8	0.0	0.0
40		28.5	10.4			38.9	0.0	10.3	0.0	0.0
41			10.4			10.4	0.0	2.7	0.0	0.0
42			10.4			10.4	0.0	2.6	0.0	0.0
43			10.4			10.4	0.0	2.5	0.0	0.0
44			10.4			10.4	0.0	2.4	0.0	0.0
45		28.5	10.4			38.9	0.0	8.9	0.0	0.0
46			10.4			10.4	0.0	2.3	0.0	0.0
47			10.4			10.4	0.0	2.2	0.0	0.0
48			10.4			10.4	0.0	2.2	0.0	0.0
49			10.4			10.4	0.0	2.1	0.0	0.0
50		140.6	3057.8	152.9		3351.2	0.0	630.9	30.2	0.0
51			10.4			10.4	0.0	2.0	0.0	0.0
52			10.4			10.4	0.0	1.9	0.0	0.0
53			10.4			10.4	0.0	1.9	0.0	0.0
54			10.4			10.4	0.0	1.8	0.0	0.0
55		28.5	10.4			38.9	0.0	6.6	0.0	0.0
56			10.4			10.4	0.0	1.7	0.0	0.0
57			10.4			10.4	0.0	1.7	0.0	0.0
58			10.4			10.4	0.0	1.6	0.0	0.0
59			10.4			10.4	0.0	1.6	0.0	0.0
60		28.5	10.4			38.9	0.0	5.7	0.0	0.0
61			10.4			10.4	0.0	1.5	0.0	0.0
62			3057.8	152.9		3210.6	0.0	423.1	21.2	0.0
63			10.4			10.4	0.0	1.4	0.0	0.0
64			10.4			10.4	0.0	1.4	0.0	0.0
65		28.5	10.4			38.9	0.0	4.9	0.0	0.0
66			10.4			10.4	0.0	1.3	0.0	0.0
67			10.4			10.4	0.0	1.2	0.0	0.0
68			10.4			10.4	0.0	1.2	0.0	0.0
69			10.4			10.4	0.0	1.2	0.0	0.0
70		28.5	10.4			38.9	0.0	4.2	0.0	0.0
71			10.4			10.4	0.0	1.1	0.0	0.0
72			10.4			10.4	0.0	1.1	0.0	0.0
73			10.4			10.4	0.0	1.0	0.0	0.0
74			3057.8	152.9		3210.6	0.0	296.7	14.8	0.0
75		140.6	10.4			151.0	0.0	14.2	0.0	0.0
76			10.4			10.4	0.0	1.0	0.0	0.0
77			10.4			10.4	0.0	0.9	0.0	0.0
78			10.4			10.4	0.0	0.9	0.0	0.0
79			10.4			10.4	0.0	0.9	0.0	0.0
80		28.5	10.4			38.9	0.0	3.2	0.0	0.0
81			10.4			10.4	0.0	0.8	0.0	0.0
82			10.4			10.4	0.0	0.8	0.0	0.0
83			10.4			10.4	0.0	0.8	0.0	0.0
84			10.4			10.4	0.0	0.8	0.0	0.0
85		28.5	3057.8	152.9		3239.1	0.0	227.1	11.3	0.0
86			10.4			10.4	0.0	0.7	0.0	0.0
87			10.4			10.4	0.0	0.7	0.0	0.0
88			10.4			10.4	0.0	0.7	0.0	0.0
89			10.4			10.4	0.0	0.7	0.0	0.0
90		28.5	10.4			38.9	0.0	2.5	0.0	0.0
91			10.4			10.4	0.0	0.7	0.0	0.0
92			10.4			10.4	0.0	0.6	0.0	0.0
93			10.4			10.4	0.0	0.6	0.0	0.0
94			10.4			10.4	0.0	0.6	0.0	0.0
95		28.5	10.4			38.9	0.0	2.2	0.0	0.0
96			10.4			10.4	0.0	0.6	0.0	0.0
97			10.4			10.4	0.0	0.6	0.0	0.0
98			3057.8	152.9		3210.6	0.0	163.3	8.2	0.0
99			10.4			10.4	0.0	0.5	0.0	0.0

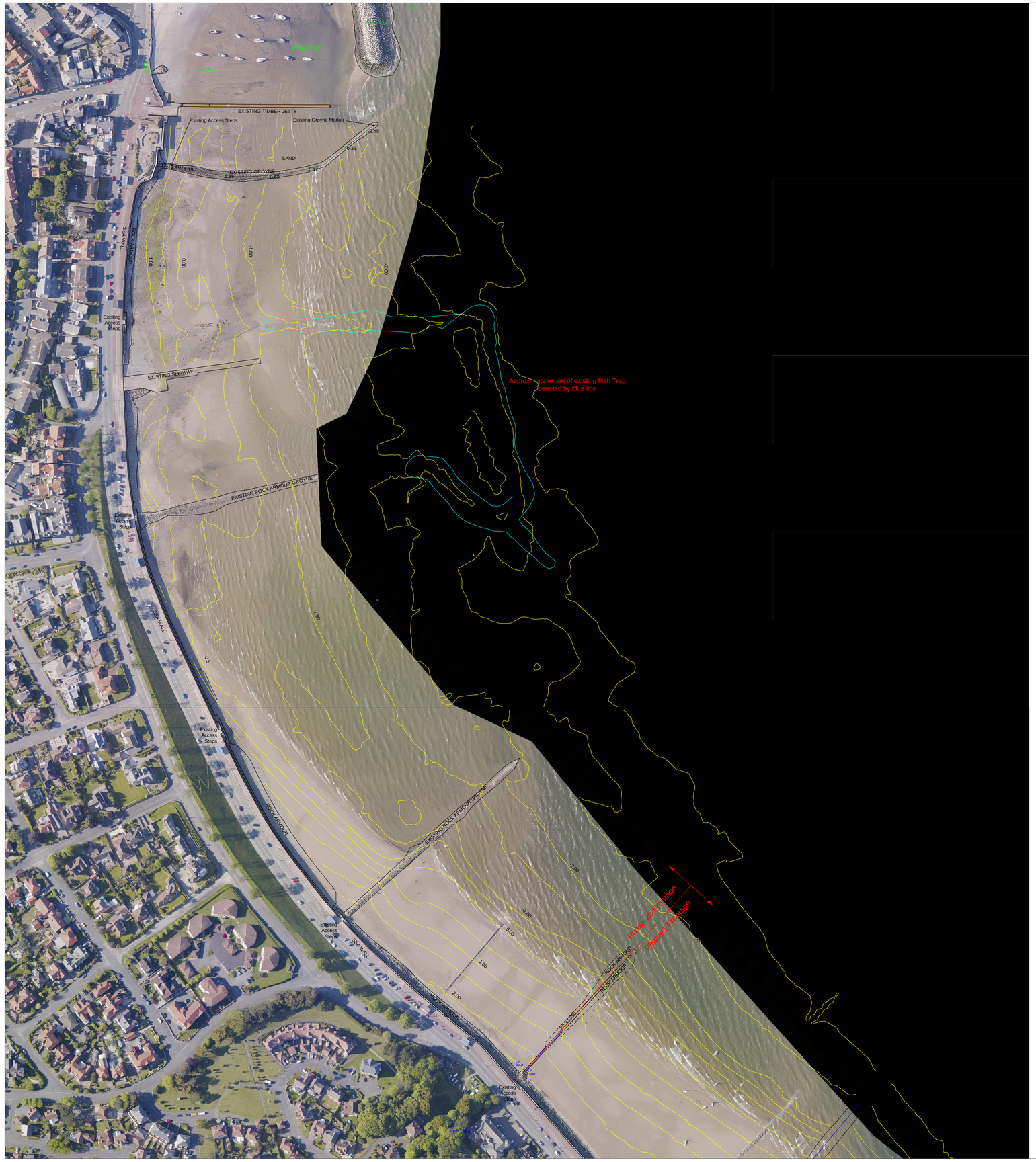
Option 4 (Beach Recharge Phase 1, Beach Recharg… (SC Groynes)

year	Capital	Struct Maint.	Beach Maint.	Fees	Negative costs	TOTALS: PV Cash	PV Capital	PV Maint	PV Fees	PV Negative costs
cash sum	64771.2	1076.9	37577.1	7977.7	0.0	111402.9	60740.0	9686.8	6292.6	0.0
0	19209.7			1988.2		21197.9	19209.7	0.0	1988.2	0.0
1	0.0			776.7		776.7	0.0	0.0	750.4	0.0
2	15251.3			1595.6		16846.9	14237.2	0.0	1489.5	0.0
3	28834.9		10.4	1753.0		30598.3	26007.4	9.4	1581.1	0.0
4	1475.4		10.4	29.5		1515.3	1285.7	9.1	25.7	0.0
5		35.0	10.4			45.4	0.0	38.2	0.0	0.0
6			10.4			10.4	0.0	8.5	0.0	0.0
7			10.4			10.4	0.0	8.2	0.0	0.0
8			10.4			10.4	0.0	7.9	0.0	0.0
9			10.4			10.4	0.0	7.6	0.0	0.0
10		35.0	3057.8	152.9		3245.6	0.0	2192.5	108.4	0.0
11			10.4			10.4	0.0	7.1	0.0	0.0
12			10.4			10.4	0.0	6.9	0.0	0.0
13			10.4			10.4	0.0	6.6	0.0	0.0
14			10.4			10.4	0.0	6.4	0.0	0.0
15		35.0	10.4			45.4	0.0	27.1	0.0	0.0
16			10.4			10.4	0.0	6.0	0.0	0.0
17			10.4			10.4	0.0	5.8	0.0	0.0
18			3057.8	152.9		3210.6	0.0	1646.2	82.3	0.0
19			10.4			10.4	0.0	5.4	0.0	0.0
20		35.0	10.4			45.4	0.0	22.8	0.0	0.0
21			10.4			10.4	0.0	5.0	0.0	0.0
22			10.4			10.4	0.0	4.9	0.0	0.0
23			10.4			10.4	0.0	4.7	0.0	0.0
24			10.4			10.4	0.0	4.6	0.0	0.0
25		172.6	10.4			183.0	0.0	77.4	0.0	0.0
26			3057.8	152.9		3210.6	0.0	1250.1	62.5	0.0
27			10.4			10.4	0.0	4.1	0.0	0.0
28			10.4			10.4	0.0	4.0	0.0	0.0
29			10.4			10.4	0.0	3.8	0.0	0.0
30		35.0	10.4			45.4	0.0	16.2	0.0	0.0
31			10.4			10.4	0.0	3.6	0.0	0.0
32			10.4			10.4	0.0	3.5	0.0	0.0
33			10.4			10.4	0.0	3.4	0.0	0.0
34			3057.8	152.9		3210.6	0.0	967.9	48.4	0.0
35		35.0	10.4			45.4	0.0	13.9	0.0	0.0
36			10.4			10.4	0.0	3.1	0.0	0.0
37			10.4			10.4	0.0	3.0	0.0	0.0
38			10.4			10.4	0.0	2.9	0.0	0.0
39			10.4			10.4	0.0	2.8	0.0	0.0
40		35.0	10.4			45.4	0.0	12.0	0.0	0.0
41			10.4			10.4	0.0	2.7	0.0	0.0
42			3057.8	152.9		3210.6	0.0	764.1	38.2	0.0
43			10.4			10.4	0.0	2.5	0.0	0.0
44			10.4			10.4	0.0	2.4	0.0	0.0
45		35.0	10.4			45.4	0.0	10.4	0.0	0.0
46			10.4			10.4	0.0	2.3	0.0	0.0
47			10.4			10.4	0.0	2.2	0.0	0.0
48			10.4			10.4	0.0	2.2	0.0	0.0
49			10.4			10.4	0.0	2.1	0.0	0.0
50		172.6	3057.8	152.9		3383.2	0.0	637.2	30.2	0.0
51			10.4			10.4	0.0	2.0	0.0	0.0
52			10.4			10.4	0.0	1.9	0.0	0.0
53			10.4			10.4	0.0	1.9	0.0	0.0
54			10.4			10.4	0.0	1.8	0.0	0.0
55		35.0	10.4			45.4	0.0	7.7	0.0	0.0
56			10.4			10.4	0.0	1.7	0.0	0.0
57			10.4			10.4	0.0	1.7	0.0	0.0
58			3057.8	152.9		3210.6	0.0	476.2	23.8	0.0
59			10.4			10.4	0.0	1.6	0.0	0.0
60		35.0	10.4			45.4	0.0	6.7	0.0	0.0
61			10.4			10.4	0.0	1.5	0.0	0.0
62			10.4			10.4	0.0	1.4	0.0	0.0
63			10.4			10.4	0.0	1.4	0.0	0.0
64			10.4			10.4	0.0	1.4	0.0	0.0
65		35.0	10.4			45.4	0.0	5.7	0.0	0.0
66			3057.8	152.9		3210.6	0.0	375.9	18.8	0.0
67			10.4			10.4	0.0	1.2	0.0	0.0
68			10.4			10.4	0.0	1.2	0.0	0.0
69			10.4			10.4	0.0	1.2	0.0	0.0
70		35.0	10.4			45.4	0.0	5.0	0.0	0.0
71			10.4			10.4	0.0	1.1	0.0	0.0
72			10.4			10.4	0.0	1.1	0.0	0.0
73			10.4			10.4	0.0	1.0	0.0	0.0
74			3057.8	152.9		3210.6	0.0	296.7	14.8	0.0
75		172.6	10.4			183.0	0.0	17.2	0.0	0.0
76			10.4			10.4	0.0	1.0	0.0	0.0
77			10.4			10.4	0.0	0.9	0.0	0.0
78			10.4			10.4	0.0	0.9	0.0	0.0
79			10.4			10.4	0.0	0.9	0.0	0.0
80		35.0	10.4			45.4	0.0	3.8	0.0	0.0
81			10.4			10.4	0.0	0.8	0.0	0.0
82			3057.8	152.9		3210.6	0.0	242.4	12.1	0.0
83			10.4			10.4	0.0	0.8	0.0	0.0
84			10.4			10.4	0.0	0.8	0.0	0.0
85		35.0	10.4			45.4	0.0	3.3	0.0	0.0
86			10.4			10.4	0.0	0.7	0.0	0.0
87			10.4			10.4	0.0	0.7	0.0	0.0
88			10.4			10.4	0.0	0.7	0.0	0.0
89			10.4			10.4	0.0	0.7	0.0	0.0
90		35.0	3057.8	152.9		3245.6	0.0	201.2	9.9	0.0
91			10.4			10.4	0.0	0.7	0.0	0.0
92			10.4			10.4	0.0	0.6	0.0	0.0
93			10.4			10.4	0.0	0.6	0.0	0.0
94			10.4			10.4	0.0	0.6	0.0	0.0
95		35.0	10.4			45.4	0.0	2.6	0.0	0.0
96			10.4			10.4	0.0	0.6	0.0	0.0
97			10.4			10.4	0.0	0.6	0.0	0.0
98			3057.8	152.9		3210.6	0.0	163.3	8.2	0.0
99			10.4			10.4	0.0	0.5	0.0	0.0

10.3 APPENDIX C: PROJECT RISK REGISTER

10.3.1 See separate pdf file 03_1707 Project Risk Register (Ph2 Review 02_2018).pdf

Appendix 2.2 – Existing Beach Contour Drawings



Notes

1. All levels are in metres and are relative to OD (Ordnance Datum). All dimensions in metres unless otherwise stated. Horizontal Control points are relative to the National Grid OSGB36.

2. Existing foreshore levels applying across the frontage vary and those shown, taken from a survey recorded July 2020, are provided for guidance only.

3. This drawing shall be read in conjunction with all related drawings and Works information. All discrepancies shall be referred to the Project Manager for decision before proceeding

4. Do not scale from this drawing.

LIST OF DRAWINGS

66-2010-01: Phase 2b - Existing Beach Arrangements

66-2010-02: Phase 1 - Existing Beach Arrangements

66-2010-03: Phase 2b - Proposed Beach Arrangements

66-2010-04: Phase 1 - Proposed Beach Arrangements

66-2010-05: Typical Beach Recharge Cross Section

66-2010-06: Rhos-on-Sea Terminal Groyne Modifications

REV	DETAIL	DRAWN	CHECKED	DATE
3	Minor amendments made	AJW	AD	25/8/21
2	Drawing List Added	AJW	AD	8/7/21
1	Minor amendments made	AJW	AD	6/7/21

PROJECT

Colwyn Bay Waterfront
Phase 2b Coastal Defences

TITLE

Phase 2b - Existing Beach Arrangements

Coastal Engineering UK Ltd
26 Rhodesway, Wirral, CH61 0HG

Email: ceuk@coasteng.co.uk Tel: (0151) 558 1956

DRAWN BY:	CHECKED BY:	APPROVED BY:	APPROVAL DATE:
AJW	AD	NH	25/08/21

SCALE @ A0:	CAD File Ref:
1:1250	File: Phase 2b Layout.dwg Layout: 01 Phase 2b Existing Beach Contours

PROJECT Ref:	DRAWING No:	REV
100374-CEUK	/ 66-2010-01-03-T	3

File: \\DISKSTATION\My Documents\CECS\Clients\Mott MacDonald\2010 Colwyn Bay Phase 2b\Outputs\ Phase 2b Layout.dwg Layout: 01 Phase 2b Existing Beach Contours Date: Aug 25, 2021 17:31 User: alanj

Notes

1. All levels are in metres and are relative to OD (Ordnance Datum). All dimensions in metres unless otherwise stated. Horizontal Control points are relative to the National Grid OSGB36.

2. Existing foreshore levels applying across the frontage vary and those shown, taken from a survey recorded July 2020, are provided for guidance only.

3. This drawing shall be read in conjunction with all related drawings and Works information. All discrepancies shall be referred to the Project Manager for decision before proceeding

4. Do not scale from this drawing.

LIST OF DRAWINGS

66-2010-01: Phase 2b - Existing Beach Arrangements

66-2010-02: Phase 1 - Existing Beach Arrangements

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66-2010-04: Phase 1 - Proposed Beach Arrangements

66-2010-05: Typical Beach Recharge Cross Section

66-2010-06: Rhos-on-Sea Terminal Groyne Modifications

REV	DETAIL	DRAWN	CHECKED	DATE
2	Drawing List Added	AJW	AD	8/7/21
1	Minor amendments made	AJW	AD	6/7/21

PROJECT

Colwyn Bay Waterfront
Phase 2b Coastal Defences

TITLE

Phase 1 - Existing Beach Arrangements

Coastal Engineering UK Ltd
26 Rhodesway, Wirral, CH61 0HG

Email: ceuk@coasteng.co.uk Tel: (0151) 558 1956

DRAWN BY:	CHECKED BY:	APPROVED BY:	APPROVAL DATE:
AJW	AD	NH	08/07/21

SCALE @ A0: 1:1250

CAD File Ref:
File: Phase 2b Layout.dwg
Layout: 02 Phase 1 Existing Beach Contours

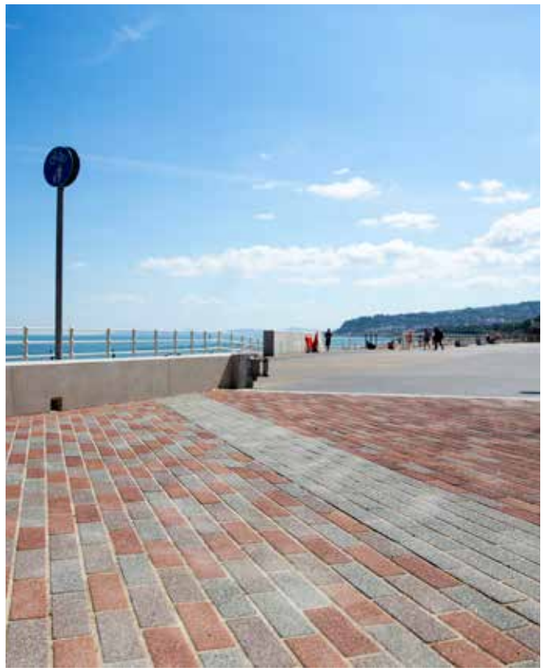
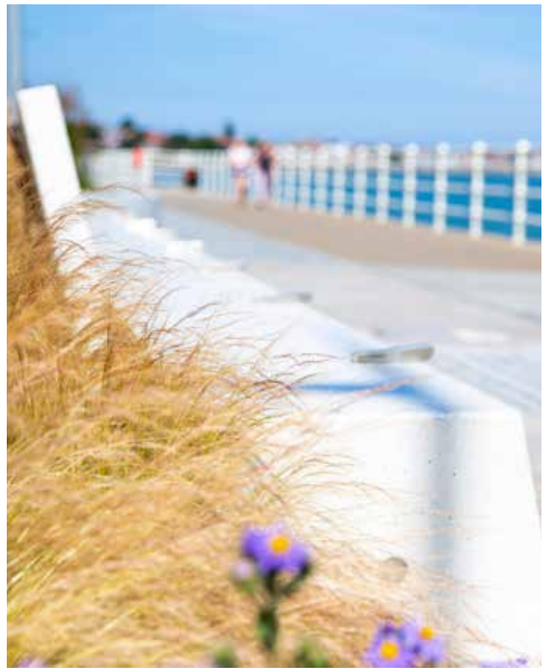
CONWY CYNGOR BWRDEISTREF SIROL COUNTY BOROUGH COUNCIL

MOTT MACDONALD

PROJECT Ref: 100374-CEUK / DRAWING No: 66-2010-02-02-T REV 2

File: \\DISKSTATION\My Documents\CEC\Clients\Mott McDonald\2010 Colwyn Bay Phase 2b\Outputs\ Phase 2b Layout.dwg Layout: 02 Phase 1 Existing Beach Contours Date: Jul 08, 2021 17:21 User: ablett

Appendix 2.3 – BCA Outline Design Document


Colwyn Bay

Phase 2B Promenade

OUTLINE DESIGN

August 2020

NOT FOR CONSTRUCTION

bcal

Landscape Proposal Overview

Landscape Overview

This document is to be read in conjunction with MottMacDonald's Highways and BCALandscape drawings.

Design is subject to change, detailed design and necessary approvals.

Street furniture/ play element/ artwork etc not detailed on the GA drawings, see visualisations for envisaged outline approach.

Vehicle wheel stops to be incorporated along parking.

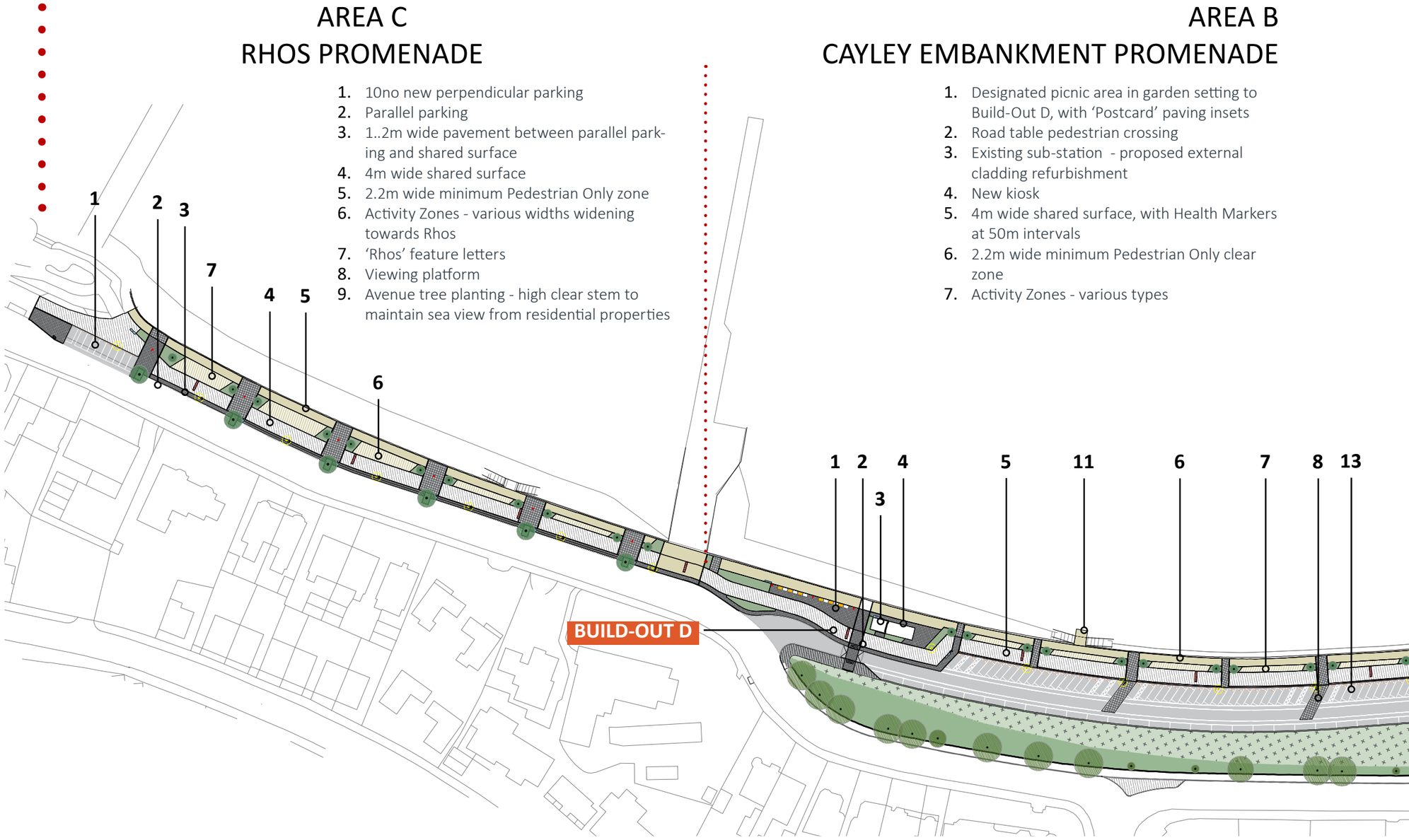
Trees shown for illustration purposes only, final planting variety and size must not adversely affect the existing seawall structure.

AREA C
RHOS PROMENADE

1. 10no new perpendicular parking
2. Parallel parking
3. 1..2m wide pavement between parallel parking and shared surface
4. 4m wide shared surface
5. 2.2m wide minimum Pedestrian Only zone
6. Activity Zones - various widths widening towards Rhos
7. 'Rhos' feature letters
8. Viewing platform
9. Avenue tree planting - high clear stem to maintain sea view from residential properties

AREA B
CAYLEY EMBANKMENT PROMENADE

1. Designated picnic area in garden setting to Build-Out D, with 'Postcard' paving insets
2. Road table pedestrian crossing
3. Existing sub-station - proposed external cladding refurbishment
4. New kiosk
5. 4m wide shared surface, with Health Markers at 50m intervals
6. 2.2m wide minimum Pedestrian Only clear zone
7. Activity Zones - various types



AREA B
CAYLEY EMBANKMENT PROMENADE

8. Pedestrian links - across carriageway and promenade. Proposed surface treatment artwork
9. Intermediate links across promenade to break up extent of Shared Surface and provide regulated division of Activity Types
10. Viewing platform
11. Parking bays

Items 8 & 9 have been regulated to coincide with column lighting location at approx. 27m intervals and provide access and circulation for parking meters at approx. 54m intervals

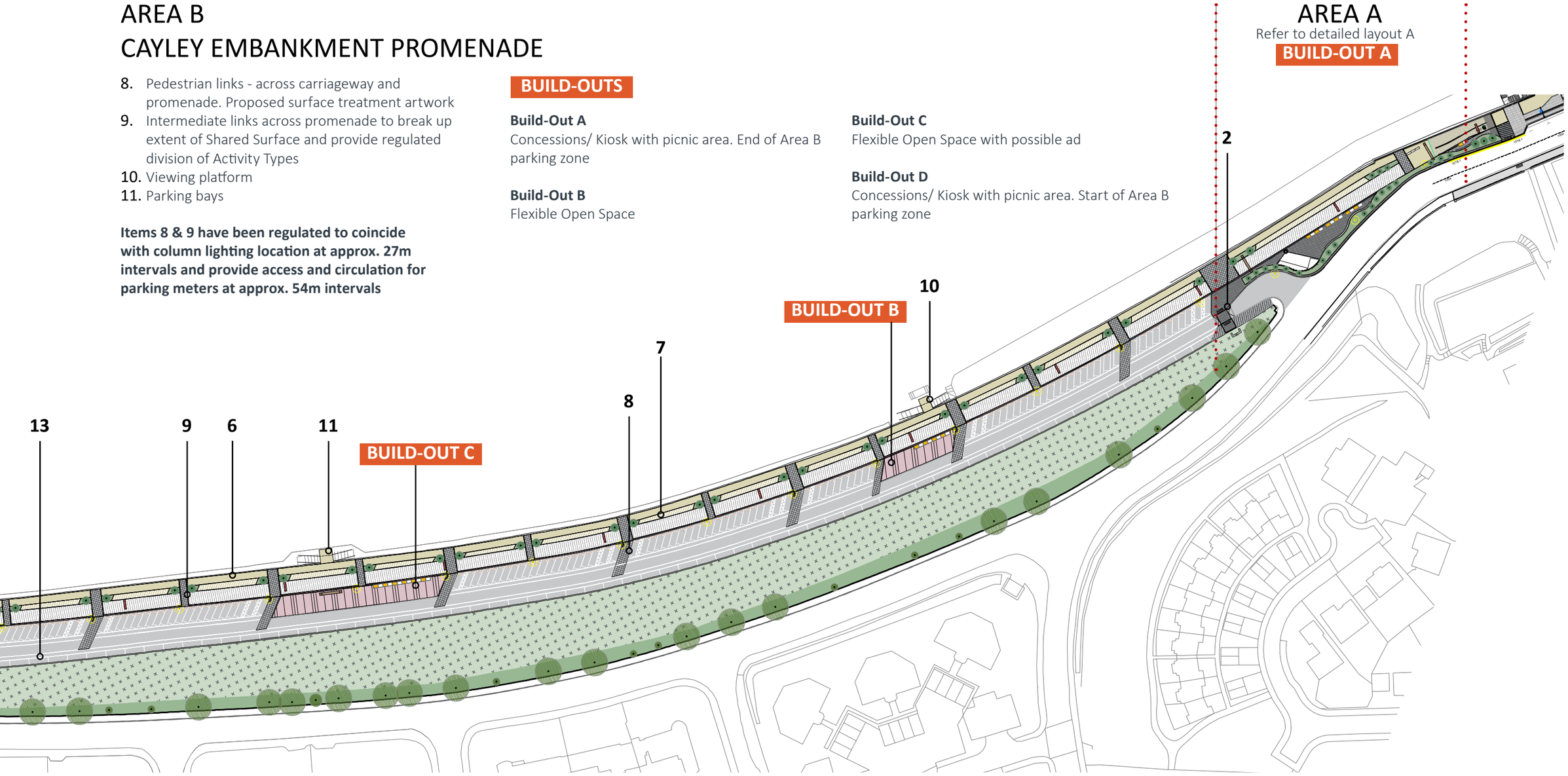
BUILD-OUTS

Build-Out A
Concessions/ Kiosk with picnic area. End of Area B parking zone

Build-Out B
Flexible Open Space

Build-Out C
Flexible Open Space with possible ad

Build-Out D
Concessions/ Kiosk with picnic area. Start of Area B parking zone



Activity Zone Typologies

Introduction

The Activity Zone is the design solution adopted to encourage cyclists away from the 1.2m high protective barrier. This linear zoning is the most cost effective solution for this relatively narrow space which requires a 4m wide continuous shared surface as the main thoroughfare along the promenade and a clear zone adjacent to the seawall and railings. The Activity Zones are the areas which separates these two routes.

Design approach

This zoning approach presents opportunities for an animated strip where visitors can enjoy the promenade while engaging in various other activities. This document presents Activity Zone Typologies to help realise these opportunities using landscape elements from the previous phases combined with new elements which better address the site constraints and public realm aspirations.

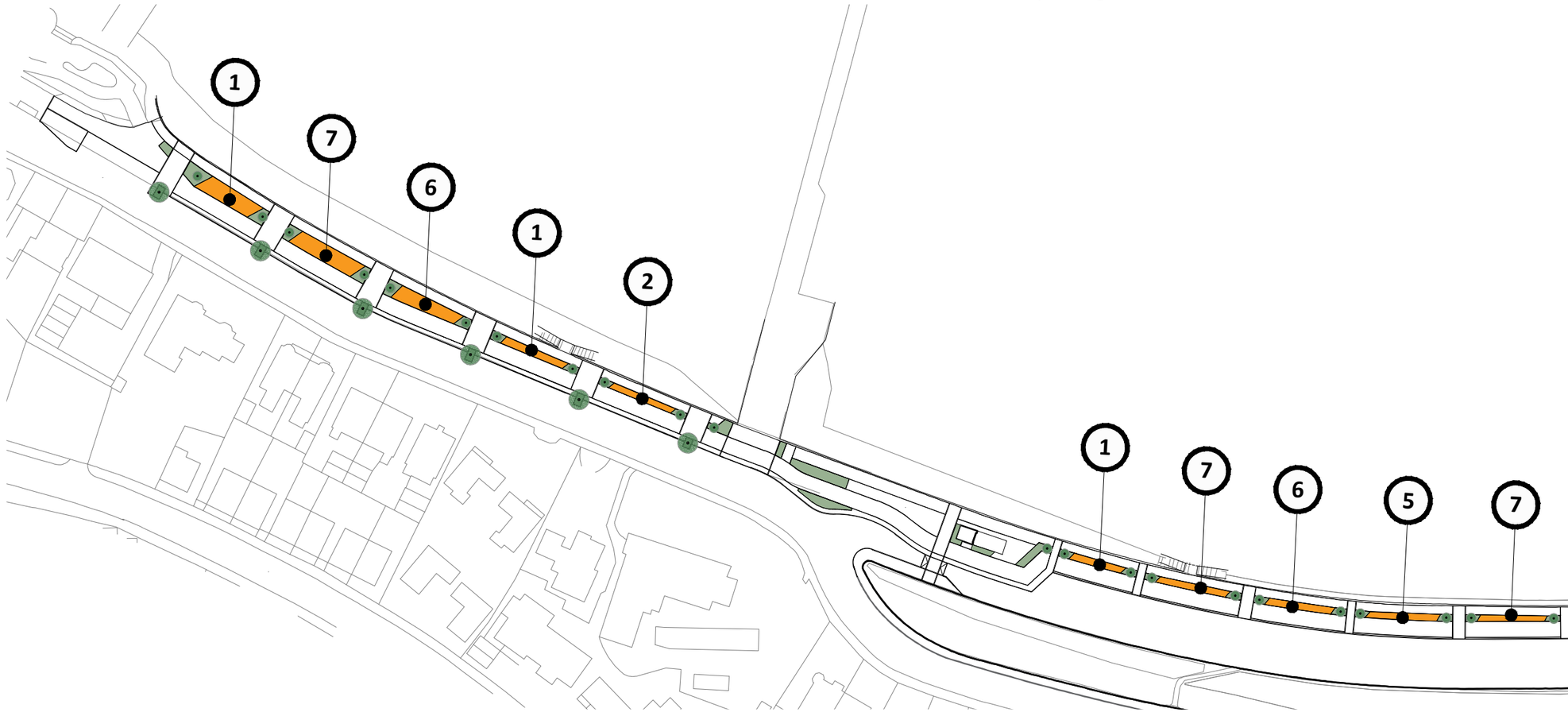
Design opportunities

The landscape character for Phase 2 differs from the previous phases mainly due to the expansive backdrop which is the Cayley Embankment and the large scale fairs, like the Prom Xtra, which occupies the whole length of the promenade under the Cayley Embankment. The design proposal looks to create a more lively public realm in term of colour, artwork, street furniture, planting and the introduction of small trees.

Activity Zone Typologies

1 Seating combinations
2 Exercise and Play
3 Seating - Phase 1d ‘Wave seat’
4 Shelter in garden setting
5 Seating - Phase 1d seating
6 Informal play - low mounds
7 Pocket Garden

Further design development will be required

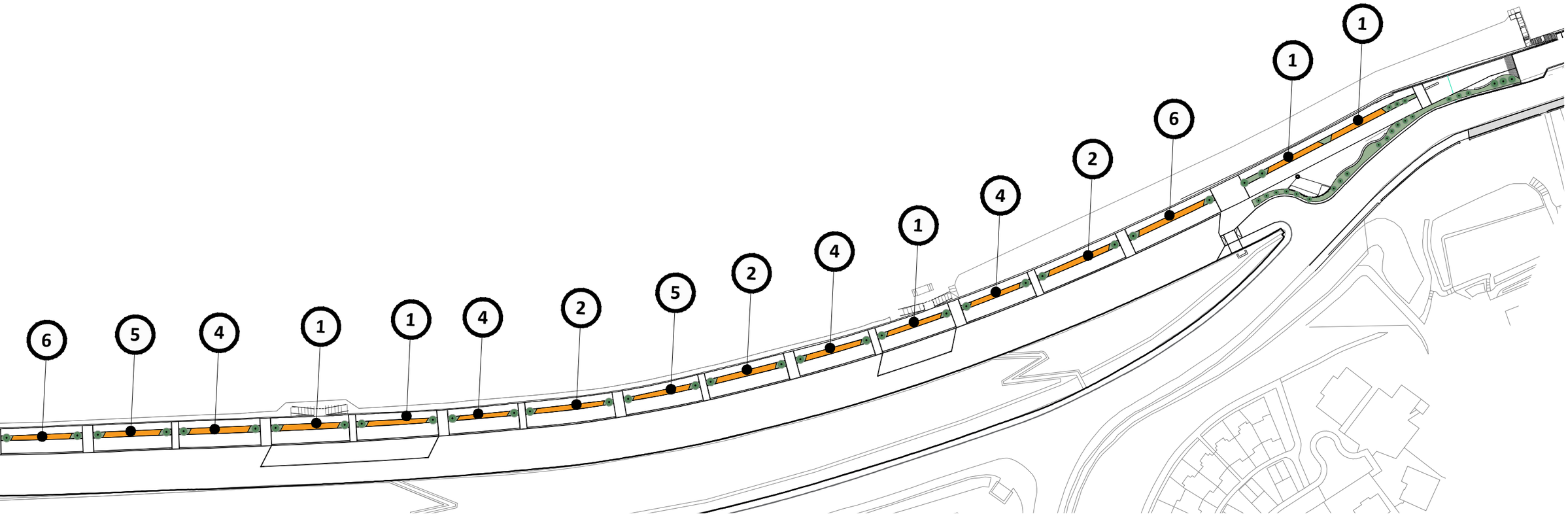


Design continuity form previous phases

Signature seating from Phase 1d
Light beacon
Artwork - health marker
Artwork - postcards
Paving palette
Street lighting

Design constraints:

1. Available widths
2. Structural strength of the sea wall. This will restrict the cumulative weight of the proposed landscape and components.
3. Parking and required spacing for parking meters. The proposed design and the spatial division of the Activity Zone is tightly linked to the parking meter spacing, by providing pedestrian routes linking parking to the promenade edge via meter locations
4. Below ground services



Activity Zone Indicative Views

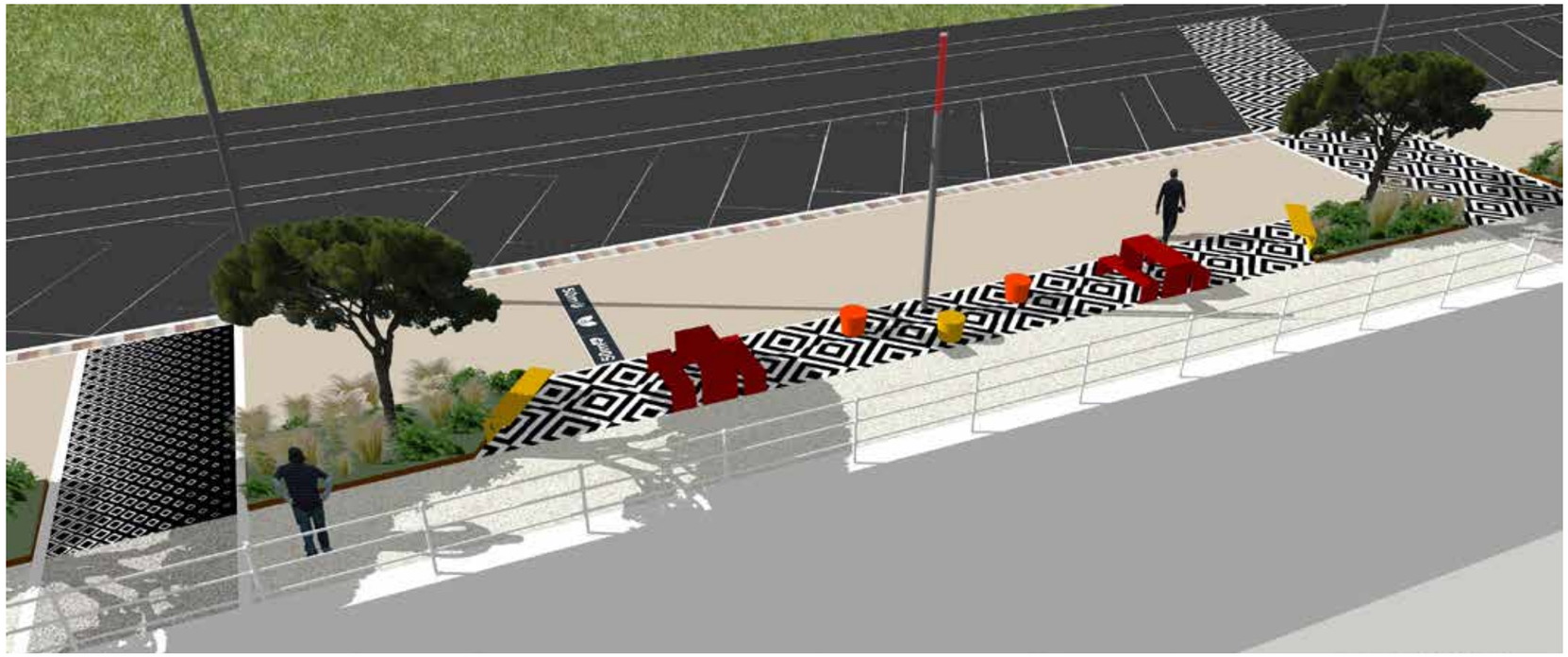
Area B - Cayley

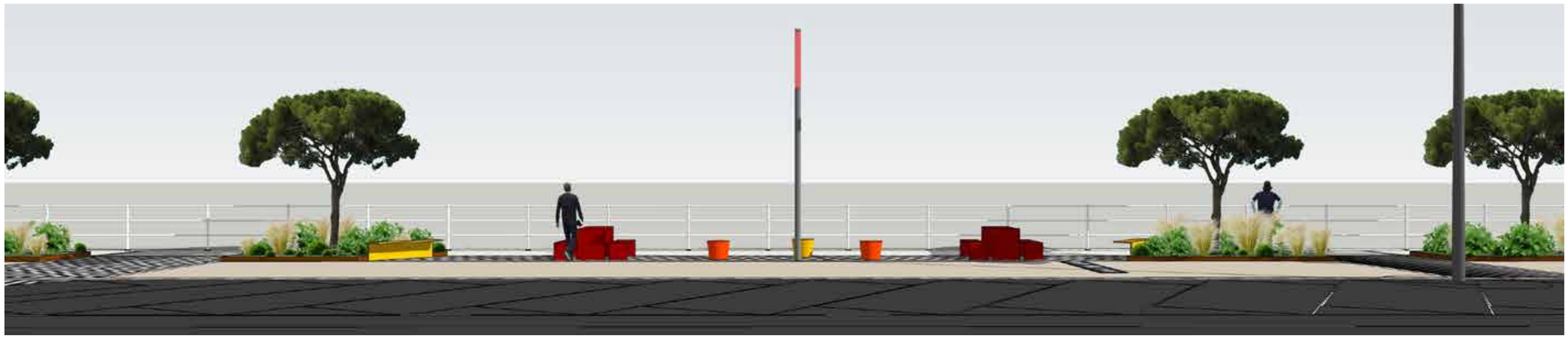
Area C - Rhos Promenade

Activity Zone Typology 01

Seating combinations
Family and group orientated space

Social hub providing various types of seating arrangements for different group sizes
Landscape elements:
65% Hardstanding surface
35% Soft landscape
2no Picnic set
2no Lightweight powder-coated benches
3no Luminous disc seat
1no Light beacon as per Phase 1d
2no Small trees





Activity Zone Typology 02

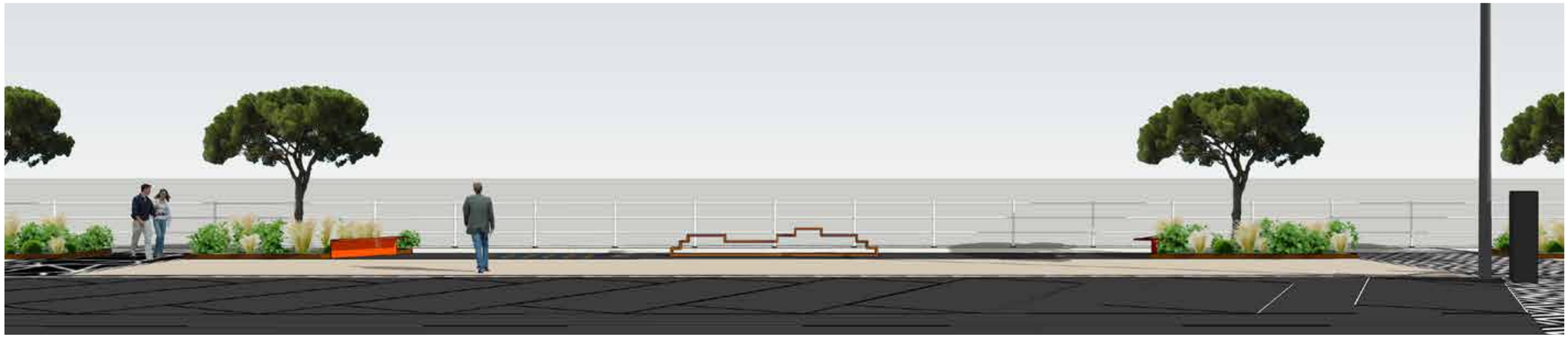
Exercise and Play
Children, family and group orientated space

Combination of floor markings to encourage particular exercises and structural play.

Wide range of colour and surface design

Landscape elements:

65% Safety surface (wet pour bonded rubber crumb), with ground exercise markings
35% Soft landscape
1no Play structure
2no Lightweight powder-coated benches
1no Light beacon as per Phase 1d
2no Small trees



Activity Zone Typology 03

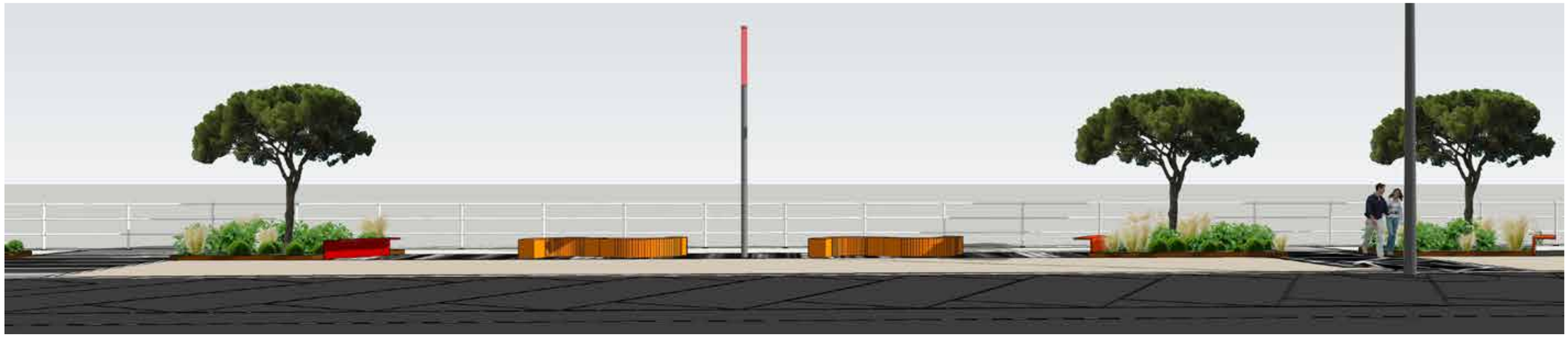
Wave seat iteration

Mix group orientated space

Lightweight seating to reference Phase 1d 'Wave Seat' for continuity of landscape elements

Landscape elements:

65% Hardstanding surface
35% Soft landscape
2no Wave seat
2no Lightweight powder-coated benches
1no Light beacon as per Phase 1d
2no Small trees



Activity Zone Typology 04

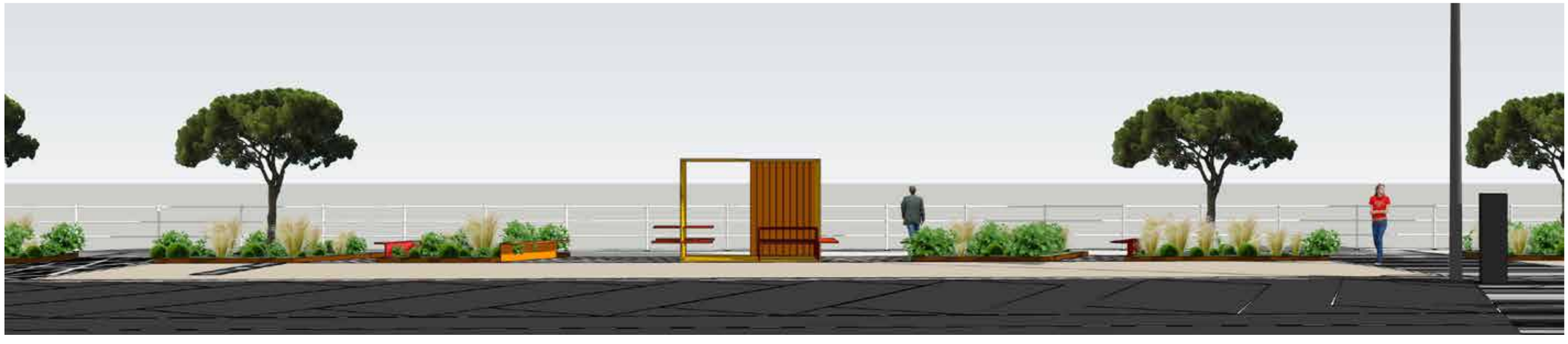
Shelter with garden seating
Mix group orientated space

Modular shelter with internal seating and tables with external seating in a garden setting

Landscape elements:

55% Hardstanding surface
45% Soft landscape
1no Bespoke shelter with internal and external seats and tables
4no Lightweight powder-coated benches
2no Small trees

Opportunity for solar panels on shelter roof with further option of green roof



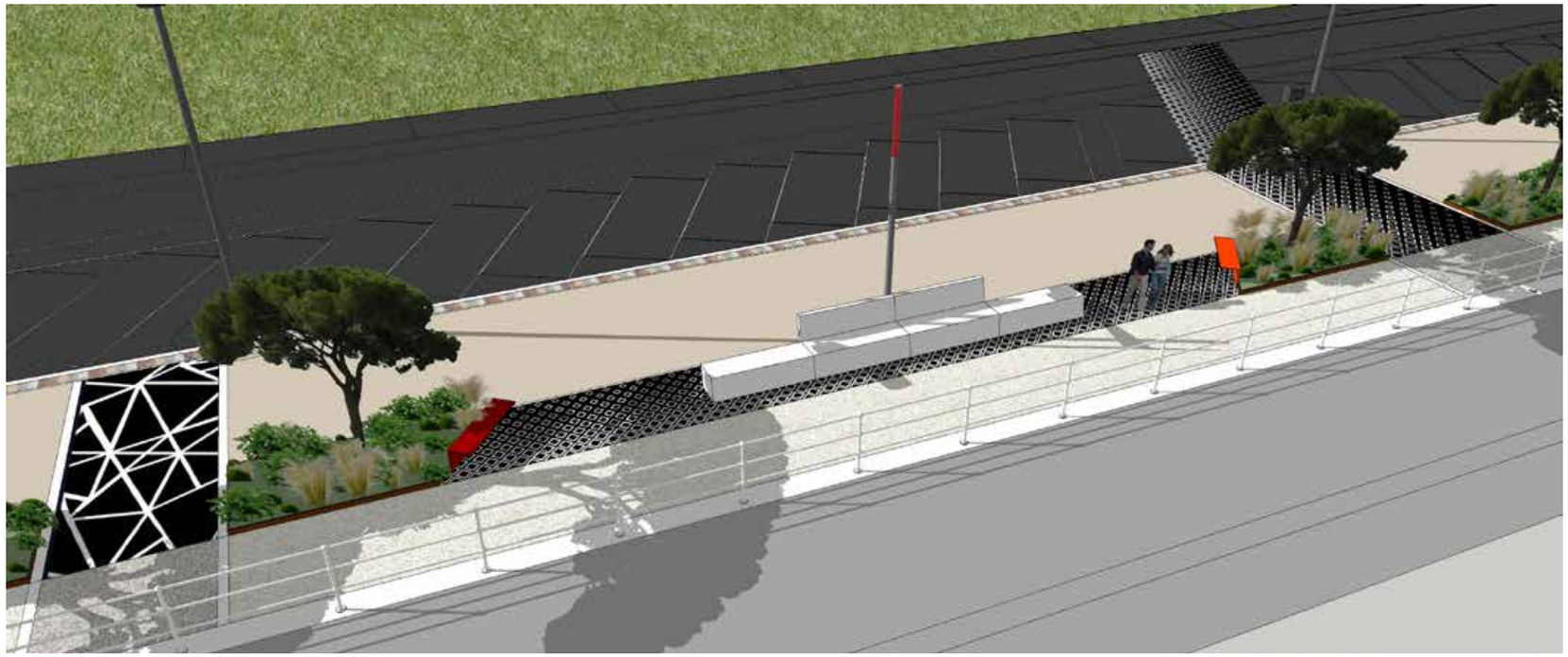
Activity Zone Typology 05

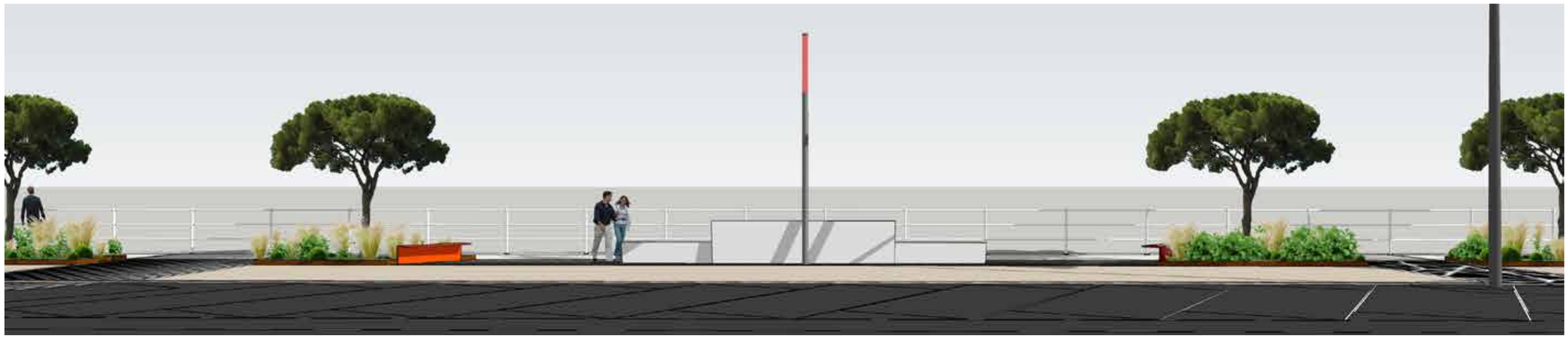
Seating as per Phase 1d
Mix group orientated space

Seating area with Phase 1b seating as centrepiece

Landscape elements:

65% hardstanding surface
35% soft landscape
2no Makatite - 2m long reconstituted granite block with back rest
2no Anastasio - 2m long reconstituted granite block
2no lightweight powder-coated benches
1no Light beacon as per Phase 1d
2no small trees





Activity Zone Typology 06

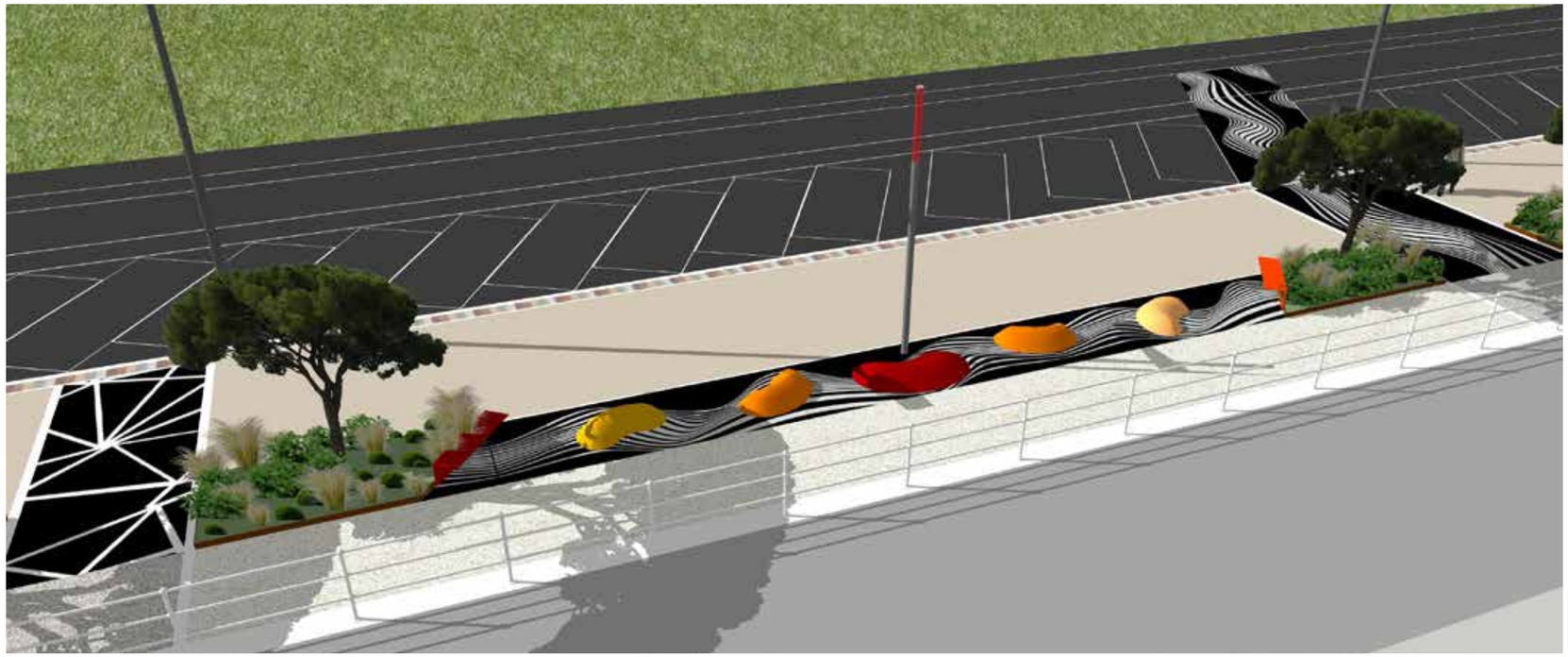
Play Mounds
Children, family and group orientated space

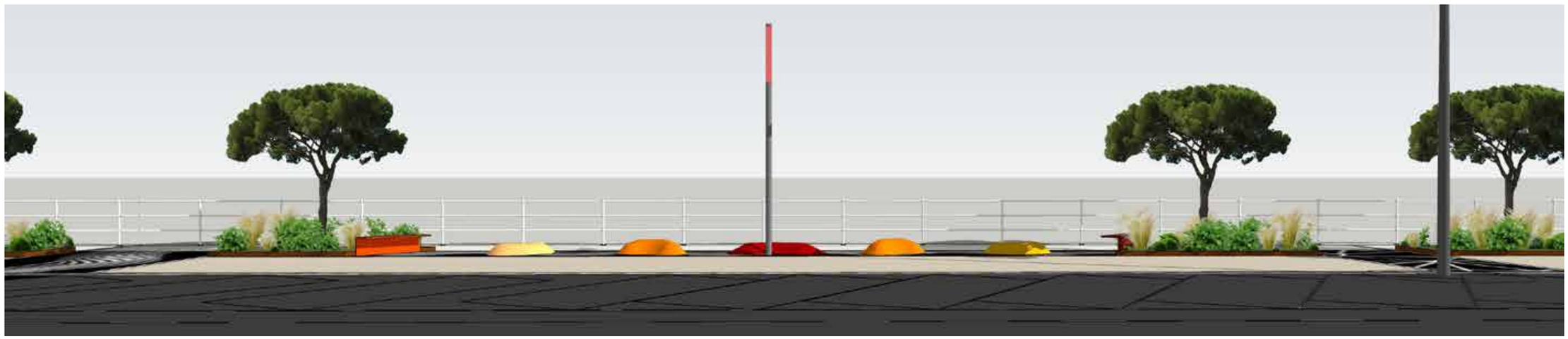
Informal and flexible low mound play area

Wide range of colour and surface design

Landscape elements:

65%	Safety surface (wet pour bonded rubber crumb), with ground exercise markings
35%	Soft landscape
5no	Play mound 600mm high maximum
2no	Lightweight powder-coated benches
1no	Light beacon as per Phase 1d
2no	Small trees





Activity Zone Typology 07

Pocket Garden

Mix group orientated space

Lightweight seating and milling space located between planting beds allowing free pedestrian movement across the promenade.

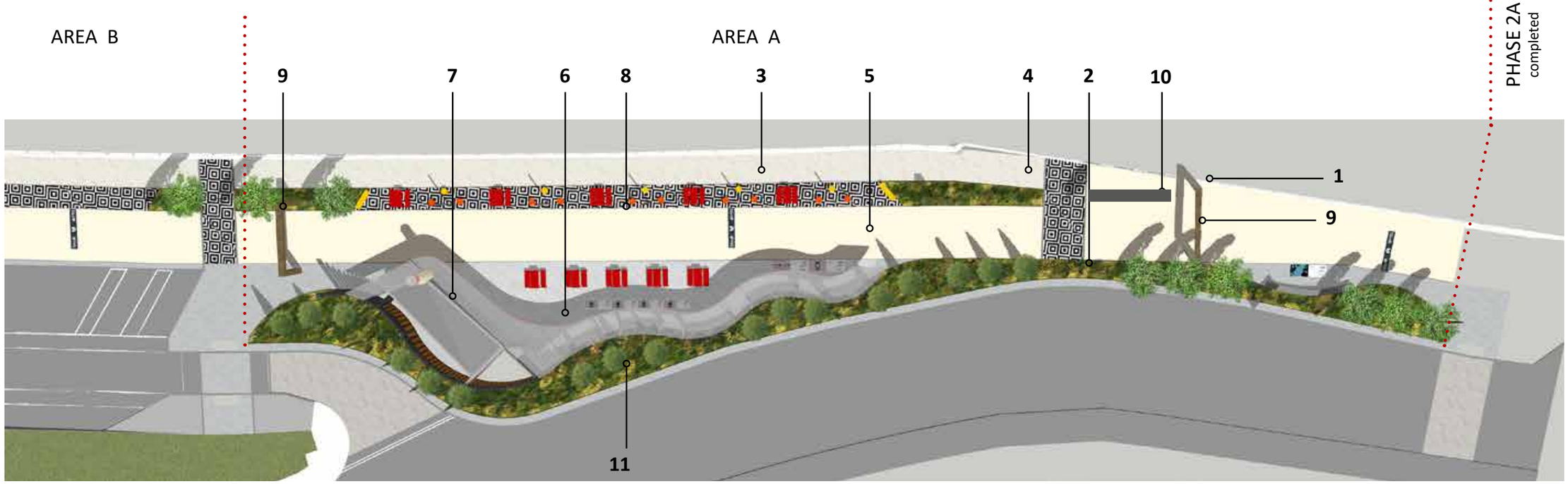
Landscape elements:

50% Hardstanding surface
50% Soft landscape
3no Luminous disc seat
5no Lightweight powder-coated benches
2no Small trees

Area A - Phase 2A and 2B Transition Zone - Kiosk and Picnic area

KEY:

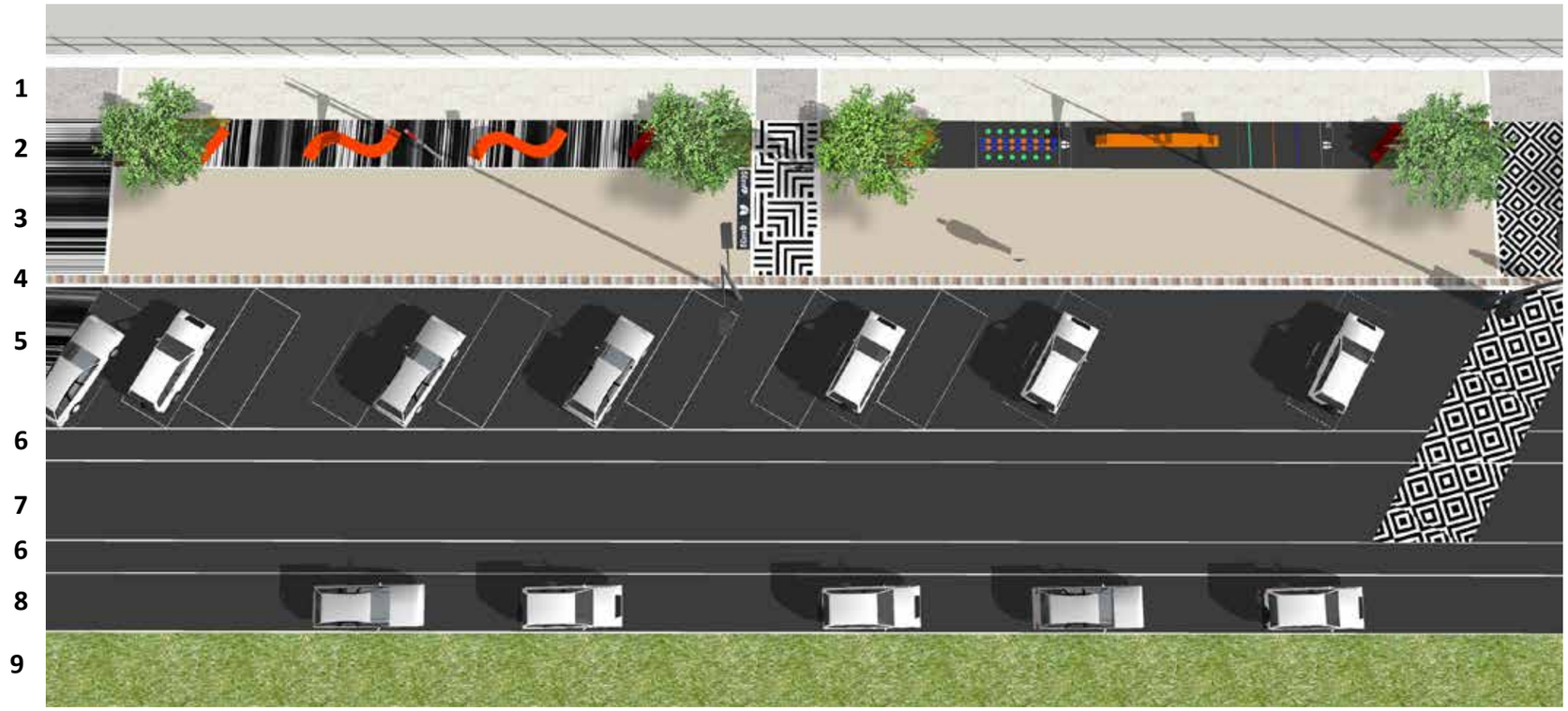
1. Indicative location for drop in railing height
2. Planting buffer to assist in cycle route management and restrict cycle access into Pedestrian Only Zone
3. 2.2m wide minimum Pedestrian Only Zone
4. Chicane access to Pedestrian Only Zone
5. 4m wide Shared Surface
6. Parallel parking
7. 1.2m wide pavement adjacent to parking zone
8. Activity Zone
9. Gateway arch
10. Seating (barrier)
11. Junction re-aligned to provide safe exit from one-way promenade road



Area B Typical Landscape Arrangement

KEY:

1. 2.2m wide (minimum) Pedestrian Only Zone
2. Activity Zones and pedestrian cut-throughs
3. 4m wide Shared Surface
4. Parking buffer strip
5. Echelon parking with pedestrian cut-through and links; column lighting, parking meters
6. 1.2m wide pedestrian routes
7. 3.15m wide single way carriageway
8. 2m wide parallel parking
9. Cayley Embankment



Area C Typical Landscape Arrangement

KEY:

1. 2.2m wide (minimum) Pedestrian Only Zone
2. Activity Zones and pedestrian cut-through
3. 4m wide Shared Surface
4. 1.2m pavement to parallel parking; column lighting, parking meters
5. Retain majority of existing parallel parking, introduce avenue tree planting at 28m intervals or 4no parking bays
6. Rhos Promenade 2-way carriageway - as existing
7. Parallel parking - as existing


RHOS

bcal

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Appendix 2.4 – Traffic Routing Options Appraisal

MOTT MACDONALD

Colwyn Bay Waterfront Project Phase 2b

Transport Options Appraisal Report

August 2021

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Colwyn Bay Waterfront Project Phase 2b

Transport Options Appraisal Report

August 2021

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P01	26 August 2021	H.Smith	D. Crockett	N. Haines	First issue

Document reference: 100374-MMD-00-XX-RP-N-0038

Information class: Standard

Contents

Tables

1 Introduction

This Transport Options Appraisal Report has been prepared on behalf of Conwy County Borough Council (CCBC) by Mott MacDonald Ltd for the Colwyn Bay Waterfront Project Phase 2b Scheme (hereafter referred to as the "Scheme"). The Scheme, located between Colwyn Bay in the east and Rhôs-on-Sea in the west comprises improvements to the coastal defences in this area along with associated promenade regeneration.

It is hoped that as part of this scheme, some changes will be made to West Promenade and Cayley Promenade, so as to improve the facilities for pedestrians and cyclists in the area. To ensure the most appropriate highways scheme is chosen, CCBC have commissioned Mott MacDonald to undertake a separate options appraisal of the three possible options which have been considered.

This report sets out the three options, outlines the methodological approach taken to assessing them, and presents the findings of the appraisal process.

2 Appraisal method

The options appraisal has been undertaken using Mott MacDonald's in-house Investment, Sifting and Evaluation Tool (INSET). While more than is necessary for this appraisal, it should be noted that this tool is a multi-criteria, decision making tool which is compliant with the UK Treasury's 'Green Book' guidance for Business Case development.

2.1 Assessment criteria

Each of the three options (summarise in Section 3 and Appendix A) has been assessed using a 5-point scoring system on a range of main criteria and sub-criteria. The criteria are shown in Table 2.1; each main criterion carries the same weighting, and the sub-criteria within each main criteria carry the same weighting within that main criteria.

Table 2.1 Assessment criteria

Main criteria	Social impacts	Transport impacts – vehicles and public transport	Transport impacts – pedestrians and cyclists	Environmental impact
Sub criteria	Access effects for businesses, residents and community facilities	Road safety	Safety	Visual impact
	Access effects for non-motorised users	Driver delay	Severance	Noise
	Recreation and open space effects	Traffic flows	Amenity	Air Quality
		Parking	Delay	Landscape
		Public transport delay – bus only		

Source: Mott MacDonald, 2021

2.2 5-point scoring system

For each option, each of the sub-criteria has been given a score. These range from -2 to +2, based on the following:

- -2 – strong negative impact
- -1 – slight negative impact
- 0 – neutral impact
- +1 – slight positive impact
- +2 – strong positive impact.

Using such a system allows a qualitative assessment to be converted to a quantitative one, thus enabling a consistent and defendable appraisal process with an overall score produced for each option. Scoring was guided by IEMA Guidelines for the Environmental Assessment of Road Traffic (IEMA, 1993).

3 Options

Three options have been included within the appraisal process. Details of these are presented in this chapter. Sketch drawings for each option are included in Appendix A.

- Option A: West Promenade's speed limit is reduced to 20mph. The existing public realm area on the seaward side of West Promenade is improved but not increased in area.
- Option B: Cayley Promenade remains as two-way, but West Promenade is made one-way in the southbound direction. West Promenade's speed limit is reduced to 20mph. The public realm area on the seaward side of West Promenade is increased in area and improved in quality. New uncontrolled pedestrian crossing points are added on West Promenade. The road geometry is altered so that Cayley Promenade becomes the priority route to Rhôs on Sea; vehicles are not permitted to turn into West Promenade from Cayley Promenade at the southern junction. The Whitehall Road / Cayley Promenade junction priority is altered to Cayley Promenade having priority. Parking bays on West Promenade will remain, but are adjusted to align with the highway layout. Parallel parking bays to be marked on the seaward side of Cayley Promenade.
- Option C: Both Cayley Promenade and West Promenade are made one-way, with Cayley Promenade allowing northbound movements only, and West Promenade allowing southbound movements only. Speed limit on West Promenade in 20mph. The highways arrangement at each junction of Cayley Promenade and West Promenade is adjusted accordingly, and the kerb lines are adjusted to allow for vehicular movements. The Whitehall Road / Cayley Promenade junction priority altered to Cayley Promenade having priority. The public realm area on the seaward side of West Promenade is increased in area and improved in quality. New uncontrolled pedestrian crossings are added on West Promenade. Parking bays on West Promenade will remain, but are adjusted to align with the highway layout. Parallel parking bays to be marked on the seaward side of Cayley Promenade.

4 Options Appraisal Results

4.1 Overview of results

This section presents the results of the options appraisal process.

Table 4.1 Options Appraisal Results

Option	Social impacts score	Vehicle and public transport impacts score	Pedestrian and cyclists impacts score	Environmental impacts score	Overall score
Option A	0.17	0	0.13	0.25	0.14
Option B	0.50	0	0.50	0.50	0.38
Option C	0.33	-0.20	0.63	0.50	0.31

4.2 Discussion

This shows that Option B provides the greatest benefit of the three options to residents, visitors and businesses.

Due to the small number of changes to the existing layout under Option A, the benefits offered are limited. The improved quality public realm area produces a small benefit for pedestrians and cyclists, due to improved safety and amenity, and improved landscape and visual effects. However, Options B and C, with their increased size in public realm area, as well as quality, offer greater benefit in this regard.

Whilst Option C provides a better social impacts score than Option A, it does not perform as well as Option B because of the slightly smaller public realm area compared to Option B, and the disruption caused to residents on Cayley Promenade as a result of the one-way system in place, which effects access to properties and causes vehicles to drive further. This factor also affects the vehicle and public transport impacts score, because of the additional miles which need to be driven, thus worsening traffic flows and driver delay.

All schemes perform well under the safety criteria within vehicle and public transport because of the reduced speeds on West Promenade and the one-way system in place in Options B and C, which reduces the potential for vehicle-vehicle and vehicle-pedestrian conflicts. These, plus the new uncontrolled pedestrian crossings on West Promenade give Options B and C a higher score under pedestrian and cyclist impacts compared to Option A.

In the environmental impacts, all three options offer air quality and noise benefits from the reduced speed limits, while Options B and C also provide landscape and visual benefits as a result of the improved and increased public realm area.

In terms of vehicle and public transport impacts, Option C provide a negative impact source, but Options A and B are neutral. The key differentiators between Option B and Option C is Option C's one way system on Cayley Promenade, which reduces access to residential properties and adds driver delay due to having to drive further. The one way system on Cayley Promenade in Option C does offer pedestrian and cyclists' safety and amenity benefits, over and above those of Option B, but not enough to offset the disruption to drivers and access to properties.

5 Conclusion

This Transport Options Appraisal Report has been prepared on behalf of Conwy County Borough Council (CCBC) by Mott MacDonald Ltd for the Colwyn Bay Waterfront Project Phase 2b Scheme (hereafter referred to as the "Scheme").

Three options (A. B and C) were assessed using Mott MacDonald's in-house Investment, Sifting and Evaluation Tool (INSET) across four main criteria: social impacts, vehicles and public transport, pedestrians and cyclists impacts, and environmental impacts.

The four main criteria each contained a number of sub-criteria, and carried equal weighting, to produce an overall score for the three options.

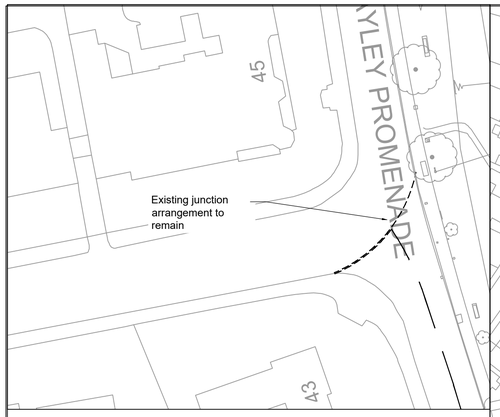
All schemes perform well under the safety criteria within vehicle and public transport because of the reduced speeds on West Promenade and the one-way system in place in Options B and C, which reduces the potential for vehicle-vehicle and vehicle-pedestrian conflicts.

In terms of vehicle and public transport impacts, Option C provide a negative impact source, but Options B and C are neutral. The key differentiators between Option B and Option C is Option C's one way system on Cayley Promenade, which reduces access to residential properties and adds driver delay due to having to drive further. The one way system on Cayley Promenade in Option C does offer pedestrian and cyclists safety and amenity benefits, over and above those of Option B, but not enough to offset the disruption to drivers and access to properties.

The assessment found that Option B (Cayley Promenade remains as two-way, but West Promenade is made one-way in the southbound direction) provides the greatest overall benefit to residents, visitors and businesses.

Appendices

A. Option Scheme Drawings



Inset B
Existing Cayley Promenade Junction

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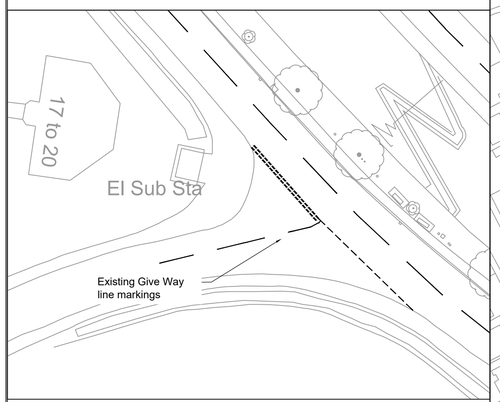

Inset C
Cayley Promenade, Llannerch Rd Junction

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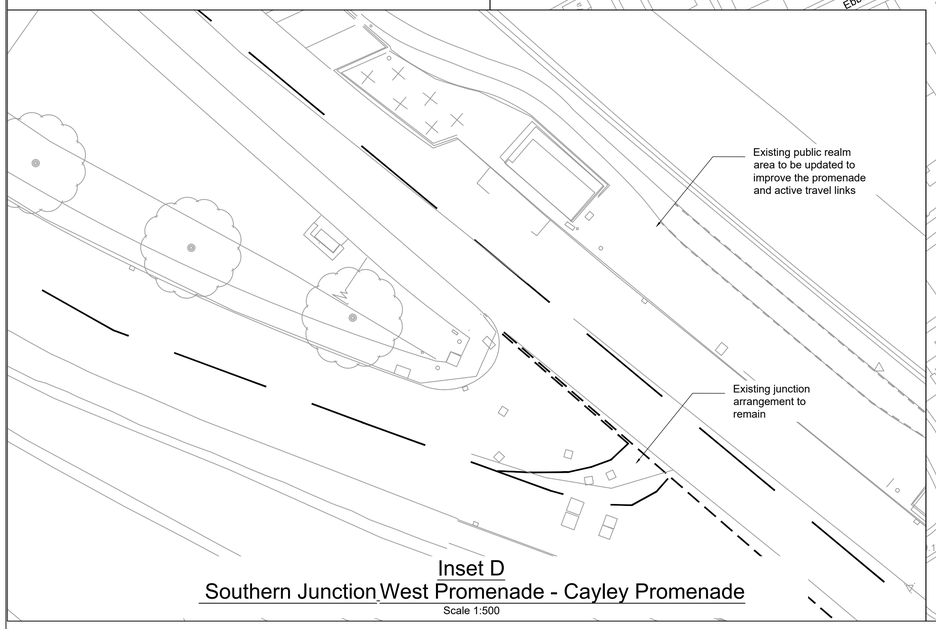
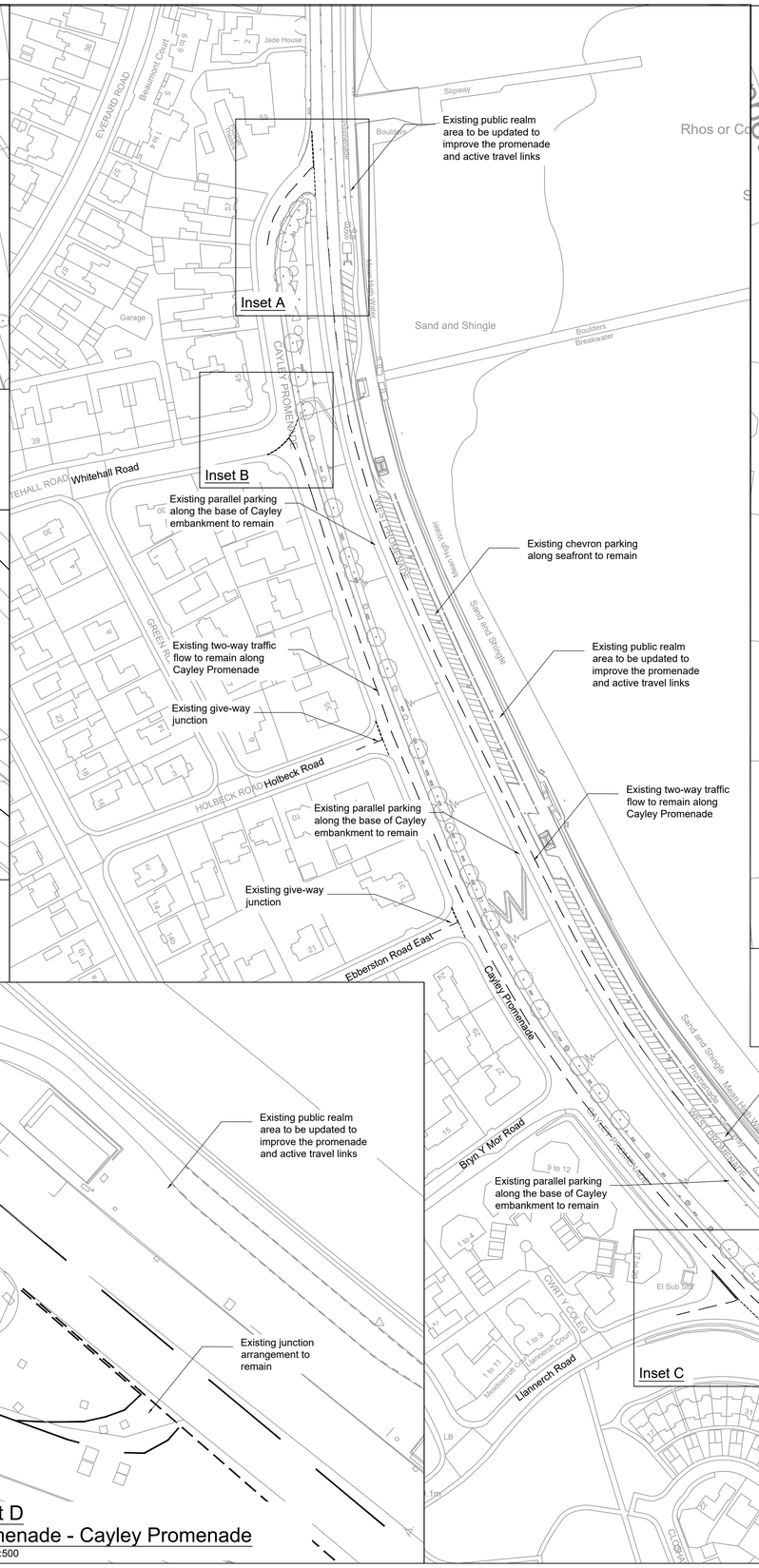
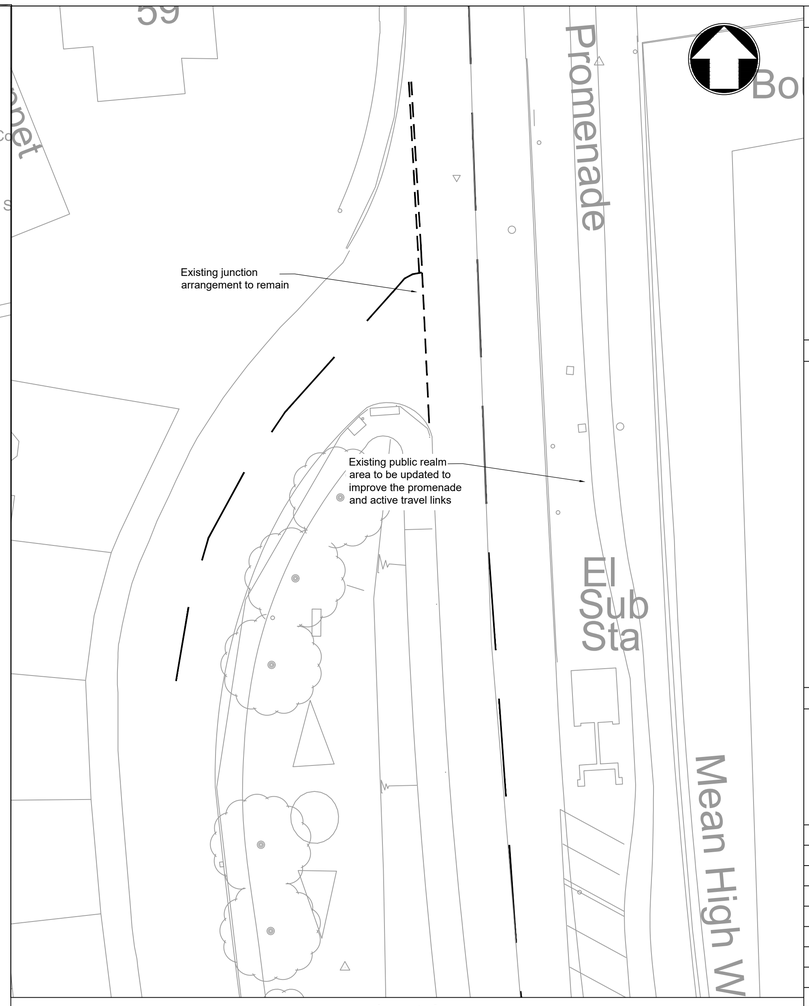


Inset D
Southern Junction West Promenade - Cayley Promenade

Scale 1:500





Inset A
Northern Junction
West Promenade - Cayley Promenade

Scale 1:250

1:250 0 12.5m 25m
1:500 0 25m 50m
1:1250 0 62.5m 125m

Notes

1. This drawing is to be read in conjunction with Mott MacDonald Optioneering Analysis Drawings & Report - 100374-MMD-00-XX-RP-N-0038
2. Do not scale any items or information from this drawing.
3. All dimensions are shown in milimetres unless otherwise stated.
4. All levels are in metres above Ordnance Datum (AOD).
5. The topographical survey was supplied to us by Survey Operations Ltd in April 2008. We accept no responsibility for errors or omissions in data supplied to us by other third parties.

Key to symbols

Reference drawings

100374-MMD-03-XX-SK-C-0003 - Optioneering Analysis - 2 Do Minimum
100374-MMD-03-XX-SK-C-0004 - Optioneering Analysis - 3 Do Something

Rev	Date	Drawn	Description	Ch'k'd	App'd
P01	27/08/21	NB	Updated following approver comments	AB	NH

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CONWY
CYNGOR BWRDEISTREF SIROL
COUNTY BOROUGH COUNCIL

Title

Colwyn Bay Waterfront Phase 2b
Optioneering Analysis
1 - Do Nothing

Sheet 1 of 1

Designed	N.Bergeson	---	Eng check	A.BARROWMAN	AB
Drawn	N.BERGESON	NB	Coordination	A.BARROWMAN	AB
Dwg check	J.FINNIGAN	JF	Approved	N.HAINES	NH

MMD Project Number	Scale at A1	Security
100374	AS SHOWN	STD

Suitability Description	Suit. Code
Suitable for Information	S2

Drawing Number	Revision
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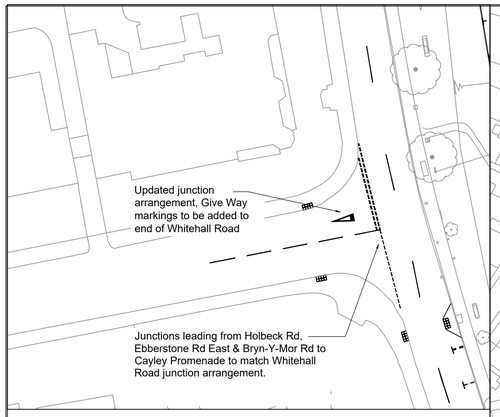

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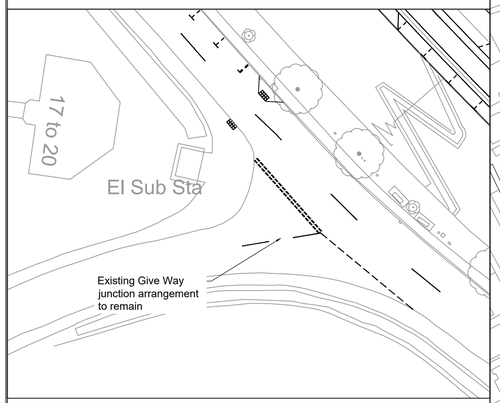
Cayley Promenade, Whitehall Rd Junction

Scale 1:500



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Cayley Promenade, Llannerch Rd Junction

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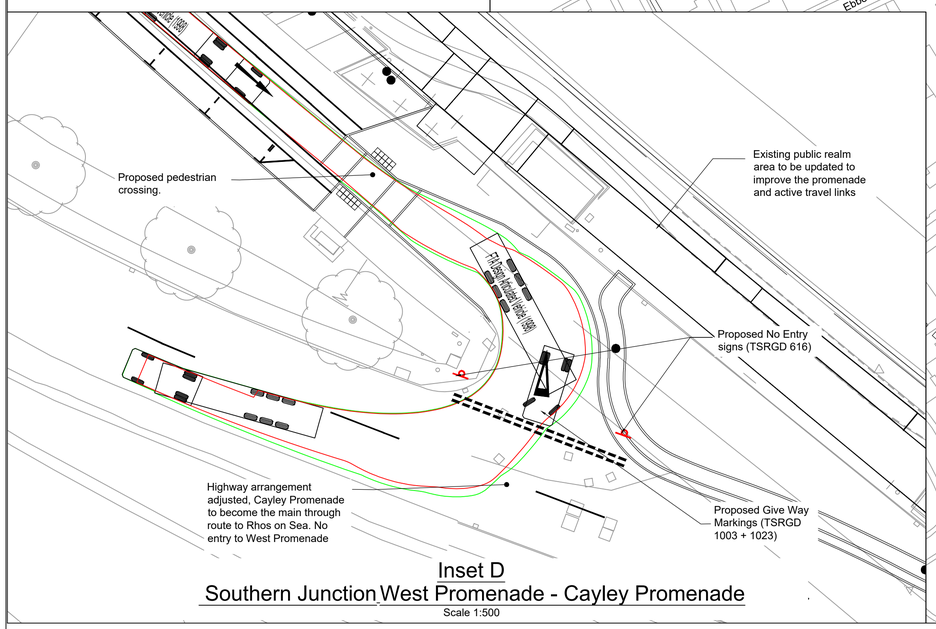

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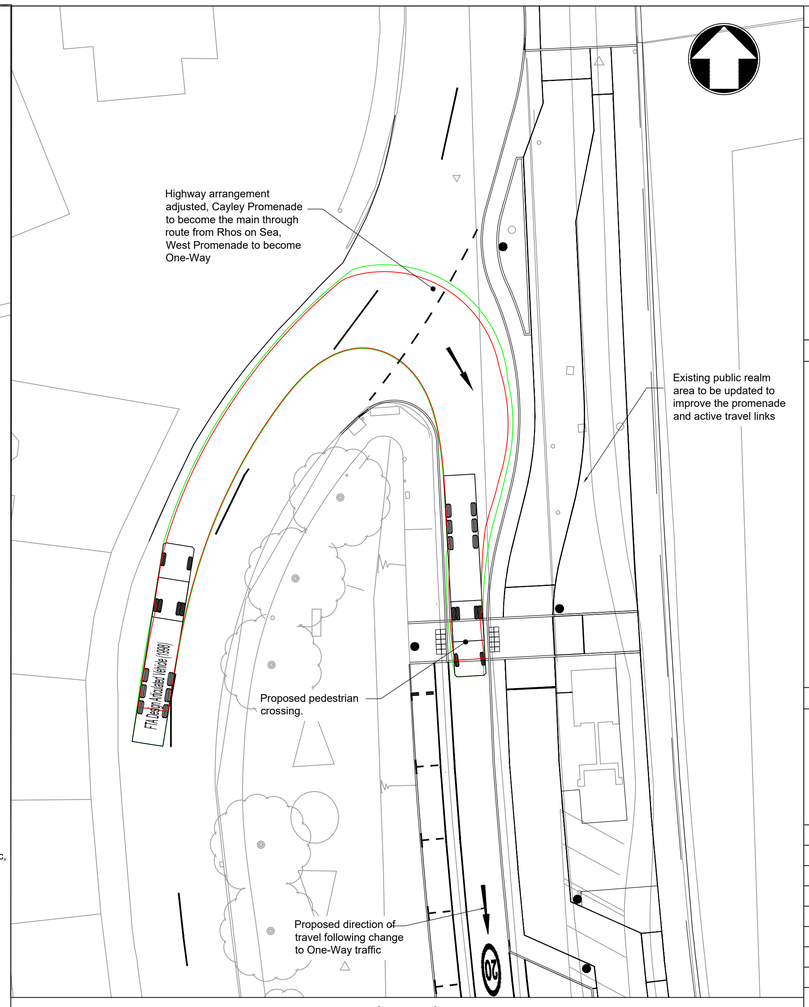
Plan

Scale 1:1250



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Scale 1:250

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Key to symbols

Reference drawings

100374-MMD-03-XX-SK-C-0002 - Optioneering Analysis - 1 Do Nothing
100374-MMD-03-XX-SK-C-0004 - Optioneering Analysis - 3 Do Something

Rev	Date	Drawn	Description	Ch'k'd	App'd
P01	27/08/21	NB	Updated following approver comments	AB	NH

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Title: Colwyn Bay Waterfront Phase 2b Optioneering Analysis 2 - Do Minimum

Sheet 1 of 1

Designed	N.Bergeson	---	Eng check	A.BARROWMAN	AB
Drawn	N.BERGESON	NB	Coordination	A.BARROWMAN	AB
Dwg check	J.FINNIGAN	JF	Approved	N.HAINES	NH

MMD Project Number: 100374	Scale at A1: AS SHOWN	Security: STD
Suitability Description: Suitable for Information		Suit. Code: S2
Drawing Number: 100374-MMD-03-XX-SK-C-0003		Revision: P01

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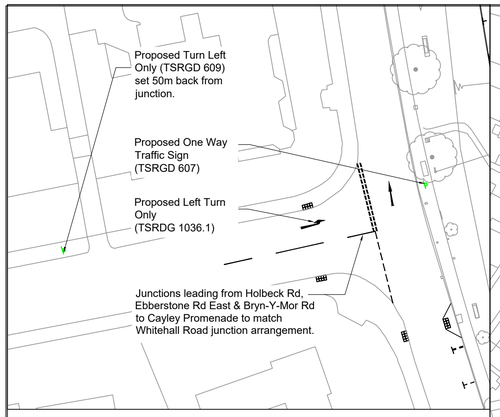

Inset B
Cayley Promenade, Whitehall Rd Junction

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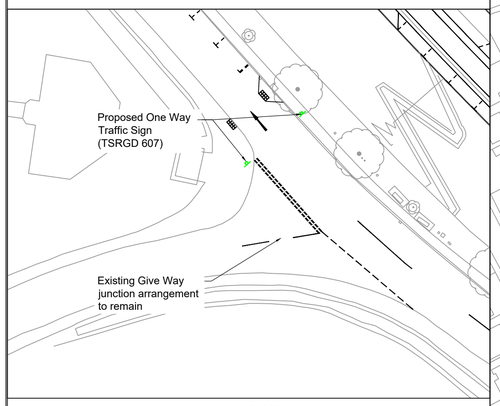

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Cayley Promenade, Llannerch Rd Junction

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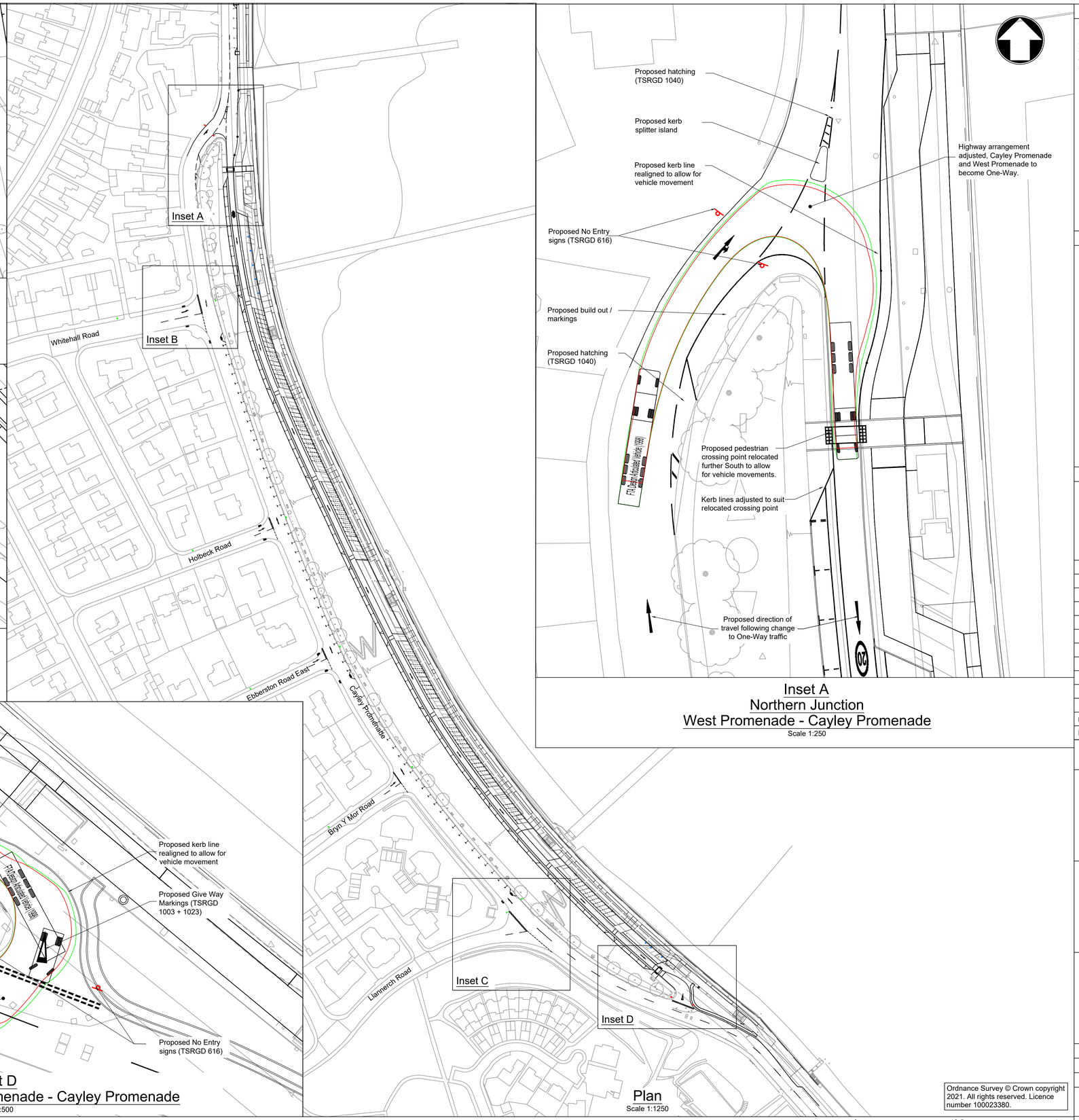
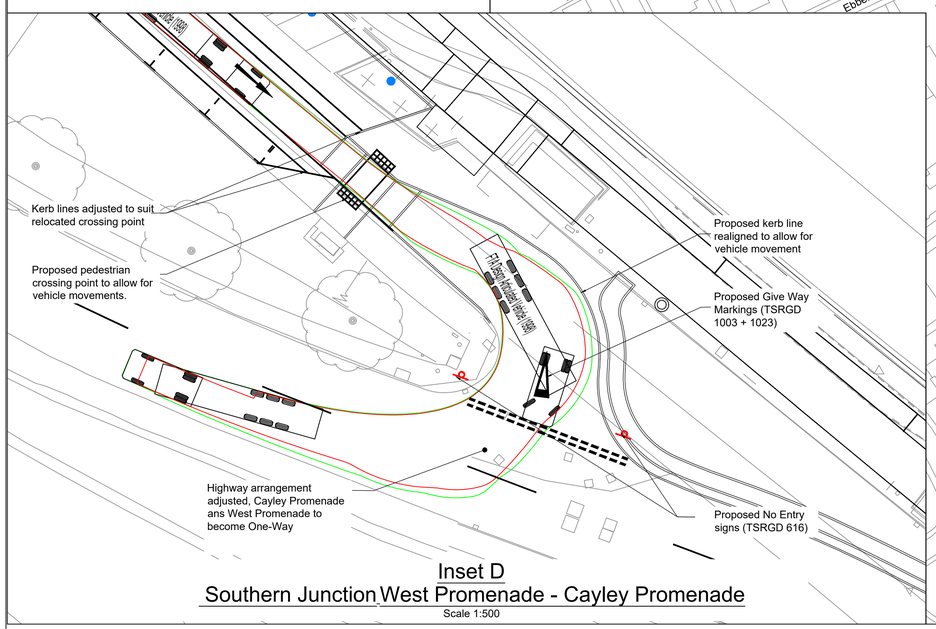


Plan

Scale 1:1250

Inset A
Northern Junction
West Promenade - Cayley Promenade

Scale 1:250



Inset D
Southern Junction West Promenade - Cayley Promenade

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1:1250 0 62.5m 125m

Notes

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Reference drawings

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100374-MMD-03-XX-SK-C-0003 - Optioneering Analysis - 2 Do Minimum

Rev	Date	Drawn	Description	Ch'k'd	App'd
P01	27/08/21	NB	Updated following approver comments	AB	NH

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COUNTY BOROUGH COUNCIL

Title

Colwyn Bay Waterfront Phase 2b
Optioneering Analysis
3 - Do Something

Sheet 1 of 1

Designed	N.Bergeson	---	Eng check	A.BARROWMAN	AB
Drawn	N.BERGESON	NB	Coordination	A.BARROWMAN	AB
Dwg check	J.FINNIGAN	JF	Approved	N.HAINES	NH

MMD Project Number	Scale at A1	Security
100374	AS SHOWN	STD

Suitability Description	Suit. Code
Suitable for Information	S2

Drawing Number	Revision
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B. Options Appraisal Results

Stage 1C: Score Investment Options

Scoring

These sheets are used for the INSET Appraisal itself, based on the themes, criteria and sub-criteria you have defined in previous sections. Scores are also weighted according to the factors you specified.

The schemes being appraised are listed on the top Each theme has been grouped into its own worksheet, with criteria and subcriteria listed in each row.
Use the drop-down menues to score each option based on the criteria you established earlier in the process. Use the Exclude column (DQ) if you wish to remove a scheme from appraisal mid-scoring.

#	Scheme	Impact			
				Social impacts	
		Access effects for businesses, residents, community facilities		Access effects for non-motorised users	
1	Option A - keep West Promenade and Cayley Promenade two way; make West Promenade 20mph; improvements to public realm on West Promenade	Neutral	0.00	Neutral	0.00
2	Option B - West Promenade made one-way in southbound direction, 20mph speed limit on West Promenade; public realm area increased and improved; changes to road geometry to make Cayley Promenade the priority route; new uncontrolled pedestrian crossings added on West Promenade	Neutral	0.00	Slight positive	0.50
3	Option C - Cayley Promenade made one-way in northbound direction; West Promenade one-way in southbound direction and 20mph; road geometries changed to reflect priorities; new uncontrolled pedestrian crossings added on West Promenade; public realm area increased and improved	Slight negative	-0.50	Slight positive	0.50

			Transport impacts - vehicles / public tra					
Recreation and open space impacts (e.g. provision of improved public		Main-Criteria Score	Road safety		Driver delay (General traffic)		Traffic flows	
Slight positive	0.50	0.17	Slight positive	0.50	Slight negative	-0.50	Neutral	0.00
Strong positive	1.00	0.50	Slight positive	0.50	Slight negative	-0.50	Slight negative	-0.50
Strong positive	1.00	0.33	Strong positive	1.00	Strong negative	-1.00	Slight negative	-0.50

Impact								
ansport					Transport im			
Parking		Public transport (bus only) delay		Main-Criteria Score	Safety		Severance	
Neutral	0.00	Neutral	0.00	0.00	Slight positive	0.50	Neutral	0.00
Slight positive	0.50	Neutral	0.00	0.00	Strong positive	1.00	Slight positive	0.50
Slight positive	0.50	Strong negative	-1.00	-0.20	Strong positive	1.00	Slight positive	0.50

pacts - pedestrians and cyclists								
Amenity		Delay		Main-Criteria Score	Visual Impact		Noise	
Neutral	0.00	Neutral	0.00	0.13	Neutral	0.00	Slight positive	0.50
Slight positive	0.50	Neutral	0.00	0.50	Slight positive	0.50	Slight positive	0.50
Strong positive	1.00	Neutral	0.00	0.63	Slight positive	0.50	Slight positive	0.50

Environment					Theme Score
Air Quality		Landscape		Main-Criteria Score	
Slight positive	0.50	Neutral	0.00	0.25	0.14
Slight positive	0.50	Slight positive	0.50	0.50	0.38
Slight positive	0.50	Slight positive	0.50	0.50	0.31