INTRODUCTION

To provide forward looking planning and management of the beaches of Llandudno, Conwy County Borough Council (CCBC) working in partnership with the Llandudno Coastal Forum (LCF) has commissioned AECOM to prepare an Outline Business Case (OBC) to cover both the North Shore and West Shore beach areas in Llandudno. This Public Display is intended to provide an update on the progress being made by CCBC/LCF and to identify the next steps towards achieving the goal of sustainable management of safe beaches for all.

PROGRESS TO DATE

- AECOM was appointed in October 2016 to provide a Beach Management Plan for the beaches of Llandudno and to revise and update the Conwy Tidal Flood Risk Assessment for Llandudno.
- Information and beach management options from public consultation events in Feb 2015 and July 2016 have been considered.
- During 2017 the flood risk to Llandudno was estimated in line with Welsh Government guidelines using state-of-the-art computer models. The resulting flood risk maps are shown on Poster 2 for present day and future, 100 years from now, scenarios, incorporating the effects of climate change.
- Following the completion of the Beach Management Plan and the Conwy Tidal Flood Risk Assessment, AECOM were appointed to undertake preparation of an Outline Business Case, in accordance with Welsh Government requirements for both North Shore and the West Shore.
- AECOM, Conwy Council and the Llandudno Coastal Forum have undertaken a number of engagement activities to ensure understanding of the key issues and collaboration in the development of the options. We have also developed a Tourism Strategy for Llandudno which will feed into the OBC.
- The Beach Management Plan identified a range of potential management options for the North and West Shores and these options have been developed into a short list for public consideration and more detailed appraisal, as presented here.
- Hydraulic Modelling of the Short List Options is currently progressing which will highlight the benefits and residual flood and erosion risk to both the North and West Shores.
- Once the modelling has been completed, formal Appraisal of these options, in accordance with Welsh Government business case guidance will be undertaken and a preferred option for the North and West shores will be identified.
- Funding for the next stage in the process, the development of an Outline Business Case, has been obtained from the Welsh Government.
FLOOD RISK

The Present Day risk is such that small areas of Llandudno have a 1 in 1000 chance of flooding in any one year; however in 2117 there will be a 1 in 30 chance of widespread flooding in any one year. It is clear that something will need to change to provide continued flood protection to the town of Llandudno.

Llandudno is effectively a bowl with the existing sea defences acting as the rim; this means that if water does pass over the defences (due to wave overtopping or high water levels) or through the defences (due to a breach) the water will flow into the town.

Sea levels are predicted to rise over the next 100 years due to climate change and this will increase the likelihood of flooding.

Source: DEFRA

The Present Day (2017) flood risk includes the risk of flooding from high still water levels, wave overtopping and breaches of the defences.

The Future (2117) flood risk shows that compared to the Present Day (2017) flood risk there is a significant increase in the likelihood of flooding.
The North Shore has been divided into six sections called Management Units (MUN). Each one has been considered separately and in-combination with the other Management Units.

**MUN1: Point of headland to the Pier Wall**
- **Description:** The sea wall on the east side of the beach is seaward of the headland. The sea wall separates the beach from the town. The area is exposed to less wave energy than the MUs to the east.
- **Issues and Objectives:** The landward side of the management unit is to maintain the beach area as an amenity whilst ensuring adequate flood protection is achieved. The objective for this MU is to maintain the beach as an amenity and provide flood protection.
- **Constraints:** Any changes to this wall are considered beyond the scope of this BMP; however given the importance of the area as the boundary to the beach area and also as a support for the promenade site and the lack of its inclusion in the current SMI inspection, the sea wall should be assessed again.

**MUN2: Children’s Corner from the Pier Wall to Trevor Street slipway**
- **Description:** This area consists of a sandy beach which is backed by a stepped concrete revetment with a wide promenade. The northern limit is bounded by the sea wall that leads to the pier and the southern limit by the Trevor Street Slipway. The area has traditionally been popular with visitors to the area due to the sandy beach present.
- **Issues and Objectives:** The area is considered by LGC as being in the ‘Beach Zone’ and it is anticipated that the actual beach area will be used (rather than the port the water or promenade). The sandy nature of the beach and proximity to the town centre means that this is a visitor destination. This section was not modified as part of the previous beach recharge works undertaken in 1996-2000. The beach was not recharged in 2014.
- **Constraints:** The objective for this MU is to maintain the beach area as an amenity whilst ensuring adequate flood protection is achieved.

**MUN3: Trevor Street slipway to Tudor Road**
- **Description:** This area consists of a steep upper shingle beach and a flat lower sand beach. The beach is backed by a stepped concrete revetment and wide promenade. The northern limit is bounded by the Trevor Street slipway and the southern limit by the boundary between the beach zone and the building zone at Tudor Road. The beach was recharged with shingle material in 2014 following the storm events.
- **Issues and Objectives:** Beach levels must be maintained to prevent wave overtopping and scour of the toe of the sheet pile wall at the bottom of the steps.
- **Constraints:** The objective for the MU is to continue to provide flood protection and retain access to the beach.

**MUN4: Tudor Road to the west edge of the Craig-y-Don paddling pool**
- **Description:** This area consists of a steep upper shingle beach and a flatter, lower sand beach. The beach is backed by a stepped concrete revetment and wide promenade. The southern limit is bounded by the border between the beach zone and the building zone at Tudor Road and the southern limit by the western edge of the paddling pool. The beach was recharged with shingle material in 2014 following the storm events.
- **Issues and Objectives:** Beach levels must be maintained to prevent wave overtopping and scour of the toe of the sheet pile wall at the bottom of the steps.
- **Constraints:** The sloping front wall allows waves to run up the face and overtop into the paddling pool. The objective for this MU is to maintain the beach as an amenity and provide flood protection.

**MUN5: Craig-y-Don paddling pool to the start of the Fishing Zone at Colwyn Road**
- **Description:** This unit consists of a steep upper shingle beach and a flat lower sand beach. The beach is backed by a vertical wall. The northern limit is bounded by the eastern limit of the paddling pool and the eastern limit by the boundary between the boating and fishing zone at Colwyn Road. No recharge was applied to this section of the beach following the 2013-14 winter storms.
- **Issues and Objectives:** The beach in this section protects the B5115 and must be maintained to provide access to and from Llandudno.
- **Constraints:** The beach levels must be maintained to prevent wave overtopping and scour of the toe of the sheet pile wall at the bottom of the steps.

**MUN6: East edge of the Craig-y-Don paddling pool to the start of the Fishing Zone at Colwyn Road**
- **Description:** This area consists of a steep upper shingle beach and a flat lower sand beach. The beach is backed by a vertical wall. The northern limit is bounded by the eastern limit of the paddling pool and the eastern limit by the boundary between the boating and fishing zone at Colwyn Road.
- **Issues and Objectives:** The beach in this section protects the B5115 and must be maintained to provide access to and from Llandudno.
- **Constraints:** The beach levels must be maintained to prevent wave overtopping and scour of the toe of the sheet pile wall at the bottom of the steps.

**Option NS6** will specifically address wave overtopping within this MU.
The West Shore has been divided into five sections called Management Units (MUW). Each one has been considered separately and in-combination with the other Management Units.

**MUW1: Frontage along Marine Drive to Gogarth Breakwater**
- **Description:** The relatively narrow beach in this area consists of a sand and shingle upper beach with a lower sand beach. The beach is backed by a stepped concrete sea wall. The northern limit extends towards Marine Drive and the southern limit is bounded by the beach itself.
- **Steps across the sections:** These are in poor condition and have been overlaid in some places.
- **Constraints:** Beach levels must be maintained to prevent overtopping and scour of the toe of the sheet pile wall at the bottom of the steps.
- **Options:** The frontage wide options of periodic beach maintenance, dune regeneration, breakwater removal, rock placement and sand traps will affect this management unit (Options WS1-6 to WS8-9).

**MUW2: Gogarth Breakwater to Lloyd Street Breakwater**
- **Description:** The upper beach consists of shingle with a lower sand beach. The beach is backed by a stepped concrete sea wall. The extents of this management unit consist of the Gogarth Breakwater to the north and the Lloyd Street Breakwater to the south.
- **Steps across the sections:** These are in poor condition and have been overlaid in some places.
- **Constraints:** Beach levels must be maintained to prevent wave overtopping and scour of the toe of the sheet pile wall at the bottom of the steps.
- **Issues and Objectives:** The Gogarth Breakwater has been successful in protecting the beach in this MU. The area immediately behind the breakwater has a relatively high beach level and thus these sections have formed at the root of the breakwater.
- **Options:** The frontage wide options of periodic beach maintenance and wall construction, dune regeneration, breakwater removal, rock placement and sand traps will affect this management unit (Options WS1-6 to WS8-9).

**MUW3:**
- **Description:**
- **Issues and Objectives:** Wind-blown sand is an issue here, particularly along the cycle path, due to the back-up of material behind the breakwater.
- **Constraints:** The cycle path is considered to be an important asset and therefore should, if possible, be protected.
- **Options:** The frontage wide options of periodic beach maintenance, dune regeneration, breakwater removal, rock placement and sand traps will affect this management unit (Options WS1-6 to WS8-9).

**MUW4:**
- **Description:** More extends from the end of the sea wall in MU3 to the Cerrig Duon breakwater. The car park is at the back of the beach and is slightly higher than the sea wall to the north. The dunes rise up from the southern end of the car park and provide a clear demarcation of the back of the beach.
- **Issues and Objectives:** The upper beach is considered to be an important asset and therefore should, if possible be protected.
- **Constraints:** Beach levels must be maintained to prevent wave overtopping and scour of the toe of the sheet pile wall at the bottom of the steps.
- **Options:** The frontage wide options of periodic beach maintenance, dune regeneration, breakwater removal, rock placement and sand traps will affect this management unit (Options WS1-6 to WS8-9).

**MUW5:**
- **Description:**
- **Issues and Objectives:** The protection of the breakwater means that the area experiences very low wave energy and sand in the system is translocated from the beach.
- **Constraints:** The frontage wide options of periodic beach maintenance, dune regeneration, breakwater removal, rock placement and sand traps will affect this management unit (Options WS1-6 to WS8-9).
Option A: Beach Nourishment & Control Structures

Description
Beach nourishment with shore connected control structures. Rock or timber groynes to be used as the control structures. This would replace the cobbles from Trevor St slipway/Children's Corner to approximately Vaughan Street with sand. The exact location of the change in material and the structures would need to be determined. Raising of the rear promenade wall would take place before year 50 to account for rising sea levels and the associated increase in flood risk.

Advantages
- Control structures will assist with accretion of sediment and assist with controlling longshore sediment transport.
- Control structures provide shelter, attenuating wave conditions at the shoreline and reducing energy acting on the beach.
- Stable pocket beaches will be created on the lee side of rock groynes.
- Rock structures have potential for incorporating amenity.

Disadvantages
- Significant amount of expensive armour/timber material required.
- Higher capital construction cost than uncontrolled environment.
- Significant visual impact.
- Control structures can restrict existing uninhibited access along the beach.
- High sand beach has associated wind blown sand issues, which could affect nearby property and infrastructure.
- Timber structures less resilient to abrasive forces from sediment movement – increased maintenance required.
- Sediment movement requires on-going management and topping up.
- Long term increase in wall elevation may impact visibility of the sea and beach.
- Requires longer term re-construction of promenade accesses, inclusion of gates/stop logs etc.
Option B: Beach Nourishment

Description
Beach nourishment only. This would replace the cobble from Trevor St slipway/Children’s Corner to approximately Vaughan Street with sand however no control structures would be put in place. Raising of the rear promenade wall would take place before year 50 to account for rising sea levels and the associated increase in flood risk.

Advantages
- Flexible coastal management solution i.e. option is reversible and scalable.
- Positive impact on adjacent areas through the maintenance of natural sediment transport processes.
- Attract more people to the frontage.

Disadvantages
- Variable standard of protection provided as beach sediment moves alongshore and down the profile.
- There is high uncertainty associated with estimating the rate of beach movement and losses and there is a high risk of higher (or lower) recharge amounts required resulting in higher (or lower) than expected maintenance costs.
- Requires more frequent monitoring and management (all options require some monitoring and management).
- Will require frequent topping up therefore it can be expensive option over the short and long term.
- High sand beach has associated wind blown sand issues, which could affect nearby property and infrastructure.
- Long term increase in wall elevation may impact visibility of the sea and beach.
- Requires longer term re-construction of promenade accesses, inclusion of gates/stop logs etc.

Proposed height for rear promenade wall:
- Proposed wall: 750mm
- Existing wall: 300-400mm
Option C: Business as Usual

**Description**
Maintenance of the existing cobble beach from Trevor St slipway to Craig-Y-Don. Raising of the rear promenade wall would take place before year 50 to account for rising sea levels and the associated increase in flood risk.

**Advantages**
- Low capital investment in short term.
- Overall, cost efficient and reconstruction of wall long term will be an effective method of maintaining the standard of protection.
- Utilises the existing promenade and rear wall to limit the risk of overtopping waters from causing flooding to property and infrastructure.

**Disadvantages**
- Requires topping up of beach to maintain standard of protection over time (but at lesser frequency than sand).
- Long term increase in wall elevation may impact visibility of the sea and beach.
- Requires longer term re-construction of promenade accesses, inclusion of gates/stop logs etc.
- Concrete would be susceptible to surface abrasion due to movement of shingle during storms.

**Proposed height for rear promenade wall:**
- Proposed wall: 750mm
- Existing wall: 300-400mm
Option A: Maintenance & Beach Management

Description
Periodic beach maintenance – will include for the topping up of additional shingle as well as the business as usual maintenance works – windblown sand clearance, concrete repairs etc.

Advantages
• Low impact on the environment.
• Surplus material can be re-used in other areas e.g. recycled to North Shore.

Disadvantages
• Variable standard of protection provided as beach moves.
• Losses occur in places (requires periodic re-nourishment).
• Requires on-going management.
• Flood risk between end of existing concrete defences and North Wales Golf Club remains.
• Reactive rather than proactive management of windblown sand issues.

Option B: Extension of Flood Defences

Description
Extension to the existing defences from end of existing concrete defences to the sand dunes.

Advantages
• Minimal impact on the environment.
• Increased flood protection along the frontage.

Disadvantages
• Higher initial capital investment.

Option C: Combined Scheme

Description
Combined scheme – maintaining and topping up beach conditions as necessary, extension of secondary defences between the existing wall and sand dunes, provision of windblown sand control measures, and provision of a raised walkway across the southern half of the frontage.

Advantages
• Advantages as (b) plus;
• Will improve the flood defence and amenity standard along the frontage.
• Will provide a continuous usable path along the shoreline from the car park to Cerrig Duon Breakwater.
• Provides proactive measures to reduce impacts of windblown sand.

Disadvantages
• Unlikely to completely eradicate the windblown issue – material may continue to blow over the top of the wall/cycle path.
• Timing of remedial works to the existing wall is dependent on the residual life of the existing structure and climate change considerations.
• Sustainability of cycleway option depends on the material used and route adopted.
Llandudno's First Pier

• Construction began 1838
• Badly damaged in the storm of 26th October 1859.
• Repaired and reused to bring timbers to build Llandudno
• Eventually sold at auction and dismantled
• Resurveyed 2012
• Identified 55 posts some single and some double
• Length 242 ft

Shipwreck Remains

Five pieces all found in the same area - 2/3 of the way down the length of the pier opposite the lifeboat slipway and the short jetty. Could they be the remains of the Archiduc Palatino, wrecked in the area of Llandudno Bay in Spring 1847? She grounded on the southern end of the old weir just opposite the St George's Hotel. More work is needed. Pieces only accessible on an extremely low tide.

Wooden Posts

'Two extensive quarries existed one on each side of the Happy Valley'
'Another stage for the same purpose (of removing stone) was situated on the site of the Grand Hotel extending on to the plot of sand just in front. This was constructed by the late Mr George Brookes, Snr, Victoria Inn. Mr Brookes also made a road to connect this stage with the quarry which is on the left side of the Happy Valley. Many hundred tons of limestone was shipped from these stages. Is this stone feature Brookes Stage? – more investigation is required.

Credit for heritage research and photographs: Debbie Wareham, Ships’ Timbers
The following timeline is presented to show the key stages in the development and history of this scheme.

- **June 2016**: AECOM starts to develop a Beach Management Plan (BMP) to revise the Conwy Tidal Flood Risk Assessment (CTFRA).
- **June 2017**: AECOM completes the BMP and CTFRA.
- **July 2017**: AECOM and Conwy Borough Council (CCBC) present the BMP to the Llandudno Coastal Forum.
- **October 2017**: CCBC approves the BMP.
- **September 2017**: The Welsh Government commits to funding for the Outline Business Case.
- **December 2013**: Significant storm impacting North Shore Llandudno reducing existing coastal protection to stepped revetment.
- **March 2014**: CCBC carry out significant shingle replenishment works at North Shore with public dissatisfaction over consultation.
- **August 2014**: First meeting of LCF and Terms of reference agreed.
- **November 2015**: CCBC apply to Welsh Government for funding through Coastal Risk Management Programme (CRMP) for a Beach Management Plan (BMP).
- **June 2016**: AECOM starts to develop a Beach Management Plan (BMP) to revise the Conwy Tidal Flood Risk Assessment (CTFRA).
- **June 2017**: AECOM completes the BMP and CTFRA.
- **March 2015**: North Shore consultation on future defence and amenity ideas.
- **March 2014**: Public meeting at Venue Cymru with over 700 in attendance.
- **August 2014**: CCBC carry out significant shingle replenishment works at North Shore with public dissatisfaction over consultation.
- **November 2015**: CCBC apply to Welsh Government for funding through Coastal Risk Management Programme (CRMP) for a Beach Management Plan (BMP).
- **August 2017**: BMP presented to LCF.
- **July 2017**: AECOM and Conwy Borough Council (CCBC) present the BMP to the Llandudno Coastal Forum.
- **October 2017**: CCBC approves the BMP.
- **November 2017**: BMP drop in held in Victoria Centre.
- **April 2016**: CCBC successful in securing funding from WG for (BMP) for Llandudno.
- **July 2016**: West Shore consultation on future defence and amenity ideas.
- **March 2017**: Future flood visualisations prepared for Llandudno.
The following timeline is presented as indicative to show the key stages in the development of this scheme.

Note that if the development of flood protection is to be tied in with other redevelopment of Llandudno then this programme may be altered by the application process for grants to support that redevelopment.

- **2020-2021**: If the Outline Business Case determines that a scheme is economically viable and that construction is required in less than 7-10 years then it is likely the project will proceed to Full Business Case.
  - Undertake the necessary environmental surveys as defined in the Outline Business Case.
  - Complete the detailed design of the preferred scheme(s).
  - Undertake Public Consultation on the detailed design of the preferred option.
  - Obtain the necessary Consents.

- **2021 Onwards**: Commence Construction in accordance with funding arrangements.

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**Outline Business Case**

- **January 2018**: Funding secured from WG for Outline Business Case.
- **March 2018**: AECOM appointed to carry out OBC.
- **April 2019**: Short list of options agreed and approved by CCBC and LCF.
- **May 2019**: Coastal Defence improvement options presented to Scrutiny.
- **June 2019**: Llandudno Tourism Vision published.
- **March 2018**: AECOM appointed to carry out Outline Business Case which will:
  - Investigate the flood risk in more detail to determine dates at which the flood risk becomes 'unacceptable'.
  - Develop Outline Designs for short-listed options.
  - Public consultation on the short-listed options.
  - Carry out a Cost Benefit Analysis on the short listed options.
  - Select a preferred options.
  - Draw together all evidence to justify that a scheme will be required and is economically viable and that the project should progress to Full Business Case.
  - Submit to Welsh Government.

**Full Business Case / Detailed Design**

- **September 2019**: Submission of OBC to LCF and then Cabinet.
- **October - December 2019**: Consideration of OBC by WG.
- **May 2019**: Coastal Defence improvement options presented to Scrutiny.
- **February 2021**: Llandudno Tourism Vision published.

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**Construction**

- **October - December 2019**: Consideration of OBC by WG.
- **2021 Onwards**: Commence Construction in accordance with funding arrangements.

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**Llandudno Tourism Vision published.**

**Submission of OBC to LCF and then Cabinet.**

**Submission of OBC to WG.**
Llandudno is a key UK tourism centre with a range of attractions and events, Victorian heritage, accessibility and high quality natural environment. The tourism sector in Llandudno has performed strongly over recent years and is a key strategic focus for both Welsh Government and Conwy County Borough Council.

**KEY TOURISM FACTS:**

**Llandudno as an International Destination**
- Llandudno is 1hr 20 mins from both Liverpool and Manchester airports, meaning it is accessible from international destinations.

**Llandudno Visitor Age Profile**
- Visitors are mostly from the older generation:
  - 60% of visitors aged 55 or above
  - 10% are families with children

**Tourism Employment in Llandudno**
- Tourism employment has risen from 4,606 in 2012 to 5,328 in 2017 (including indirect employment).

**Accessible from Key Cities**
- Other key cities, including Chester, Stoke-on-Trent, Leeds and Birmingham are within a 2.5hr drive time.

**Economic Impact of Tourism in Llandudno**
- The total economic impact of tourism in Llandudno was £384 million in 2017, up from £296m in 2012.

**Llandudno’s Beaches Attract Tourists**
- Llandudno’s beaches are a key part of the town’s tourism offer. A recent tourism study showed that 28% of visitors were attracted by the town’s beaches.

If Llandudno adapts to changing market conditions and invests accordingly, a high growth scenario suggests that the economic impact of tourism will rise from £388.8 million to £513.6 million by 2045.