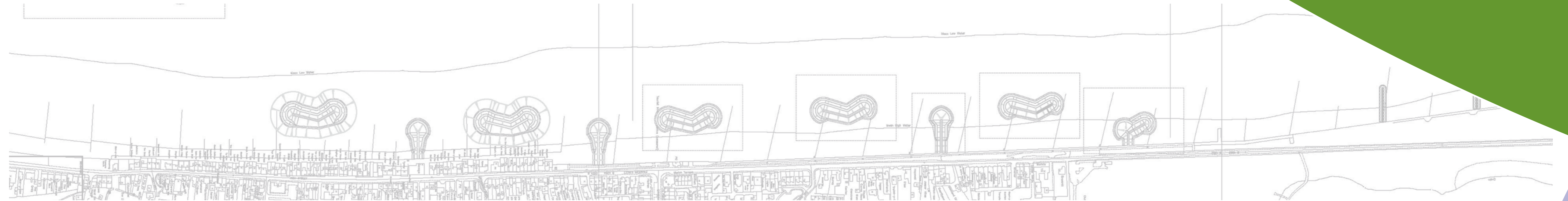


# Borth Coastal Protection Scheme

## Where have we come from?



### Flooding and Erosion in Borth

Borth has a history of coastal flooding and erosion and whilst the existing timber groynes and breastwork are in place to prevent this from occurring, they are coming to the end of their life at an age of around 40 years.

Ceredigion County Council have commissioned Royal HaskoningDHV to carry out the work necessary for replacement and improvement of the coastal defences in Borth.



### Who are Royal HaskoningDHV?

Royal HaskoningDHV is a leading independent, international engineering consultancy service provider, ranking globally in the top 10 of independently owned, non-listed companies and top 40 overall.

Our 7,000 professionals provide consultancy services worldwide from 100 offices in 35 countries in the fields of infrastructure, water, maritime, aviation, planning and transport, industry, energy, mining and buildings.

Our commitment to working with our clients and partners to find innovative sustainable solutions to today's world challenges is reflected in our brand promise - to enhance society together.

### What has been done so far?

**2001** An investigation into the feasibility and need for a coastal protection scheme began because the existing defences are coming to the end of their life.

**2004** A study to investigate and facilitate the inclusion of a Multi-Purpose Reef in the proposed "Borth Coastal Protection Scheme", which will bring benefits beyond the principal function of coastal protection.

**2006** An appraisal of options was carried out which assessed a range of approaches against technical, economic and environmental considerations to Coastal Protection, including Do Nothing, Maintenance and Do Something.

**The Preferred Option is Rock Beach Control Structures with a Multi-Purpose Reef and Beach Nourishment.**

**2008** An Outline Design Study was carried out to determine the location, size and quantity of structures required to maintain a sufficient beach to protect the town of Borth.

**2009** Ceredigion Council obtained convergence funding from the EU for the construction of the first phase of the scheme.

**2009** Draft Shoreline Management Plan 2 recommending Hold the Line for Epochs 1 (0-20 years) and 2 (20-50 years) at Borth and Managed Realignment in Epoch 3 (50-100 years)

**2012** Completion of Phase 1 of the Coast Protection works at Borth, incorporating the multi-purpose reef, rock structures and beach nourishment.

**2012** Steering Group Approval of SMP2 ready for Welsh Government adoption.

**2012** Commencement of Phase 2 outline design.

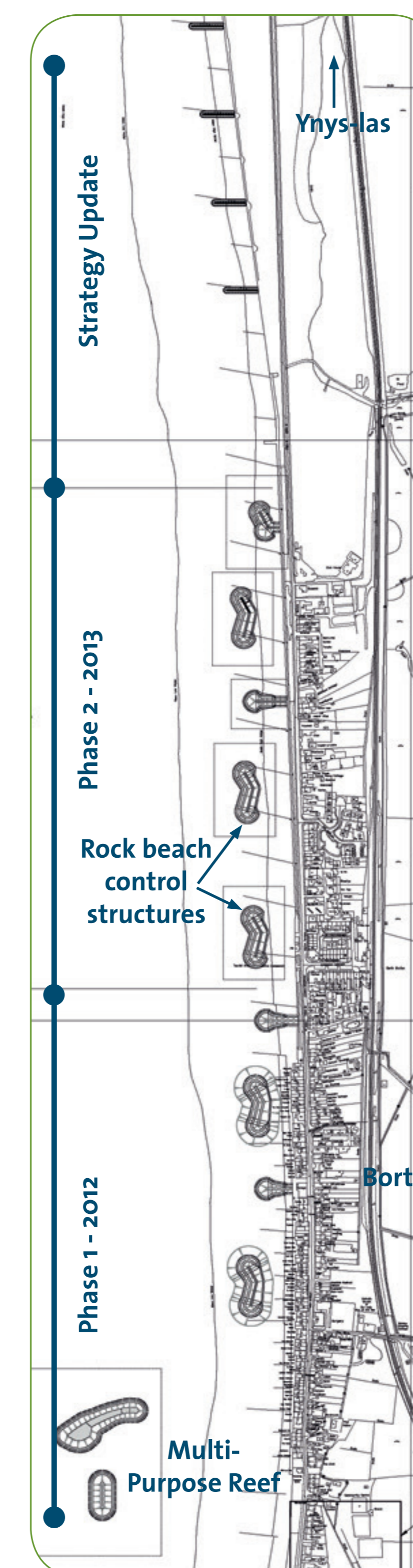


Diagram showing the whole Scheme Layout and how it will be phased.

### What will the Scheme do?

- Flood and erosion risk will be lowered for the village of Borth. The target standard of defence will be for a 1:100 year event.
- The Rock Structures are designed to make sure that this shingle stays in place and is not removed by waves and currents.
- The Slipway provides a longer crest platform and wider seaward end to assist with recovery of vessels. The breastwork at the back of the beach will provide an additional element of coast protection.
- Renourishment may be required to increase the beach width.



### The Future

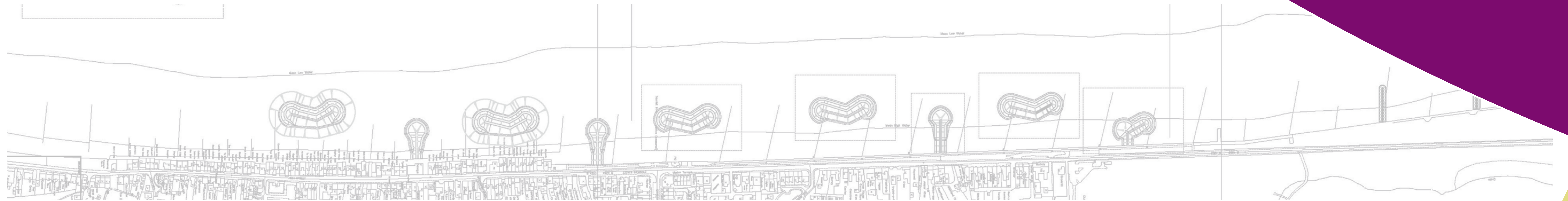
This is Phase 2 of coast protection works within the agreed Strategy. A review of the scheme within the context of SMP2 and the existing Strategy has been undertaken. The works are in line with both, although it is recognised an update of the Strategy is needed, with particular consideration of coastal management to the frontage north of Borth.

**The cost of Phase 2 is estimated at £3million**

The whole proposed scheme is adaptable to allow it to be altered if the conditions/policies change. Importantly, consideration also has to be made of future Climate Change (rising sea levels) to give the new defences a longer life.

# Borth Coastal Protection Scheme

## What are we doing?



### Ground Investigation

A series of trial pits and cone penetration tests have been carried out at various locations along the Phase 2 frontage. This was undertaken in January 2013 using the rig in the photograph. The Ground Investigation results will be used to validate the assumptions from Phase 1 in terms of settlement allowances for the rock structures.

### Numerical Modelling and Detail Design

During Phase 1, a scale model of the scheme was constructed in a wave tank and tested under a number of wave conditions to help finalise the design of individual structures. The Multi-Purpose Reef was also assessed using the scale model. The information gathered from this testing was used to design, in detail, the final structures.

This scale model considered the layout of the individual structures to be implemented as part of Phase 2. Therefore it was not considered necessary to undertake further laboratory testing. Indeed, the Phase 1 structures provide a full scale evidence base at Borth.

The approach for the detailed design for Phase 2 was undertaking numerical modelling to validate the findings of the physical model. This resulted in minor changes to the layout of the structures.

A key consideration in the design of the Phase 2 structures is the detail at the north, in terms of providing a transition between the "with scheme" Borth frontage and the existing timber groynes to the north towards Ynys-Ias.



### Planning Permission

A Planning Application will be submitted to obtain consent for Phase 2 of the Borth Scheme. Other licences we required included:

Marine Licence which replaces the Coast Protection Act and Food and Environmental Protection (FEPA) Act.

A full Environmental Impact Assessment (EIA) is being prepared to identify and mitigate effects on the natural and human environment.

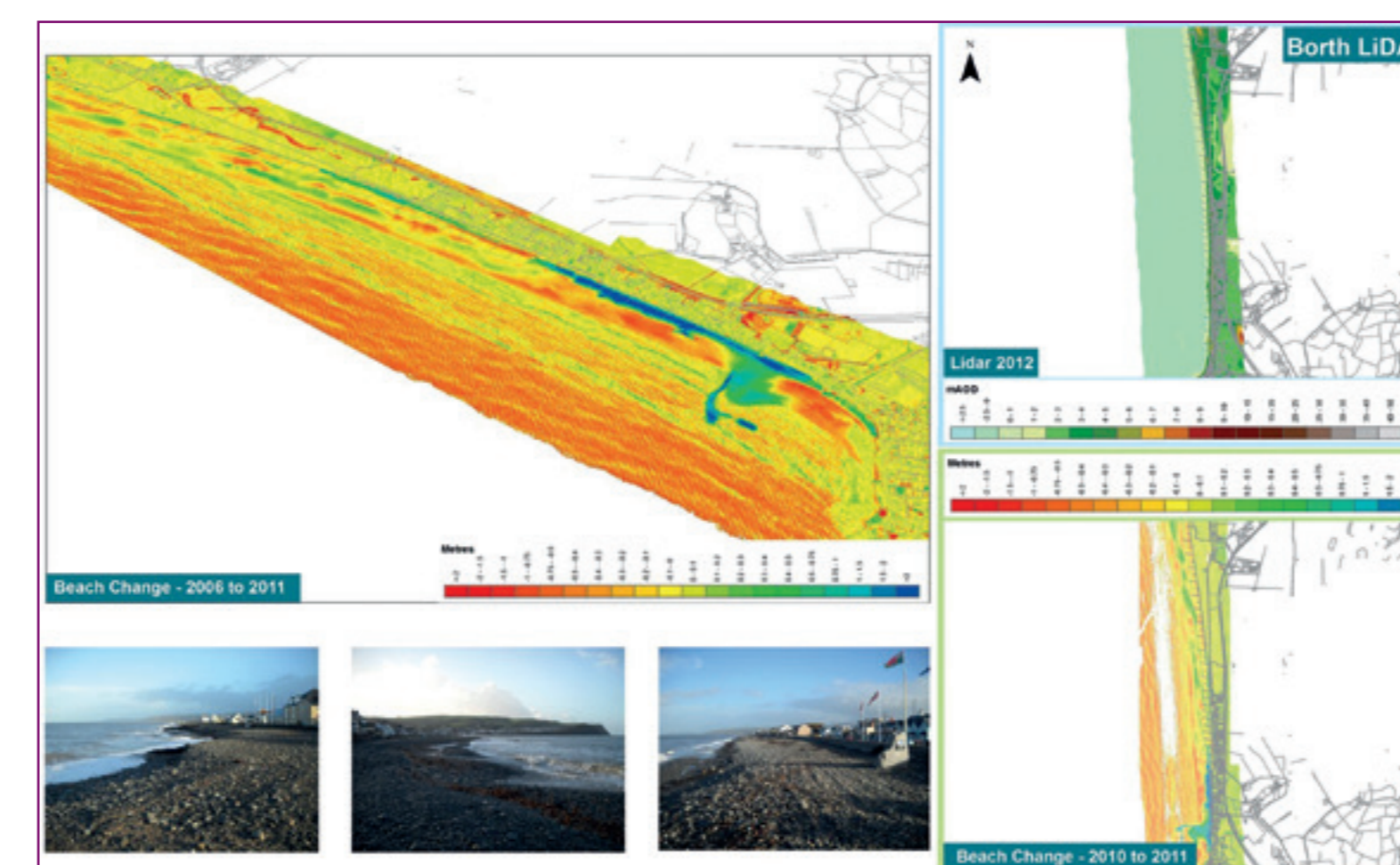
### Slipway and Breastwork Completion

**The breastwork/ sea wall and slipway construction is underway and will be completed prior to the busy tourist summer months at Borth.**

### Surveys - Beach

A Topographic Survey, carried out by a team of surveyors will map the features and shape of the beach.

This is in addition to the annual monitoring undertaken at Borth as part of the Ceredigion Beach Monitoring which assesses changes in beach levels.



### Construction Phases

A contractor will be appointed to construct the second phase of the Scheme. The target date for the start is autumn 2013. Portions of the beach will be temporarily closed whilst the construction is carried out. Construction is anticipated to take 6 months.



### Phase 2 Completion

The Phase 2 works are yet to receive funding approval from Welsh Government. Undertaking detailed design and obtaining necessary consents will ensure the scheme can proceed without delay once the funding is confirmed.

2012

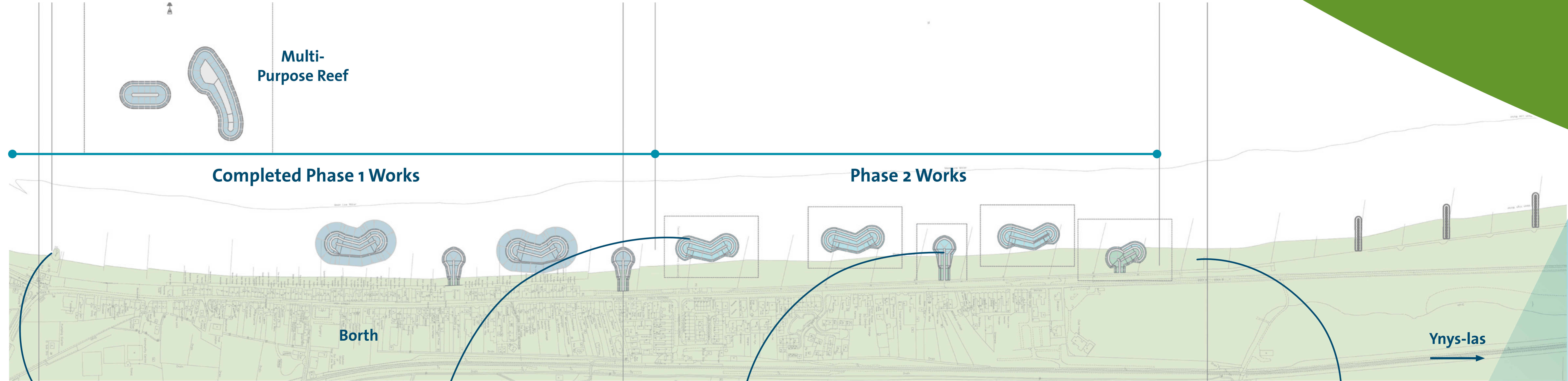
Winter/Spring 2013

Summer 2013

Autumn 2013

# Borth Coastal Protection Scheme

## What will it look like?



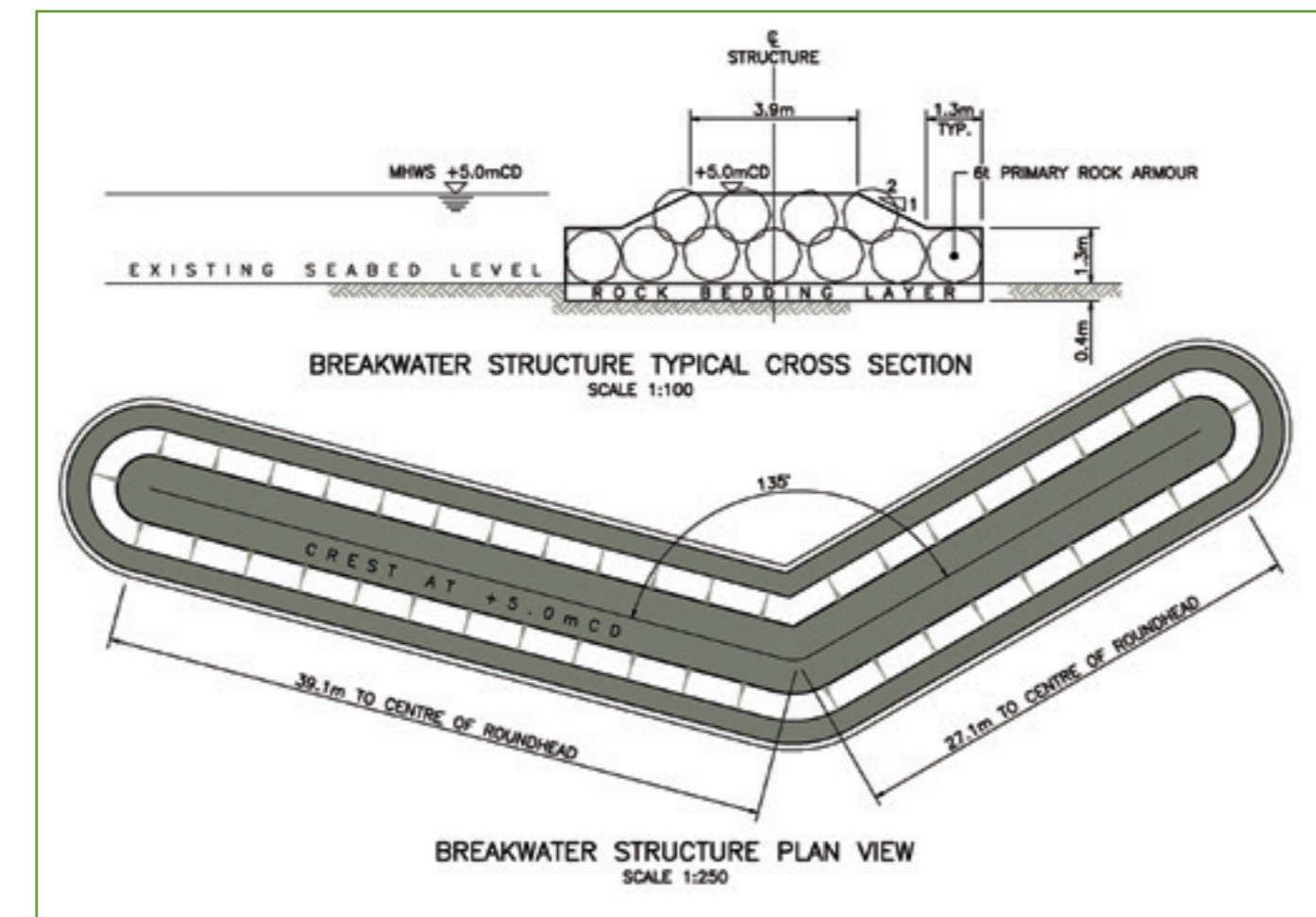
### Slipway\*

The slipway is a like for like construction in terms of the timber structure. The piles have been designed to provide a foundation for the structure into underlying competent material. The members have all been specified to be sustainably sourced. The slipway benefits from a longer crest and wider seaward end to aid vessel recovery in addition to repairs to the flood gate.



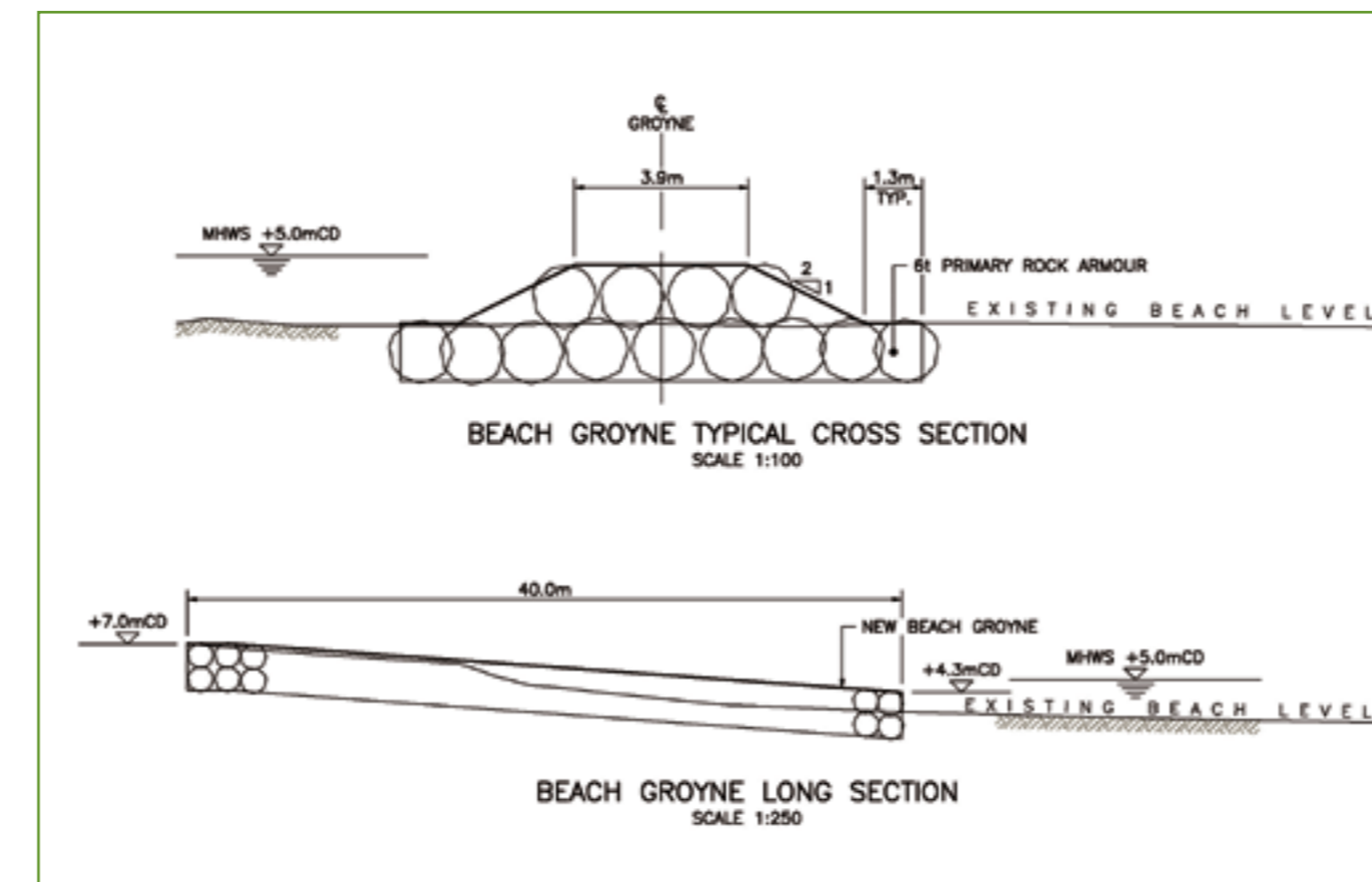
### Beach Rock Breakwaters

These are placed between the rock groynes, slightly offshore, to force waves to break further out to sea, therefore protecting the village from wave attack. The breakwaters will also generate sand and shingle salients behind them. Once the breakwaters are built, the beach will build up and the water will be shallow enough so that you will be able to walk out to them at low tide.



### Beach Rock Groynes

Rock groynes will be placed at intervals along the beach. These will retain shingle, in the same way as the timber groynes do now.



### Beach Nourishment

At this time it is envisaged that very little beach nourishment will be required, if any. This will depend on changes in beach levels prior to construction, which are continuously monitored by the Council.



### Breastwork\*

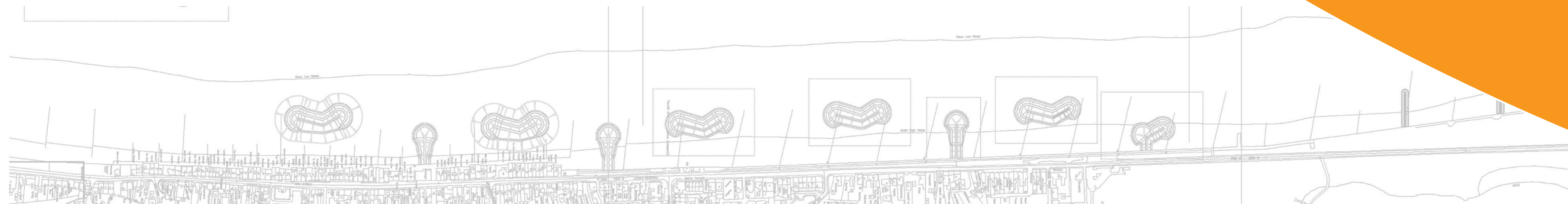
As with Phase 1, the breastwork/sea wall at the back of the beach is also being improved as the existing timbers are reaching the end of the design life and are deteriorating. The design is similar to that of the existing sea wall.



\* Note, the Slipway and Breastwork are currently being constructed and the necessary consents have been obtained.

# Borth Coastal Protection Scheme

## How will we build it?



### Rock Structures

The rock will be transported to the beach by either boat or by road. This will depend on where the rock will come from. Once on site, excavators will lift and place the rocks to form the breakwaters and groynes. At this stage it is anticipated that all rock for Phase 2 can be sourced in the UK and will therefore be transported by road.

The rock groynes and breakwaters will be constructed when the tide is low enough to allow machinery onto the beach.

During construction, sections of the beach will be closed to the public to ensure health and safety of beach users.



### Beach Nourishment

Shingle will be sourced from an appropriate source, both in terms of technical specification and appearance. Given the limited quantities of shingle required, if at all, the shingle will be transported from a suitable quarry

to the frontage. The shingle will be delivered in stages rather than during Phase 1, where the EU funding conditions meant that materials had to be purchased in advance of commencement of the works.

