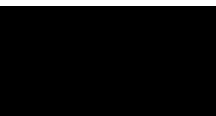
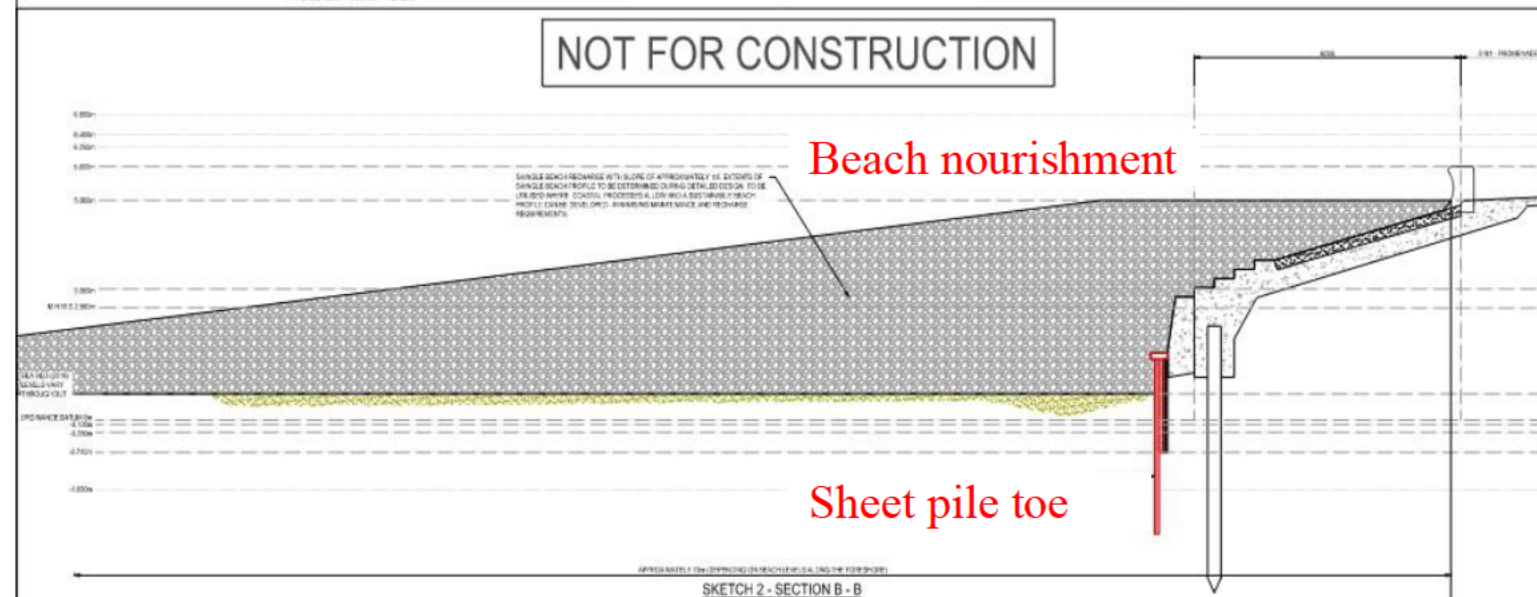
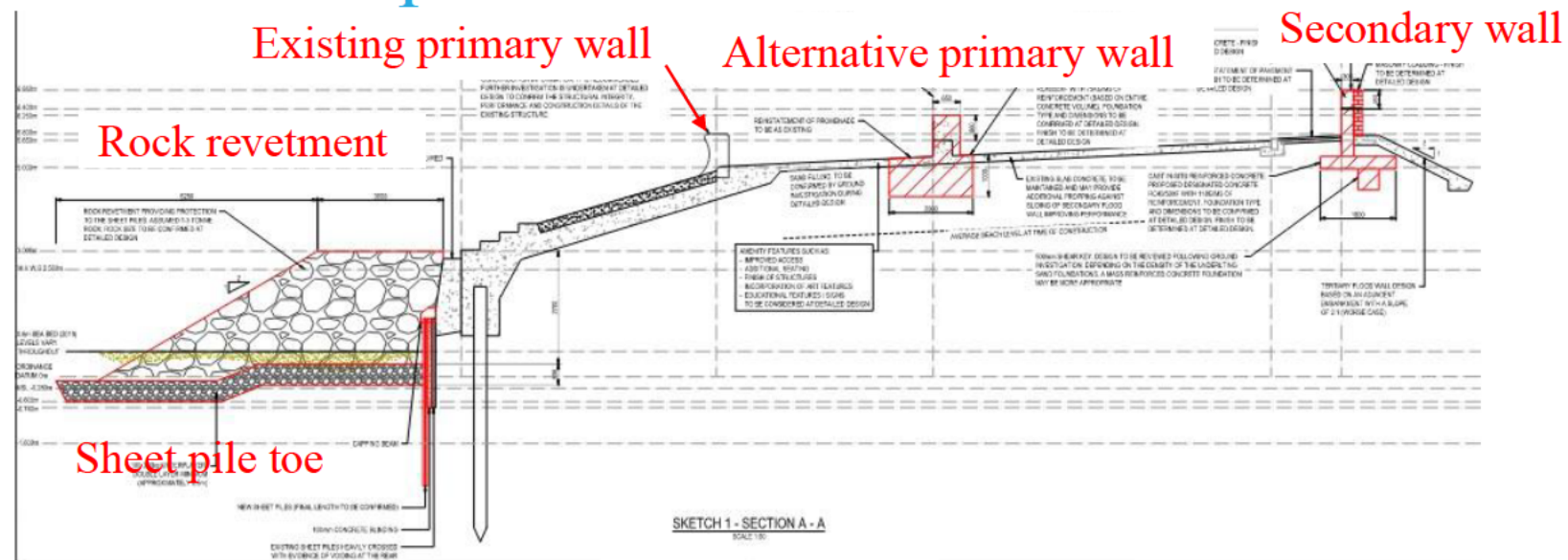


Barmouth Coastal Scheme

Phasing Options



Preferred Option - OBC



Preferred Option – Staged Approach delivering defined benefits

- 1) Vision, design (**RIBA3 + physical modelling**) for **whole scheme**. Includes engagement & environmental assessment.

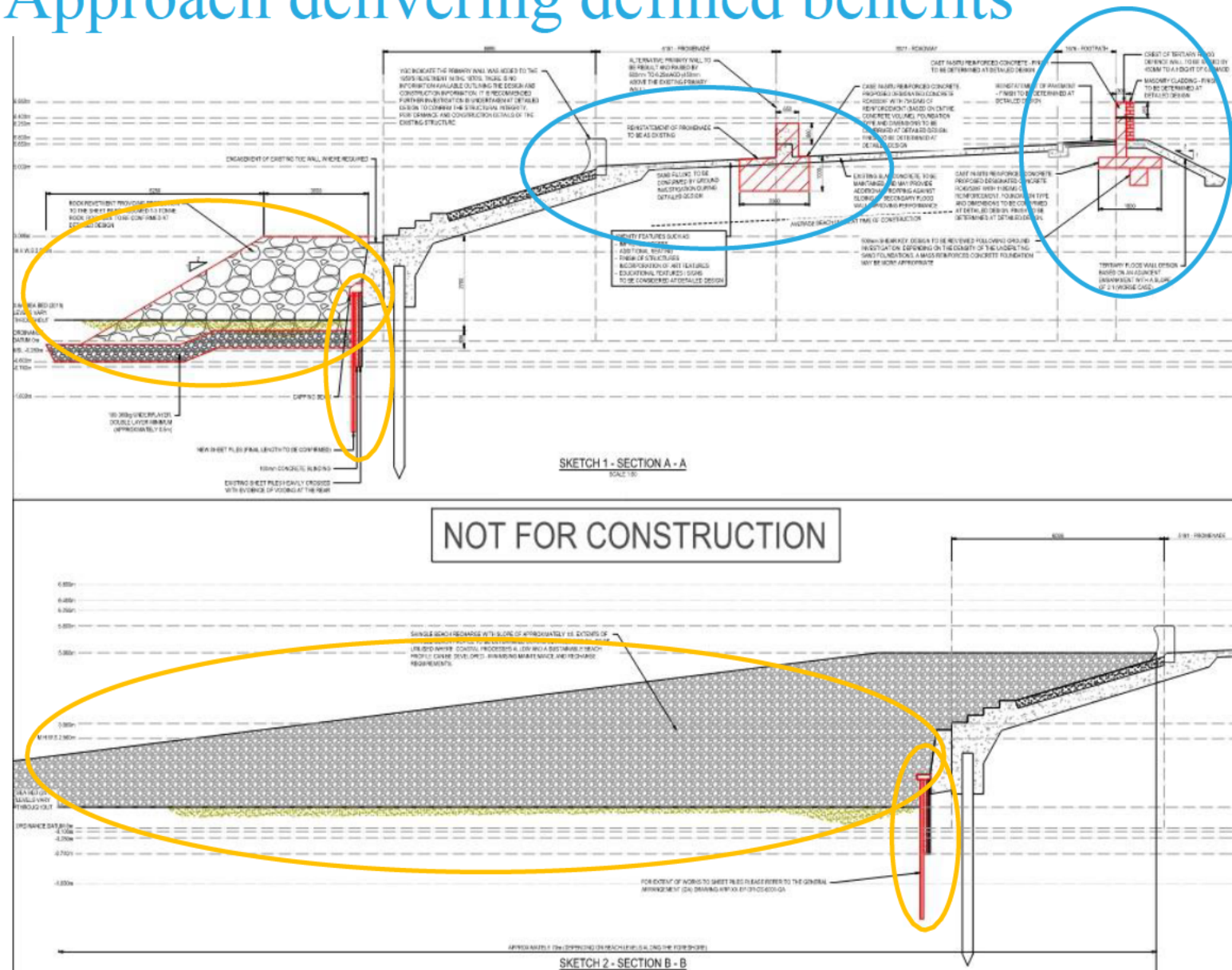
Phase 1 interim works to contain flooding

- 2) **Maintenance and void filling**. No consent implications. Benefit = avoiding collapse/breach.
- 3) **Secondary flood wall**. Detailed design (RIBA4) and consenting (planning). Benefit: short-term flood risk management to hinterland, shorter consenting period.

Phase 2 works to manage coastal risks

- 4) **Beach nourishment/ rock revetment**. Detailed design and consenting (planning and 4mth+ marine licence) informed by HRA and likely EIA. Benefits = erosion and long term flood risk reductions to hinterland.
- 5) **Toe piling works** recommend align with 4) to avoid marine consenting.

Timing of **primary/ alternative primary wall works** = Flexible recommend 1+2. - Included in phase 1 for costing



OBC – Preferred option costing

Table 7. Preferred Option Costing

Proposed Scheme	PV Costs (£k)	Non Discounted Costs (£k)	Comments
<i>OBC to Construction Subtotal</i>	<i>£969</i>	<i>£969</i>	<i>Assumed to occur in Year 0.</i>
Construction and Construction Support	£17,682	£17,682	PV Capital cost, based on estimate from ECI. Includes: ○ Preliminaries: 36 weeks at £25,000/wks. ○ Material stock piling: 52 weeks at £5,000/wks. ○ Profit + overheads: 10% of total direct cost + preliminaries + material stock piling ○ Quantified risk assessment 95%ile Construction Period: May 2022 to December 2022
Optimism bias	£4,597	£4,597	26% applied to 'OBC to Construction' and 'Construction' costs due to uncertainty pending design development and survey. Allowance for Network Rail BAPA included as Optimism Bias.
Quantified Risk Assessment 95%ile	£5,284	£5,284	Appendix H – Quantified Risk Assessment
<i>Subtotal</i>	<i>£23,248</i>	<i>£23,248</i>	
Future costs (maintenance)	£178	£403	PV Maintenance cost to include minor concrete repair works to sea wall, promenade and reseating of the rock armour and reinstatement of shingle.
Optimism bias	£107	£242	60% applied to 'OBC to Construction' and 'Construction' costs due to uncertainty pending survey and design.
Total	£23,533	£23,533	

Costing - Work in Progress approach comparison

- Longer duration of works – increased material cost, inflation and preliminaries and increased disturbance
- Opportunity to build consensus with stakeholders and reducing consenting risk
- Further work on costing and risk assessment required

Approach	Construction Costs, risk and construction support (£k)	Optimism Bias (£k)	Total (£k)
Single stage (as per OBC)	£17,700	£4,600	£22,200
Staged (*)	£19,800 (*)	£5,100	£24,900
Phase 1 (2021)	£6,600	£1,700	£8,300
Phase 2 (2024)	£13,200	£3,400	£16,600
Staged (**)	£16,700	£10,000	£26,700
Phase 1 (2021)	£5,600	£3,300	£8,900
Phase 2 (2024)	£11,100	£6,700	£17,800

(*) Risk allowance for each phase is the Quantified risk assessment 95%ile (for the single stage scheme) prorated based on the construction costs. **26% optimism bias**

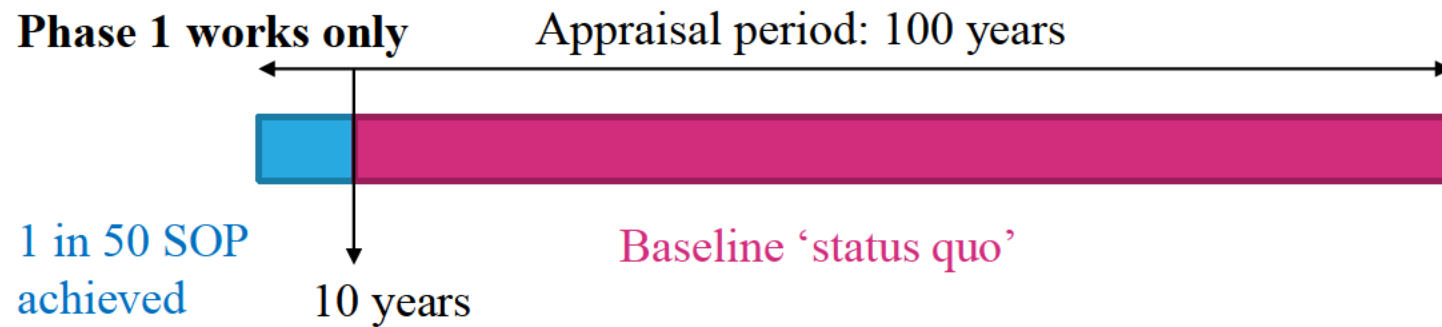
(**) Risk allowance is 15% construction cost and optimism bias 60%

Preferred Option – Staged Approach Benefits

Component	(£k)	Key areas of uncertainty
<i>Flood Related Damages</i>		
Damage to people and property	£99,767	<i>Extents and severity of flooding</i>
<i>Erosion Related Damages</i>		
Loss of properties	[Excluded – up to 60 properties affected]	<i>High uncertainty associated with the rates of erosion.</i>
Cambrian Coastal Railway Loss	[Excluded - benefits of protecting this asset are likely to range in the £m's and safe-guarding of this asset is imperative]	<i>Significant cost uncertainties and lack of available data. Wider context/connectivity risks.</i>
Loss of Recreational Benefits	[Excluded - the loss of Barmouth North Promenade may reduce the appeal of Barmouth]	<i>North Promenade amenity interdependent on Barmouth South.</i>
Damage to utilities infrastructure (services replacement)	£100	<i>Cost of diversion works & replacement services, timing</i>
Total	£99,867	
Significant potential benefits are excluded from this assessment due to uncertainties in a quantitative figure. The damages could arguably could increase significantly if implications of property erosion, loss of the Cambrian Coastal Railway function and recreational or wider benefits were included. Benefits are considered qualitatively.		

Preferred Option – Staged Approach Benefits

Approach	Present Value Damages (PVD) (£k)	Present Value Benefits (£k)	Benefit/cost ratio
Baseline	£99,867	-	
Single stage (as per OBC)	£29,221	£70,304	~3.2
Staged			
Phase 1	£90,516	£9,251	~1.0
Added benefit of Phase 2		61,053	~3.4



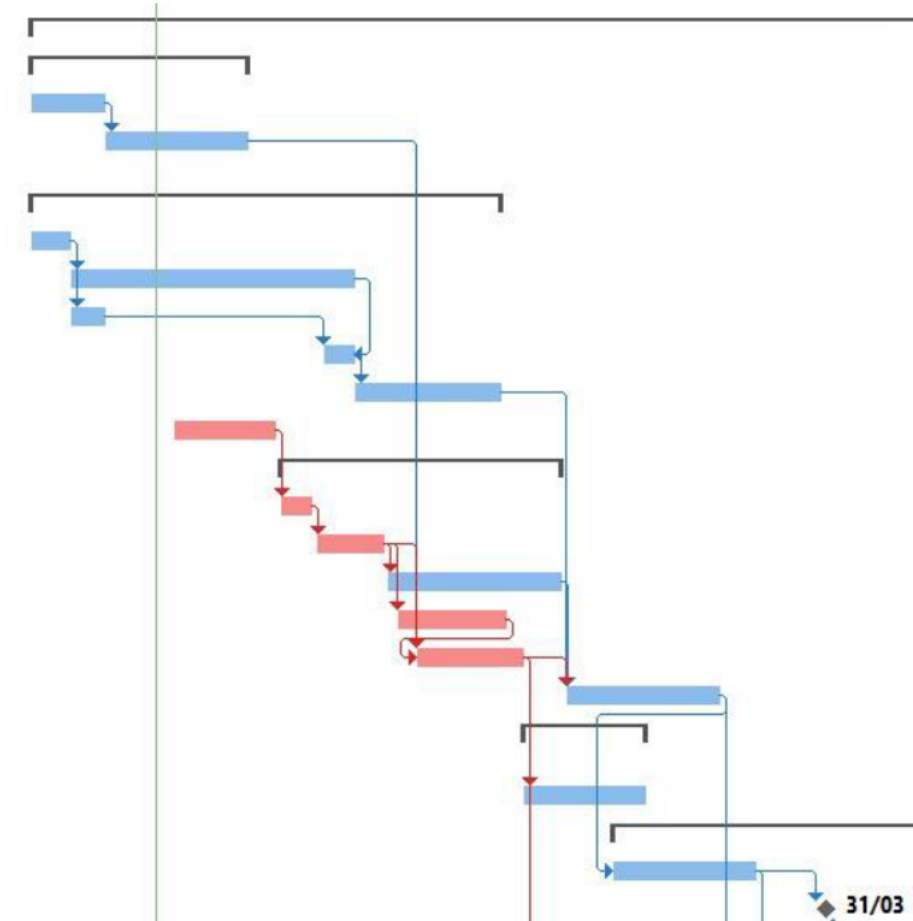
Preferred Option – Staged Approach risks

	Key risks	Mitigation
1	Significant flood or erosion event occurs in advance of FBC completion.	Specific funding to be available for reactive works.
2	Failing to progress with Phase 2 works	Early and continuous stakeholder engagement to identify and mitigate causes that could prevent Phase 2 from progressing.
3	Variability in material costs and inflation	Early contractor involvement throughout the project to advise on changing market conditions.
4	Project sensitivity to legislation and regulation changes	Quantified risk assessment to be revisited regularly to capture latest regulation and legislation changes.

Note: risks in addition to/ increased probability than previously identified in OBC for single stage scheme

Preferred Option – Staged Approach programme

▣ Barmouth North Promenade	399 days?	Mon 24/05/21	Thu 15/12/22	0 days?	
▣ Land-based GI	60 days	Mon 24/05/21	Mon 16/08/21	68 days	
Scope of works and spec (YGC)	20 days	Mon 24/05/21	Mon 21/06/21	68 days	
Site works (2w on site, 4w lab testing, 2w reporting)	40 days	Tue 22/06/21	Mon 16/08/21	68 days	4
▣ Marine GI	131 days	Mon 24/05/21	Tue 23/11/21	71 days	
Scope of works and spec (YGC?)	10 days	Mon 24/05/21	Mon 07/06/21	71 days	
Marine licence for GI (NRW)	4 mons	Tue 08/06/21	Mon 27/09/21	3.55 mons	7
GI tendering	10 days	Tue 08/06/21	Mon 21/06/21	133 days	7
GI mobilisation	8 days	Thu 16/09/21	Mon 27/09/21	71 days	9,8FF
Site works	41 days	Tue 28/09/21	Tue 23/11/21	71 days	10
Update and approval of OBC	30 days	Mon 19/07/21	Fri 27/08/21	0 days	
▣ RIBA 3 design entire scheme	80 days	Mon 30/08/21	Fri 17/12/21	0 days	
Scoping	10 days	Mon 30/08/21	Fri 10/09/21	0 days	12
Procure designer	20 days	Mon 13/09/21	Fri 08/10/21	0 days	14
Physical 2D Modelling	10 wks	Mon 11/10/21	Fri 17/12/21	5 wks	15
Surveys	30 days	Fri 15/10/21	Thu 25/11/21	0 days	15FS+4 days
Phase 1 works - Design for consenting	30 days	Fri 22/10/21	Thu 02/12/21	0 days	15FS+4 days,5FS-20
Phase 1 works - Detailed design	40 days	Mon 20/12/21	Thu 17/02/22	25 days	18,11FS-28 days,16
▣ Phase 1 works - Consenting and planning application	30 days	Fri 03/12/21	Wed 19/01/22	231 days	
Consenting and planning application	30 days	Fri 03/12/21	Wed 19/01/22	231 days	18
▣ Phase 1 works on site	160 days	Fri 07/01/22	Thu 25/08/22	25 days	
Tendering	2 mons	Fri 07/01/22	Thu 03/03/22	1.25 mons	19FS-30 days
Contractor appointment	0 days	Thu 31/03/22	Thu 31/03/22	180 days	23,30



Conclusions – phasing construction works

- Achieves construction commencement by March 2022
- Reduced consenting risks
- Increases the scheme cost
- Increases programme – increasing disruptions