

5 FEBRUARY 2019

CABINET

**JOINT REPORT FROM THE HEADS OF CULTURE & COMMUNITY
AND GROWTH & INFRASTRUCTURE**

SEAFRONT DEVELOPMENT - CANFORD CLIFFS

1.0 PURPOSE

- 1.1 To seek approval to revise the seafront development scheme at Canford Cliffs and undertake essential cliff stabilisation works to enable the previously approved enhancements of beach huts & seafront facilities to proceed.

RECOMMENDATIONS

- 2.1 To note the impact of the 2017 cliff slippage at Canford Cliffs (West) and the work undertaken to develop solutions to stabilise the cliff.
- 2.2 To recommend to Council that it approves the revised seafront development scheme for Canford Cliffs and undertakes essential cliff stabilisation works to enable the previously approved enhancements of beach huts & seafront facilities to proceed.
- 2.3 To recommend to Council that it approves the financial strategy for the revised scheme using up to £2.9m prudential borrowing (repaid from the additional income earned).
- 2.4 To recommend to Council that it delegates to the Chief Financial Officer the ability to decide on the final funding mix of the revised scheme between the use of the Councils Capital Contingency or prudential borrowing.

3.0 LOCAL GOVERNMENT REVIEW

- 3.1 The Bournemouth, Christchurch and Poole Shadow Executive Committee will be consulted on the revised scheme at its meeting on 12 February 2019 prior to Poole Council considering it for final approval at its meeting on the 19 February 2019.

4.0 BACKGROUND

- 4.1 In Nov 2016 the Council approved investment in the [Seafront Development Programme](#) to deliver the policy and priorities set out in the Draft Local Plan and the [Seafront SPD](#) by improving seafront facilities, beach hut provision and underlying infrastructure. The programme was reviewed and extended in Nov 2017 (see [Council Minutes 14/11/17](#)).
- 4.2 The various projects within the overall programme will improve the connectivity of public spaces, create new plazas and gardens and new catering & commercial outlets, and add a wide range of new, rebuilt or refurbished beach huts. Delivery of the programme is led by BoP Culture & Community.
- 4.3 Significant progress has been made with projects completed at Sandbanks, Flaghead, Branksome Dene & Hamworthy. Construction works are also planned during 2019 at Shore Rd, Shore Rd East & Branksome Chine. For full details see Appendix 1.

5.0 INFORMATION

5.1 Original scheme for Canford Cliffs

Following a cliff slippage in Feb 2017 (see ariel photo in Appendix 2) the enhancements of beach huts & seafront facilities shown in Table 1 originally planned for Canford Cliffs during 2017/18 were postponed. The scheme was at an advanced stage having achieved planning permission and due to be tendered within weeks.

Table 1 – Original scope of works

Proposed Works	Block Numbers (see Appendix 2)			
	1 – 8	9 - 11	Pavilion	12-13
Demolish beach huts and stabilise the lower cliff replacing part of the catch wall + plinth	✓	✓		
Rebuild 102 existing, add 89 new + refurbish 4 huts	✓	✓	✓	
Develop new café, refurbish toilets & improve public realm			✓	
Refurbish 18 huts				✓

5.2 Following the cliff slip, BoP engineers have worked closely with consultants WSP to assess the cliff and site geology. Vegetation has been carefully cleared and maintained in a sterile state, monitoring targets installed and borehole samples taken.

5.3 Analysis shows that the cliff face is continuing to deteriorate and in order to: maintain the condition; prevent damage / safeguard the infrastructure on Cliff Drive in the longer term; and allow for the more immediate development of the seafront, a permanent remedial solution should be implemented.

5.4 In light of this analysis (see Appendix 3 for WSP report), recommendations for a revised scheme for cliff stabilisation and enhancement of beach huts & seafront facilities at Canford Cliffs are therefore the main focus of this report.

5.5 OPTIONS

The options for scheme delivery at Canford Cliffs are summarised below together with a brief description of the works and potential associated benefits /issues:

Option A - No remedial action

- Potential significant infrastructural, financial and reputational risks.
- Further beach hut closures expected with loss of additional rental income.
- Opportunities from delivery of the enhancement scheme would not be realised.

Option B - Stabilise upper cliff face only

- Rectifies immediate issue of soil movement and stabilises upper cliff using soil nailing.
- Further issues with lower cliff face anticipated in near future affecting service provision and rental income.
- Opportunities from delivery of the enhancement scheme would not be realised.

Option C - Stabilise whole cliff face

- Rectifies immediate issue of soil movement and stabilises the upper & lower cliff.
- Significant revenue loss from the demolition of huts (c £200k/yr), necessary to replace catch wall and plinth
- Opportunities from delivery of the full enhancement scheme would not be realised.

Option D - Stabilise whole cliff face and deliver reduced development scheme

- Rectifies immediate issue of soil movement and stabilises the upper & lower cliff.
- Replaces lost revenue from demolished huts within current approved budget.
- Opportunities from delivery of the enhancement scheme would not be realised.

Option E - Stabilise whole cliff face and deliver revised development scheme

- Rectifies immediate issue of soil movement and stabilises the upper & lower cliff.
- Replaces lost revenue from demolished huts.
- Enables significant additional service benefits and revenues to be realised from delivery of full enhancement scheme using prudential borrowing.

5.6 Recommended Option

5.6.1 Options A - D have been considered and discounted. Taking no remedial action carries potentially significant risks to the cliff and highway infrastructure, as well as the continued and future increased loss of beach hut incomes. These options would not:

- achieve the public service/facility benefits anticipated from the full scheme
- achieve the £230k/yr+ net revenue forecast from the full scheme or
- provide the Council with a cost effective solution

5.6.2 Option E provides the most beneficial outcomes in terms of cliff stabilisation, future proofing, service provision, income protection & generation, efficiency and return on investment (ROI). It is a pro-active and responsible approach and would stabilise the whole cliff face and deliver for enhancements to beach huts & seafront facilities. Key benefits include:

- a prudent, long term, value for money investment in preserving and enhancing the quality of a prime destination for both local residents and tourists
- improving the design and attractiveness of the area whilst protecting existing and achieving significant new additional income
- cliff stabilisation work to protect the infrastructure above and below the cliff face
- helping to meet consistently strong resident demand for beach huts in this location

5.7 Proposed scope of works

Actions	Block Numbers (see Appendix 2)		
	1 – 8	9 - 11	Pavilion
Stabilise upper cliff face using soil nailing	✓		
Demolish beach huts and stabilise the lower cliff replacing all the catch wall + plinth	✓	✓	
Rebuild 102 existing, add 89 new + refurbish 4 huts	✓	✓	✓
Develop new café, refurbish toilets & improve public realm			✓

- 5.8 The revised scheme could take 9-12 months to complete and the most efficient option is to undertake cliff and seafront construction as a single co-ordinated project. Subject to approvals in Feb 2019, works could start in Sept 2019. Delaying the start carries potentially significant infrastructural, financial and reputational risks.
- 5.9 Bournemouth B.C. have also been dealing with a land slippage from April 2016 on the East Cliff, with a different set of circumstances and options. Officers from both authorities have worked closely to consider the proposal for Canford Cliffs and support delivery of the proposed scheme.

6.0 RISK MANAGEMENT

6.1 Summary of key project risks for delivery of the revised scheme at Canford Cliffs:

	Strategic Risk Identified	Action Taken/Proposed	Residual Risk
1	Further cliff movement could affect the scheme	Cliff stabilisation works planned to start as soon as possible.	High
2	Project delivery costs higher than expected.	Cost advice procured from independent experts. Contingency increased for sub-structure works.	Med
3	Environmental issues impact on scheme delivery	Impact assessments carried out and appropriate mitigations in place.	Low
4	Construction takes longer than planned	Cautious approach to delivery and financial planning to allow for possible delays.	Low
5	Fall in customer demand for beach huts.	Consistently strong demand + positive customer feedback. 300 people on waiting list for Canford Cliffs (1693 total)	Low

7.0 FINANCIAL STRATEGY

7.1 CAPITAL

Appendix 4 outlines the financial strategy to deliver the proposed works at Canford Cliffs which can be summarised as follows:

<u>Costs</u>	£
Cliff stabilisation works	3,100,000
Seafront development scheme	4,200,000
Total	7,300,000
<u>Funding</u>	£
Approved capital contingency resource	4,000,000
Coastal Communities Fund (CCF)	400,000
Prudential Borrowing	2,900,000
Total	7,300,000

7.2 Cliff stabilisation works are based on expert technical advice and estimated to cost £3.1m made up of cliff stabilisation works £3m (WSP estimate + 25% contingency) + internal project management fees estimated at £100k. No external grant funding sources have been identified to finance the works.

7.3 The proposed £4.2m seafront development scheme costs include beach huts £2.3m, pavilion toilets & café £426k and public realm £353k. Prelims, project management and 10% contingency total £1.05m. The original budget was £4.8m (Nov 2017) and in bringing forward the proposals approx. £500k has been spent or committed for: design, planning & project management (£220k) and cliff stabilisation assessment & design (£280k). £100k of refurbishment work to Blocks 12 & 13 has been withdrawn.

7.4 The revised scheme is forecast to provide the new BCP Unitary with the following financial outcomes:

- £230k+ net revenue income from year 1
- Payback of investment in beach huts within 15 years
- Beach Hut life span of 50 years+
- 5.6% rate of return on seafront development scheme (£4.2m)
- Potential to improve returns further from development of BCP wide seafront pricing strategy and from reducing the borrowing period from 25 years.

7.5 In seeking to reduce the cost of the works, consideration will be given to all value engineering options through the design and subsequent tender process, where it is effective to do so without compromising quality or life span. These could include repairing rather than replacing elements of the current stabilisation infrastructure and considering the use of alternative forms of construction such as off-site modular build.

7.6 Prudential Borrowing

7.6.1 The Council would be exercising its legal power to prudentially borrow £2.9m. In considering this borrowing activity, Members should be aware that:

- There are no current Government caps on borrowing
- Any borrowing is required to conform with the "CIPFA Prudential Code for Capital Finance in Local Authorities (2017 edition). This stipulates that:
 - the borrowing is used to support capital investment
 - the borrowing is affordable over the life of the asset (period it provides value to the organisation). The test of affordability being ability to repay the capital sum and associated interest costs over the life of the asset

7.6.2 The £2.9m borrowing proposed requires annual payments over the next 25 years of £157k (£117 principal + £40k interest). Allowance for this sum has been made within investment financial appraisal calculations. After deducting borrowing repayments, the Council still anticipates generating net revenue contributions of £230k+ from year 1.

7.6.3 The borrowing proposal is also within the Council's Prudential Borrowing operational boundary and authorised limits. These are the internal limits the Council sets to control its level of borrowing.

7.7 REVENUE

- 7.7.1 There is a current income loss of £36k/yr from Blocks 4 & 5 (18 huts) which are unusable. £108k/yr revenue income from the remaining blocks in this location (1-3 & 6-8) income is also at risk if the proposed remedial works are not delivered. The income projections for the revised scheme are cautious and include CPI based inflation only, pending wholesale review of BCP pricing structure.
- 7.7.2 Provision for the loss of beach hut income for (up to) 12 months during construction has been set aside within the Medium Term Financial Plan and would be used if Council approves the revised scheme.

8.0 LEGAL

- 8.1 There is not a specific legal requirement on the Council to undertake repairs to the cliff face. If repairs are not carried out however the Council faces potentially significant infrastructural, financial and reputational risks.
- 8.2 To achieve the proposals for beach huts and catering provision will require negotiation the current catering kiosk tenant. This could have some resource implications and may effect the design proposal for Block 10.
- 8.3 In accepting the £1.2m grant awarded by the Coastal Communities Fund, the Borough has entered into a legal agreement relating to the delivery of the Dorset Coastal Connections 'People & Places Project', which governs and restricts use of these funds. Should the £400k of the grant allocated to Canford Cliffs seafront not be spent by May 2020, there is a risk that that element of the funding could be withheld.

9.0 PLANNING

- 9.1 Planning permission was granted in 2017 for the rebuilding of 102 existing, 89 new and 4 refurbished beach huts, together with a new café, refurbished public toilets and improved public realm, along the western promenade of Canford Cliffs Beach. See Appendix 5 for images of proposed enhancements. The permission requires commencement within 3 years and should the scope of the works differ substantially from that approved, a further application will be required.
- 9.2 The scheme was developed in the context of previous approvals, operational requirements, the vision of 'Sustaining Poole's Seafront' Supplementary Planning Document (SPD) and using feedback from public consultation.
- 9.3 Adopted in December 2015, the SPD sets out a 25 year vision for the development of Poole's beaches and aims to:
1. Conserve the beautiful natural environment
 2. Improve the range of facilities to encourage visitors all year round
 3. Invest in the ageing infrastructure such as drainage and toilets, to ensure the preservation of core services

10.0 POLICY IMPLICATIONS

10.1 The Seafront Development Programme supports the Council's vision to develop a strategic commercialisation programme and generate more income from the seafront by providing long term, high quality and desirable recreational assets.

11.0 ENVIRONMENTAL IMPLICATIONS

11.1 To reduce the likelihood that environmental factors such as wildlife and protected species constrain future decision making, the affected cliff face has been maintained in a sterile state. Protected species such as lizards and slow worms have been relocated and the vegetation and habitat appropriately and sensitively managed.

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Appendix 1: Seafront Development Programme Summary

Appendix 2: Ariel Photo – Canford Cliffs (West)

Appendix 3: Feasibility Report & Outline Construction Costs (WSP Jan 2019)

Appendix 4: Financial Summary

Appendix 5: Images of proposed enhancement scheme

Appendix 1: Seafront Development Programme Summary

Location		Project	Status	Update
Sandbanks	Block 5	Refurb 6 + add 6 new huts	Completed or progressing	Complete
Shore Rd	Block 8	Refurb 12 + add 12 new huts	Completed or progressing	Construction starts Sept 2019. Capital budget moved from 18/19 to 19/20.
	Block 1	Refurb 10 + add 2 new huts	Completed or progressing	
	Promenade	Enhance public realm & facilities inc. new kiosk and water sports concessions	Completed or progressing	
Flaghead Chine	Promenade	Add 4 huts + enhance public realm	Completed or progressing	Complete
Branksome Chine	Promenade	Improved public realm + enable land train	Completed or progressing	Construction phased during 2019.
Branksome Dene Chine	Promenade	Add 4 new huts	Completed or progressing	Complete
Hamworthy Park	Eastern promenade	Add 16 new huts	Completed or progressing	Complete
General		Connectivity Projects: Way Marking / Info Points	Completed or progressing	Installation planned during 2019 (various)
Canford Cliffs (W)	Pavilion	New café, refurb toilets & improve public realm	Currently on hold	Planning Permission granted. On hold following cliff slip.
	Block 1-11	Rebuild 102 existing, add 89 new + refurb 4 huts.	Currently on hold	
	Blocks 12&13	Refurbish	Withdrawn	To be included in a future phase of work.

Key:

Completed or progressing	Currently on hold	Withdrawn
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Appendix 2: Canford Cliffs (West) - Ariel View



Appendix 3: Feasibility Report & Outline Construction Costs (WSP Jan 2019)



Canford Cliffs Beach
Hut Foundations r1.pdf



TECHNICAL NOTE

TO	Borough of Poole	FROM	WSP
DATE	07 January 2019	CONFIDENTIALITY	Confidential
SUBJECT	Canford Cliffs Beach Hut Foundations Feasibility and Outline Costing		

QUALITY ASSURANCE		
Author	Checker	Approver
Ben Ward Senior Engineer	Simon Maynard Associate	Andy Indoe Associate Director

Scope of Work

At the request of the Borough of Poole (BoP), WSP have been engaged to undertake a feasibility study into the foundation options for the proposed beach huts (Blocks 1-11) forming part of the Canford Cliffs Scheme. This includes a review of the ACS technical report data, prepared in November 2015.

As part of this review, outline construction costs have been presented for the foundation options and proposed cliff stabilisation works. Considerations have also been given to the costs associated with the restraint or reconstruction of the retaining walls.

The retaining walls are located immediately behind the existing beach huts, which are currently intended to be demolished, with 2 storey beach huts constructed within the same footprint. The works proposed previously included retention of the existing retaining walls. However, due to the construction of the new beach huts, the existing passive restraint to the wall which is provided by the current foundation slab, will be removed in the temporary condition combined with excavation of the retaining wall toe. This would lead to instability of the current retaining walls. Refer to the 'Numerical Assessment of Existing Retaining Wall Stability – September 2018' for further details.

This technical note provides a review of the foundations options and a preliminary assessment of the preferred foundation solution based on the current available information.

The foundation assessment has been split into two sections:

- A review of the historic investigation carried out by ACS testing and a subsequent assessment on the suitability of a raft foundation; and
- A preliminary assessment of an alternative piled slab, in order to ascertain pile diameter and length.

The outline construction costing has been included based on the outcome of the above review. It also considers differing options for the retaining walls, as well as providing an estimate for the cliff stabilisation works.

Ground Conditions - General

The ground conditions have been interpreted from the Ground Investigations undertaken by Geotechnical Engineering (GEL) [Ref 1], Card Geotechnical Ltd (CGL) [Ref 2] and ACS Testing 2015 [Ref 3]. It shall be noted that the GEL investigation was specified in relation to the cliff stabilisation works only.

Table 1 overleaf summaries the encountered strata adjacent to beach hut blocks 1 to 11. A further review of the dynamic probing (DPSH) data is included in the following sections.

Table 1 – Typical Ground Conditions

Beach Hut Blocks 1 - 11		
Stratum	Depth Encountered (mBGL)	Thickness (m)
Promenade (Tarmacadam)	0.0	0.10
Made Ground – Reworked Branksome Sand (<i>loose silty SAND / Firm sandy CLAY</i>)	0.10	2.4
Branksome Sand Formation (<i>medium dense to very dense silty Sand with occasional deposits of Gravel of subrounded to rounded fine flint, with pockets of firm thinly laminated brown silty clay</i>)	2.4	>8.1 Not proven

Note: Existing beach hut slab surface level is typically 0.6m above promenade level, which would give a Made Ground thickness of 3.0m

The characteristic geotechnical parameters used in the review of the suitability of raft foundations have been determined on the basis of the engineering descriptions in the exploratory hole logs, and the SPT 'N' values derived from the DSPH tests undertaken by ACS in 2015, where a conservative correlation of $N_{200} = N$ has been taken [Ref 4]. These values have been plotted against the SPT 'N' values gathered during the 2018 GEL investigation and are presented in Figure 1 below.

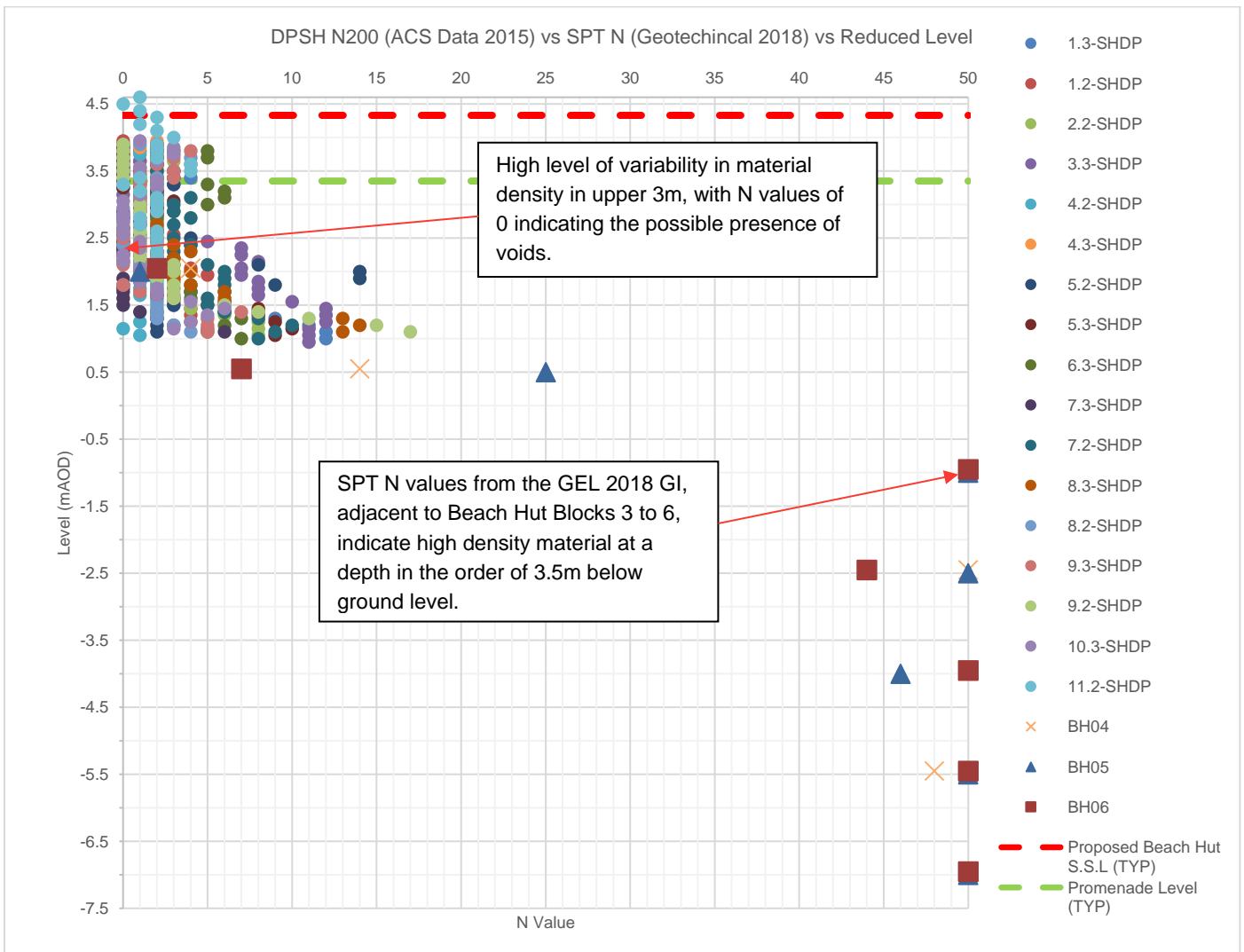


Figure 1 DSPH vs SPT N vs Reduced Level

Table 2 - Characteristic Geotechnical Properties for feasibility assessment only

Stratum	Parameter	Symbol	Magnitude	Unit	Source
Made Ground – Reworked Branksome Sand	Unit Weight	γ	15	kN/m ³	Figure 2 of BS 8002: 2015, assumed lower bound as conservative [Ref 5]
	Effective Internal Angle of Friction	ϕ'_{cv}	28	°	Figure 5 of CGL Report 28116 2017 [Ref 2] Peck, Hanson & Thornberg, CIRIA 143 Figure 36 pg 79 [Ref 6]
	Effective Cohesion	c'	0	kPa	Assumed to be 0 as conservative estimate based on standard practice
	Effective Stiffness (Large Strain)	E'_{LS}	Highly variable – 4 to 30	MPa	Peck, Hanson & Thornberg, CIRIA Section 8.1 [Ref 6]
Branksome Formation	Bulk Unit Weight	γ_b	20	kN/m ³	Figure 2 of BS 8002: 2015, assumed lower bound as conservative [Ref 5]
	Internal Angle of Shear Resistance	ϕ'	38	°	Peck, Hanson & Thornberg, CIRIA 143 Figure 36 pg 79 [Ref 6]
	Effective Cohesion	c'	0	kPa	Assumed to be 0 as conservative estimate based on standard practice
	Effective Stiffness (Large Strain)	E'_{LS}	40 – 65	MPa	Peck, Hanson & Thornberg, CIRIA 143 Section 8.1 [Ref 6]

Raft Foundation Considerations

The properties of the reworked Branksome Formation beneath the existing beach huts has been considered assuming the material to comprise a single stratum. This is because while exploratory hole logs indicate distinct layers of cohesive and granular material, in practice the material is likely to be heavily mixed due to reworking on site. Any cohesive layer is likely to contain a high granular percentage and vice versa. Furthermore, the material has remained in place with the *in-situ* overburden from the existing structures for sufficient time for drained conditions to have fully mobilised within any cohesive material, it is therefore not required to model total stress conditions or make an assessment on long term settlement at this stage.

The effective internal angle of friction of the reworked Branksome Formation has been reduced from what has been assumed in the CGL report. This is on the basis of the derived SPT values given in Figure 5 of the CGL report, in accordance with the correlation given by Peck, Hanson and Thornburn in CIRIA 143 [Ref 6]. The reduced value also accounts for the potential high percentage of fines within the stratum.

It shall be noted that at the time of preparing this technical note, no settlement limits have been provided by the beach hut designer nor has a breakdown of the beach hut loads been established. Therefore a differential settlement limit of 10mm has been assumed. A uniformly distributed load over a typical raft area beneath a beach hut block has also been adopted to allow for an outline assessment to be undertaken. It shall be noted that this is not anticipated to represent the worst case or most onerous form of loading to the raft.

The raft geometry has been based on information presented in the Smith Foster drawings series 25075.

A preliminary elastic settlement assessment beneath a typical beach block arrangement indicates an immediate settlement in excess of 35mm. The variability in the material stiffness is anticipated to result in differential settlements beneath the raft foundation in excess of 25mm. A simplified model is presented in figure 2 below, illustrating the effects of varying foundation stiffness, note this does not include the effects of possible voids.

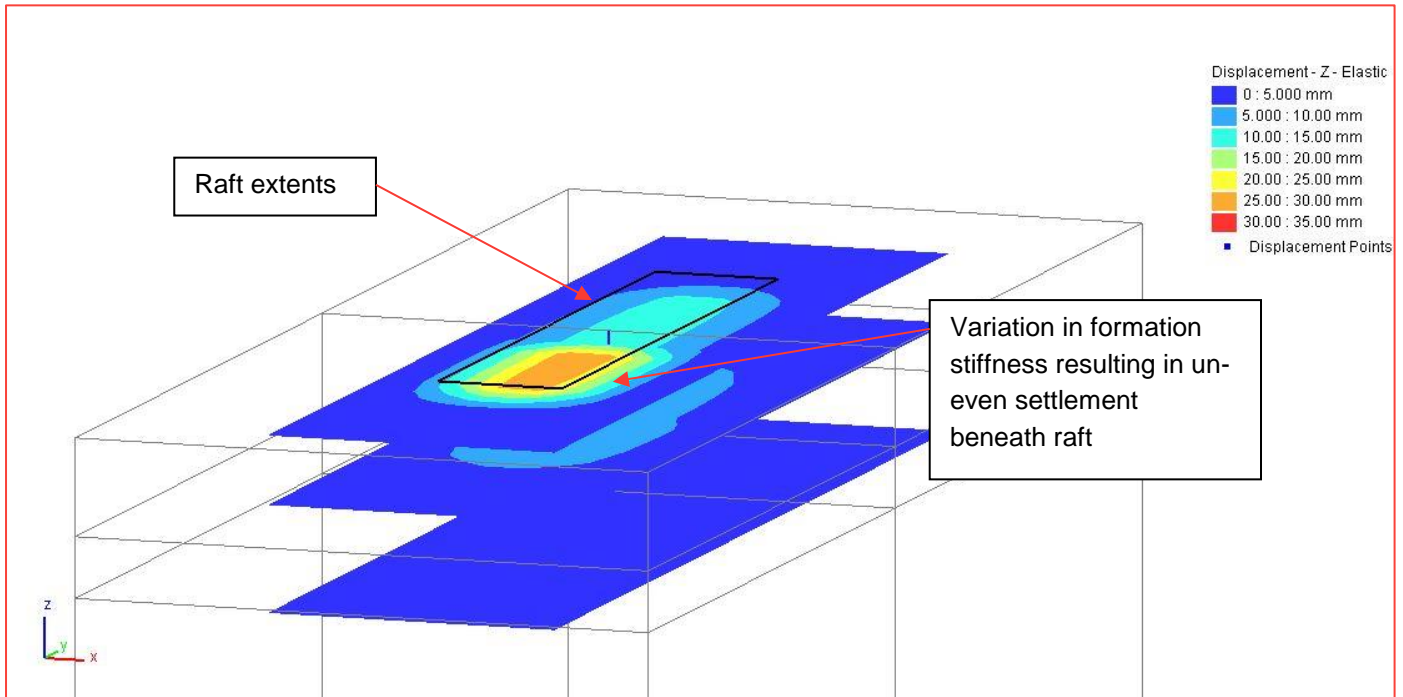


Figure 2 Outline Settlement Assessment

These settlement values are anticipated to increase with more onerous loading conditions, where concentrated areas of load are anticipated to result in a non-uniform loading of the raft, requiring a significantly greater amount of reinforcement or un-economic increase in raft slab thickness. The presence of possible voids up to 3m below the surface slab level could also have a detrimental effect on the structural performance of the raft slab and subsequently result in structural damage to the beach huts. Any ground improvement methods to this depth are anticipated to outweigh the cost of adopting a small diameter piled approach. On this basis an assessment of a piled raft approach is presented in the following sections.

Piled Foundation Considerations

Groundwater

A moderately conservative design groundwater level was used in the calculations of the foundation feasibility study and defined as 2.0 mbgl (1mAOD), based upon the groundwater monitoring results provided in the GEL Factual Report [Ref 1].

Ground model and Characteristic Geotechnical Parameters

Made Ground - reworked natural materials approximately 2 m thick were encountered overlaying the Branksome Sand Formation. The Made Ground was described as Loose to medium dense sand, whilst the Branksome Sand formation as dense to very dense sands. Thin layers of firm to stiff Clays with frequent pockets of fine to coarse sand were encountered interbedding with very dense sands in BH04 and BH06. In BH06 the same materials were encountered underneath the very dense Sands below 5.7 mbgl (-2.35 mAOD).

Table 3 overleaf proposes the ground model and the geotechnical parameters used in the piled foundation feasibility study. Note these have been based on the 2018 GEL investigation, where boreholes were formed to a depth of 10mbgl.

Table 3 Ground model - piles

STRATUM	DESCRIPTION	Thickness (m)	γ (kN/m ³)	φ' (°)	c' (kPa)	c_u (kPa)	E' (MPa)	E_u (MPa)	μ (-)
Made Ground / Reworked natural materials	Medium Dense Sand	2	18	32	0	N/A	31	N/A	0.30
Branksome Sand	Very Dense Sand	2	17	38	0	N/A	44	N/A	0.30
	Firm to Stiff Clay	>6	19	27	0	100	40	60	0.45

1 – the ground level was considered to be 3.4 mOD which is the top of the BH04 considered to be the most representative of the ground for the design of the foundation;

2 – the bottom of the stratum was not recorded during the GI.

Piled Foundation Methodology

It is proposed to form small diameter piles using replacement methods, which shall be comprised of reinforced concrete and constructed through cased boring to prevent void filling or hole collapse. The assessment has been carried out using the loads and pile layout is indicated in Smith Foster drawings series 25075.

The construction method shall comply with the recommendations of the 3rd Edition of ICE Specification for piling and embedded retaining walls [Ref 7].

Soil structure interaction

It has been assumed that the interaction between piles and the cohesive materials is represented by a ratio α_{repl} provided in Figure 16-14 in Foundation Analysis and Design [Ref 8]. A value of 0.5 was adopted in the analysis.

An earth pressure coefficient of $k_0 = 0.7$ soil and a pile interaction angle $\delta = 1.0$ were used as per recommendations of Table 8 and Table 9 of BS 8004 [Ref 9].

Actions

Actions are indicated in the Smith Foster piles layout drawing series 25075.

It has been assumed the actions indicated in the drawings are the sum of 70% Permanent and 30% Variable (25% Surcharge and 5% Wind). The percentage used in the calculation shall be confirmed at the detailed design stage.

The combination of Actions to be analysed followed the recommendations provided in Section 6.4 of BE EN 1990 [Ref 10].

Action eccentricity at the top of the piles was not considered at this stage and will have to be assessed at detailed design stage.

Method of analysis

Standards

The recommendations of the following standards were used:

- BS EN 1997-1:2004+A1:2013 Eurocode 7: Geotechnical design – Part 1: General rules [Ref 11];
- NA+A1:2014 to BS EN 1997-1:2004+A1:2013 Eurocode 7: Geotechnical Design – Part 1: General Rules [Ref 12].

Complementary references

The pile stability analysis was also undertaken considering the recommendations indicated in:

- BS 8004:2015 Code of practice for foundations [Ref 9].

Ultimate Limit States

The analysis method and the partial safety factors adopted to undertake the stability analysis of the piles conform to BS EN 1997-1, with due consideration of NA to BS EN 1997-1.

The Design Approach 1, Combination 1 and Design Approach 1, Combination 2 partial factors are summarised in Table 4.

In addition to the partial safety factors a design model factor of 1.40 to affect the piles resistance has been applied with the assumption that static load tests will not be undertaken prior to construction.

The recommended ψ factors to affect secondary variable actions for buildings is provided in Table NA.A1.1 of NA to BS EN 1990:2002+A1:2005.

Table 4 Partial Factors for Ultimate Limit State analysis – Piled Foundations

DESIGN APPROACH 1		COMBINATION 1			COMBINATION 2		
		A1	M1	R1	A2	M1	R4 ⁽¹⁾
Permanent Actions		1.35	-	-	1.00	-	-
Variable Actions		1.50	-	-	1.30	-	-
Material Properties		-	1.00	-	-	1.00	-
Bored Piles	Base Resistance	-	-	1.00	-	-	2.00
	Shaft Resistance (compression)	-	-	1.00	-	-	1.60
	Shaft Resistance (tension)	-	-	1.00	-	-	2.00
Model Factor		1.40					
1 – Applied to the resistance of piles when the resistance is not verified on site by a maintained load test.							

Serviceability limit states

Predicted displacements were calculated in Repute. The characteristic value of actions was used in the Serviceability Limit States analysis.

The Serviceability Limit State analysis was undertaken using the partial factors on actions equal to 1.0 as per Annex A of BS EN 1990 as well as on materials as per Section 6.5.4 of BS EN 1990.

Results of analysis

The outline pile diameter and lengths for a range of load cases is presented in Table 5.

Table 5 Outline Pile characteristics

RANGE OF ACTIONS ⁽¹⁾ (kN)	DIAMETER (mm)	LENGTH (mm)
Action < 70	300	5000
70 ≤ Action < 90	300	6000
90 ≤ Action < 110	300	7000
110 ≤ Action < 130	300	8000
130 ≤ Action ≤ 160	300	9000

1 – the indicated range of loads is in accordance with the values provided in drawings 25075.

An outline assessment of the loadings and pile lengths above result in an acceptable utilisation for the proposed solution of below 1.0, with preliminary anticipated maximum vertical and horizontal displacements of below 10 mm.

It should be noted that the ground conditions at a depth of 3m below the current beach hut level have not been established adjacent to Beach Hut Blocks 1,2, 7 to 11. It is recommended supplementary GI be undertaken to verify the ground conditions used to establish the conclusions of this outline assessment and therefore provided suitable information for the detailed design of the works. This could be achieved through use of a truck mounted Cone Penetration Testing (CPT) unit, with a series of investigation points adjacent to the proposed beach hut blocks spaced at regular intervals along the scheme. The CPT data can be made immediately available after the investigation has been undertaken, with anticipated duration of the site works in the order of 3 days. The CPT probe may refuse at depths around 5m below existing beach hut level, but will allow for identification of the top of the dense layer of Branksome Formation in which to found the piles and result in a more economic design.



Outline Construction Costs

Outline construction costs have been estimated for the following elements:

- The stabilisation of Canford Cliffs comprising a grid pattern soils nails and a tensioned flexible facing system meshing;
- The reconstruction of the retaining walls behind beach hut blocks 1 to 8;
- The anchoring of the retaining walls behind beach hut blocks 9 to 11;
- The construction of small diameter bored pile raft foundations for beach hut blocks 1 to 11.

Cliff Stabilisation

Based on the outline stabilisation solution proposed - soil nails are to extend over the cliff profile adjacent to beach hut blocks 1 to 8. WSP have approached a specialist geotechnical contractor to establish outline cost for the works, which are summarised in table 4 below.

Table 4 Cliff Stabilisation Outline Construction Costs

Works Element	Estimated Cost
Mobilisation / site establishment	£25,000
Site overheads / welfare	£30,000
Soil nails	£1,040,000
Inclined drains	£50,000
Nail Testing	£15,000
Meshing System	£152,000
TOTAL	£1,312,000

It shall be noted that the above estimate makes no allowance for the installation of test nails prior to site works, associated attendances and traffic management or any demolition works and subsequent offsite disposal. It is suggested that a further 25% contingent should be added to the total cost.

The duration for the will be reliant on the construction methodology and could be accelerated if nails were installed simultaneously from the top and bottom of the cliff utilising long reach excavators with boom mounted rigs, combined with roped access skid frames.

The contractor further recommends the installation and testing of nails ahead of the main works, which will not only determine the likely bond to be developed between the ground and the nail and therefore its ultimate capacity, but will also provide valuable information on the best method of nail installation.

Retaining Walls

A number of options have been explored in relation to the proposals for the existing retaining walls adjacent to beach hut blocks 1 to 11. Table 5 presents the outline costs for the reconstruction of the retaining walls adjacent to beach hut blocks 1 to 8. This construction is facilitated by the advanced stabilisation works to the cliffs above, and the use of temporary soil nails to construct the new walls. Note that current proposals do not extend the soil nails to the cliffs adjacent to blocks 9 to 11, therefore along this particular section it is proposed to retain the existing retaining walls and install anchors to maintain their stability throughout the construction of the new beach huts.

Table 5 Retaining Walls Outline Construction Costs

Works Element	Estimated Cost
Temporary Soil nails to facilitate retaining wall construction adjacent to Beach Hut Blocks 1 to 8	£180,000
Gravity blockwork retaining wall solution adjacent to Beach Hut Blocks 1 to 8	£270,000
Installation of anchors to existing retaining structures adjacent to Beach Hut Blocks 9 to 11	£80,000
TOTAL	£530,000

The above costs include an allowance for the excavation of temporary benches or overstepping into the cliff to allow for the installation of temporary soil nails, disposal of arisings and placement and compaction of fill material adjacent to the new block work wall. However, no allowance has been made for the demolition and disposal of the existing retaining walls. It is suggested that a further 25% contingent should be added to the total cost.

It is recommended that a detailed survey is undertaken into the condition of the existing retaining walls and their suitability for anchoring is to be assessed. It is suggested that anchoring all existing retaining walls (Beach Hut Blocks 1 to 11) as an alternative to the re-construction of the walls adjacent to blocks 1 to 8 above, would be in the order of £200,000 - £300,000 less and may prove to be the most cost-effective solution. There is also potentially less risk to the stability of the cliff in adopting this approach. The maintenance costs of any anchors installed are not included in the above construction costing.

Foundations

The outline construction costs for the foundations and slabs to the proposed beach huts are presented in Table 6 below, these estimates have been based on the foundation recommendations

Table 6 Slab and Foundation Outline Construction Costs

Works Element	Estimated Cost
Installation of 300mm diameter bored piles (332no.) typical length 7m	£270,000
Reinforced concrete slab to piled foundations to Beach Hut Blocks 1 to 11	£300,000
TOTAL	£570,000

Allowance for breaking out the existing slab, excavation around the piles, offsite disposal and import and placement of compacted fill have been made in the above costing. However, it is suggested that a further 25% contingent should be added to the total cost.

The rates used to generate these outline construction costs have been based on values taken from the 2016 edition of SPONS Civil Engineering and Highways Works Price Book [Ref 13]. No increase has been made for inflation.

It shall be noted that these costs do not relate to the demolition of the existing beach huts or the construction of the proposed new beach huts.

The material cost for the piled option has been based on the Smith Foster general arrangement in drawings 25075-01 to 25075-027.



The labour costs have been assumed as 1 concrete gang, consisting of 1 charge hand, 2 skilled operatives, 4 unskilled operatives and 1 plant operator, working on the slab for each block for 2 weeks. This is from the start of the excavation to the finished power floated floor surface. Allowance has been made to account for possible difficult site access which could delay concrete delivery.

A waterproofing allowance has been based on a damp-proof membrane below the foundation slab across the full area of each block and includes labour and material costs. As the slabs of each block are independent of one another and therefore do not exceed a length of 30m expansion joints to accommodate movement would not be necessary in the structure. Construction joints would be used in order to form the slab but this type of joint will not incur significant extra cost.



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Appendix 4: Financial Strategy

Canford Cliffs (West) over 25 years

	£
Cliff Stabilisation Works	1,312,000
Retaining Walls	530,000
Piling and new slab foundations	587,100
Contingency (25%)	607,400
BOP project management fees	93,400
Cliff Stabilisation Works	3,129,900
Beach Huts	2,349,000
Pavilion & Café	426,500
External Works & Public Realm (inc potential utilities upgrade)	353,000
Contractor preliminaries, overhead and profit	512,000
BCP project management fees	203,000
Contingency (10%)	341,500
New Beach Hut Provision (191 new and 4 refurbished)	4,185,000
Total Capital Expenditure	7,314,900
Reprioritised Approved Capital Allocation (cliff stabilisation)	3,129,900
Residual Approved Capital Allocation (residual available for revised beach hut development)	870,100
Coastal Communities Grant (revised development - public realm elements)	400,000
PRU Borrowing requirement over 25 years (v estimated beach hut useful economic life of 50 years)	2,914,900
Total Funding	7,314,900
Loan period (years)	25
Investment payback period	Year 15
Return on investment (over 25 years)	5.6%

Key Assumptions:

- 1 Existing Blocks 1 -10 demolished to facilitate efficient and more cost effective cliff stabilisation
- 2 New Blocks 1-10 174 new huts (150 standard, 18 Super, 6 Deluxe)
- 3 4 standard new huts on Pavilion (8 huts in total)
- 4 Block 11 - development proposes remodelled, enhanced provision of 13 different huts (9 Super, 3 Deluxe, 1 Premier).
- 5 New Pavilion café estimated £10k additional net income above current kiosk
- 6 Construction spend based on BCIS inflation rates to QTR2 2020
- 7 Borrowing over 25 years - cautious estimate of Beach Hut Useful Economic Life

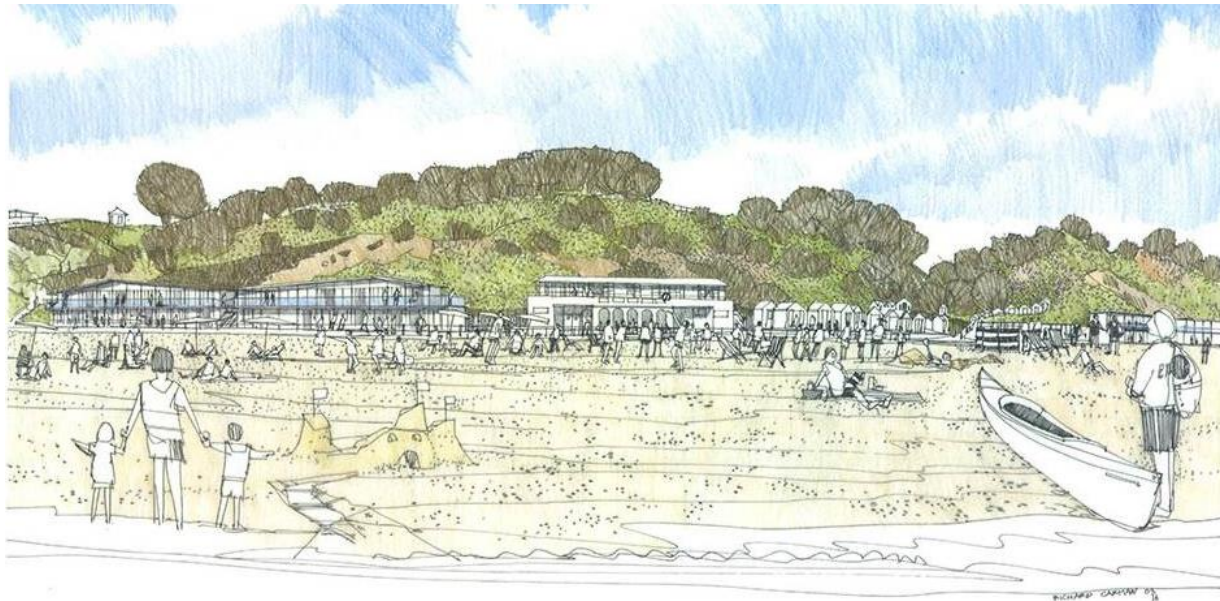
- 8 Income projections include CPI based inflation only - pending wholesale review of BCP pricing structure
- 9 NDR impact not material. Average rateable value of a hut is £2k, and most occupants are entitled to 100% business rates relief (as sole non-domestic property)
- 10 Project includes £0.95m contingency

Appendix 5: Images of proposed enhancement scheme at Canford Cliffs

Current beach huts



Proposed beach huts



Current Pavilion



Proposed Pavilion + Café

