Hill Head Coastal Defence

Independent Review Guard Rail

Fareham Borough Council

60549910

July 2017

Fareham Borough Council
Civic Offices
Civic Way
Fareham
PO16 7AZ

Quality information

Prepared by	Prepared by	Approved by
Dan Glasson Principal Engineer	Avijit Maitra Regional Director	Paul Norton Technical Director
		

Revision History

Revision	Revision date	Details	Authorized	Name	Position
Draft	July 2017	Draft	-	-	-
Rev 1	July 2017	Final for Issue	PN	Paul Norton	Technical Director

Distribution List

# Hard Copies	PDF Required	Association / Company Name
×	✓	Fareham Borough Council

Prepared for:

Fareham Borough Council
Civil Offices
Civil Way
Fareham
PO16 7AZ

T: +44 (0)1329 236100

Prepared by:

AECOM Infrastructure & Environment UK Limited
Midpoint
Alençon Link
Basingstoke
Hampshire RG21 7PP
UK

T: +44(0)1256 310200

Limitations

AECOM Infrastructure & Environment UK Limited ("AECOM") has prepared this Note for the sole use of Fareham Borough Council in accordance with the Agreement under which our services were performed [PM00412, July 2017]. No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by AECOM. This Note is confidential and may not be disclosed by the Client nor relied upon by any other party without the prior and express written agreement of AECOM.

The conclusions and recommendations contained in this Note are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by AECOM has not been independently verified by AECOM, unless otherwise stated in the Note.

The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this Note. The work described in this Note was undertaken in July 2017 and is based on the conditions encountered and the information available at this time. The scope of this Note and the services are accordingly factually limited by these circumstances.

Where assessments of works identified in this Note are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

AECOM disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Note, which may come or be brought to AECOM's attention after the date of the Note.

Certain statements made in the Note that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Note, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. AECOM specifically does not guarantee or warrant any estimate or projections contained in this Report.

Copyright

Table of Contents

1. Introduction

1.1 Introduction

Approximately a 120m long section of new seawall is in the process of being constructed at Hill Head. The seawall will be configured so that its highest point is 600 mm above the promenade behind it. This creates a potential fall from height hazard because the beach behind the seawall may be as much as 2.76 m below the top of the sea wall.

The Designer has proposed a steel guard-rail along the top of the wall to create an effective barrier and prevent people using the area behind the wall from falling over the edge of the seawall.

The owners of the beach huts behind the seawall have complained that the guard-rail obstructs their view and have questioned the need for any kind of barrier. In response to this, Fareham Borough Council, the Client for the Project, asked the Designer of the seawall, ARUP, to prepare a technical note to "capture the basis of design, the design and its associated risks, the risk assessment and rationale for additional controls, leading to the requirement for a guard-rail along the length of the sea wall".

ARUP completed this technical note and it was issued to the Client. AECOM has been appointed to carry out an independent review of the need for the guard-rail and to provide assurance to the Client that the decision to provide a guard-rail is justified by the requirements of current legislation. The Client also wishes to demonstrate that it has taken reasonable steps to discharge its duties in respect of the safety of people who will use the area behind the seawall and to deter people from climbing on to the Seawall as the first step in a short-cut to the beach.

1.2 Scope

To carry out an independent review of a technical note ***Hill Head Coastal Defence – Barrier Note In Response To Instruction 11*** (the Technical Note), prepared by ARUP[1] and provide assurance that the reasons for the provision of a guard-rail on top of the Hill Head Coastal Defence are supported by relevant regulations and are necessary for the Client, Fareham Borough Council, to discharge its duties in respect of public safety, in particular falling from height. Safety during construction is outside the scope of this report.

[1] The Designer and Principal Designer for the Scheme

2. Executive Summary

The findings of this note are summarised below:

a) The Designer was correct to consider falling from the outer edge of the Seawall as a material risk that had to be managed.

b) The provision of a guard-rail to create edge protection 1100 mm high was correct and required by law.

c) The decision not to provide the requirements for children under five can be justified by the precedents of other promenade guard-rails around the UK.

d) We recommend that the guard-rail should lean inwards to act as a further deterrent to climbing on to the Seawall as part of a short-cut to the beach.

3. Background

The current coastal protection at Hill Head consists of an array of structures including concrete bag work, gabion baskets, and shallow sheet piles with a concrete promenade structure on top allowing access to the beach huts from the Hill Head Sailing Club.

The condition of the existing structure(s) was deemed as insufficient, in terms of providing the required level of protection, during potential future storm events. Therefore, a new defence structure, comprising a continuous sheet pile wall with a concrete recurve capping as well as concrete cladding (the Seawall) is being constructed. The Seawall being constructed is illustrated below [**Figure 1**].

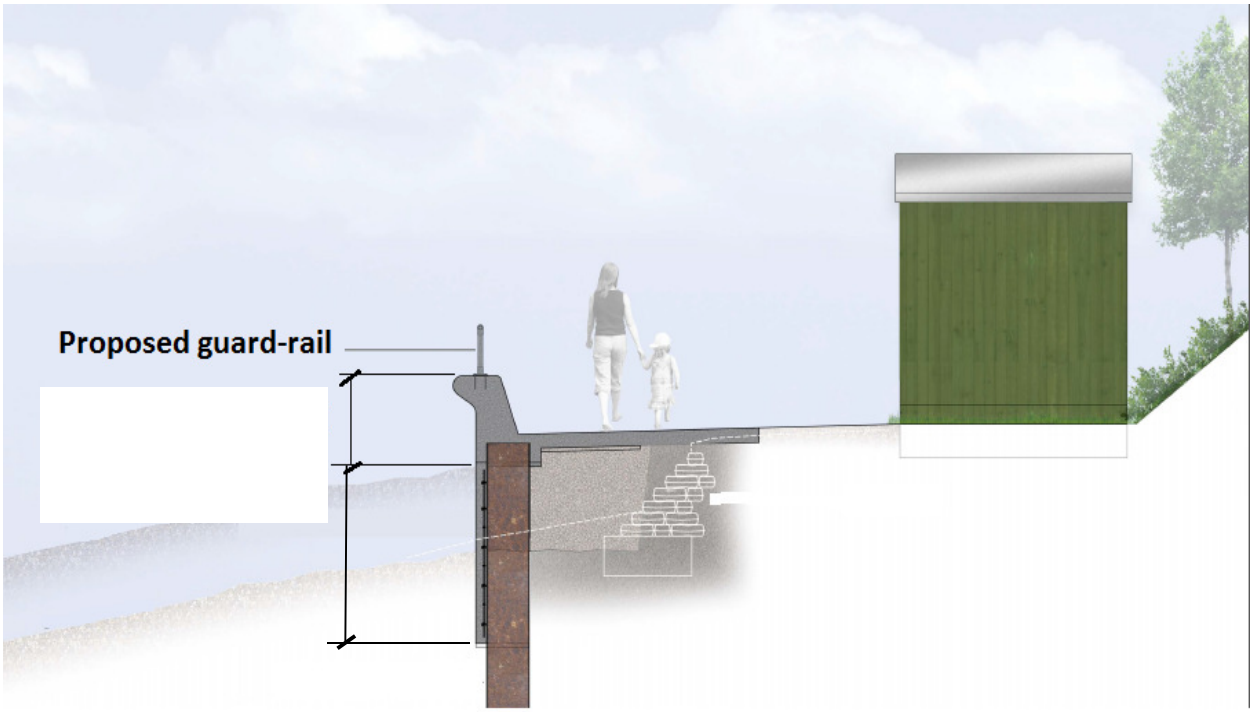

Figure 1: Cross-section through the Seawall (Source – ARUP, 2017)

The proposed new footpath level has been maintained at +3.0m AOD for consistency with existing structures at both ends of the works. The purpose of the Seawall is to protect the coast behind and the level of the concrete upstand was calculated using wave height information with future sea level rise accounted for. The level of the beach means that at some points along the Seawall there is a potential falling distance of 2.76m (ARUP, 2017). It is likely that any person falling such a distance will suffer injury and probably serious injury.

The owner/occupiers of the beach huts have questioned the need for the guard-rail as it obstructs their view.

4. Applicable Legislation

In the UK it is a legal requirement that any facility provided by any client is safe to construct, maintain, use and eventually demolish. These laws apply to the Seawall.

4.1 Safety during Construction

Safety during construction, maintenance and eventual demolition is regulated by the Health and Safety at Work, etc. Act (the Act) and all statutory instruments (Regulations) drawn up under the Act. The Act is relevant because each of these activities involves people at work.

In our opinion, the following Regulations are particularly applicable to the activities associated with building, maintaining and demolishing the Seawall:

a) The Construction (Design and Management) Regulations 2015 (CDM 2015); and

b) The Work at Height Regulations 2005.

CDM 2015 requires designers to design to ensure that maintenance can be carried out safely. The height of the Seawall[2] means that operatives carrying out maintenance in the area behind the Seawall (on the promenade) will be exposed to falling from the edge of the Seawall. This is not allowable under UK health and safety law.

We also draw attention to the Work at Height Regulations, in which the requirements for protecting workers against falls from height are set out. These Regulations set out a hierarchy of measures (the Hierarchy) to enable duty holders to select the most appropriate measures to minimise the risk associated with work at height. Each level of the hierarchy is qualified by so far as is reasonably practicable (SFAIRP), which means that a duty holder has to consider measures to prevent[3] a fall and before considering measures that mitigate the fall.

Therefore, in order to discharge its duties under CDM 2015 in respect of future maintenance, the Designer was correct to provide a barrier because it provides collective passive protection against falling, i.e. it is at the top of the Hierarchy for protection for work at height, because it was reasonably practicable to do so.

[2] The top of the Seawall is only 600 mm above the area behind it.
[3] Collective passive measures take precedence over all other measures and should be provided wherever it is reasonably practicable to do so.

4.2 Safety during use of the promenade by the public

We are not aware of any specific Regulations that set out requirements for safety of people on promenades. However, it is our opinion that the law would not allow a client to provide a facility that did not provide protection against foreseeable risks.

UK law does not allow people using a building to be exposed to the risk of falling from height. The legislation covering this for buildings is in the Building Regulations. In our opinion, the relevant Building Regulations are:

- The Building Regulations: Part K: Protection from falling, collision and impact.

In particular, we draw attention to part K2, which requires any edge off which people in and about a building can fall to be protected from falling by the provision of an effective barrier. Part K2 then goes on to specify deemed to satisfy dimensions [**K2: Diagram 3.1**]; for public buildings, the recommended height of a barrier is 1100 mm.

Where children may be present, Part K2 contains the additional requirement that the barrier is infilled by vertical bars spaced no further than 100 mm apart.

It is our opinion that falling from the Seawall is a foreseeable risk and the designer was correct to make provisions for protecting workers and the public against this risk.

5. Configuration of the Barrier

5.1 General Requirements

Given what is set out above, it is our opinion that there is no supportable (or logical) argument for providing a lower level of protection for people using the public promenade behind the Seawall than for those using public buildings, meaning that in order to comply with the more onerous Building Regulations, the height of the edge protection; Seawall plus guard-rail, should be 1100 mm.

Therefore, it is our opinion that the Designer was correct to provide a guard-rail on top of the Seawall, to a level of 1100 mm above the ground (Promenade) behind the Seawall.

5.2 Requirements for children

The requirement for children under five: no gaps in excess of 100 mm, presents a number of problems in that the additional vertical bars will:

a) require additional maintenance; and

b) reduce its permeability, thus increasing the design loads on the guard-rail; and

c) provide greater obstruction to the view from the beach huts, which was the original complaint against the guard-rail and to be avoided.

Each of points (a) to (c) provide an argument against providing the additional vertical bars. Such a decision could be supported by the precedent set by numerous other promenades, where the edge protection does not incorporate vertical bars; some examples are illustrated below [**Figure 2**].

(Source – Google Images)

Figure 2: Examples of other promenades where the guard-rails have no vertical bars

5.3 Foreseeable risk of climbing the seawall

The crest of the proposed concrete Seawall is 600 mm above the level of the promenade (forming an edge protection) and will be easily climbed, the risk of people climbing the edge protection, as a short-cut to the beach, and exposing themselves to falling is a material risk. Therefore, the positioning of the guard-rail to limit the space between guard-rail and the inside face of the Seawall to 200 mm, to act as a deterrent to climbing onto the top of the Seawall was a sensible design decision.

However, it is our opinion that 200 mm would still allow a person to stand on the Seawall, with most of his/her feet on the Seawall. Therefore, to provide a more assured deterrence to climbing the Seawall, it is our opinion that the guard-rail should lean inwards to create less space for a foothold on the top of the Seawall; Figure 2(c) illustrates this principle.

6. Conclusions

In conclusion it is our opinion that it was correct to:

a) consider falling from the edge of the Seawall as a material risk that needed to be guarded against;

b) provide measures that were collective passive in the form of a guard-rail because it was reasonably practicable to do so;

c) limit the space between the guard-rail and the inside of the Seawall to 200 mm to discourage people from climbing on to it;

d) set the height of the edge protection at 1100 mm, to comply with the more onerous requirements of the Building Regulations.

In addition, it is our opinion that the requirements for children can be relaxed by the precedents set by other promenade guard-rails [**Figure 2**].

Therefore, it is our opinion that in providing the guard-rail as detailed, the Client has taken reasonable steps to discharge its duties in respect of preventing falls from the edge of the Seawall.

7. Recommendations

The 200 mm space between the guard-rail and the inside of the Seawall may not be the deterrent that the designer hoped for because it will allow a foothold on the top of the Seawall. There may be structural reasons for the provision of 200 mm, which we are not in a position to challenge. Therefore, to provide further discouragement against climbing the Seawall, we would recommend that the guard-rail is leant inwards to a point where its principal guard-rail is 50 mm off the edge of the Seawall [**Figure 3**].

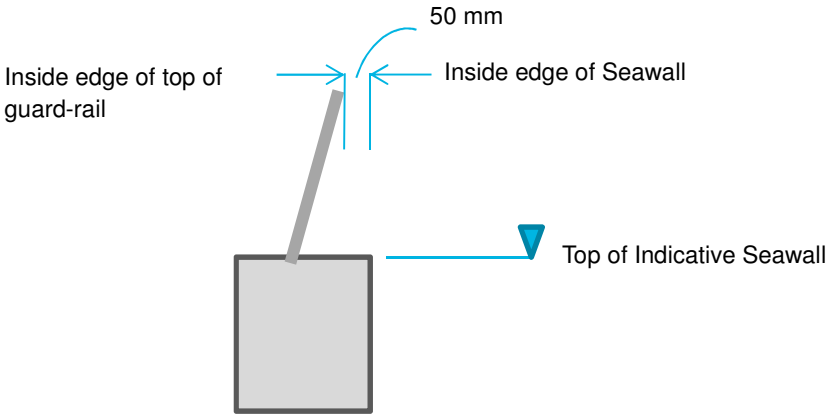

Figure 3: Illustrating recommended measure for further reduction of foothold on the Seawall

The designer's suggestion to use signs to warn against climbing on the Seawall will also provide further assurance against this action.

Appendix A – ARUP's Technical Note

HILL HEAD COASTAL DEFENCE – BARRIER NOTE IN RESPONSE TO INSTRUCTION 11

File Note

ARUP

63 St Thomas Street
Bristol
BS1 6JZ
www.arup.com

t +44 0117 976 5432

Project title	Hill Head Coastal Defence	Job number	250760-00
cc		File reference	
Prepared by	Lucy Stephenson	Date	10 July 2017
Subject	Hill Head Coastal Defence – Barrier Note in response to Instruction 11		

1 Overview

Arup were appointed Designer and Principal Designer for the Hill Head Coastal Defence project for the period from Option Selection to completion of permanent works design and issue of Construction drawings.

ESCP, on behalf of FBC, as Client for the scheme have requested Arup to produce a technical note to "capture the basis of design, the design and its associated risk, the risk assessment and rational for additional controls, leading to the requirement for a hand barrier along the length of the seawall".

This is in "light of recent public concern regarding the provision of a hand barrier on the Phase 2 seawall design, Fareham Borough Council have requested the ESCP seek an independent review of the need for a hand barrier."

This note is Arup's response to the above request and intends to provide the information required for an independent design review.

2 Design

2.1 Existing structure & proposed structure

The current coastal protection at Hill Head consists of an array of structures including concrete bag work, gabion baskets, and shallow sheet piles with a concrete promenade structure on top allowing access to the beach huts from the Hill Head Sailing Club. Due to the current condition of the existing structure being deemed insufficient to deal with potential future storm events, a new, continuous sheet pile wall with a concrete recurve capping as well as concrete cladding has been proposed, as shown in Figure 1. The existing promenade is at approximately +3.0m AOD, and so the proposed new footpath level has been maintained at +3.0m AOD for consistency with existing structures at both ends of the works.

Since the purpose of the sea wall is to protect the coast behind; with particular regard to the beach huts; from coastal erosion and damage due to storm events, the level of the concrete upstand was calculated using wave height information with future sea level rise accounted for.

2.2 Beach levels used in design

Description	Level mAOD	Source
Minimum recorded beach level	+ 1.20m	ESCP reference drawings provided at commission
Beach level January 2015	+ 1.8m	Provided by ESCP as average beach level during survey
Beach level February 2016	+ 2.4m	Topographic survey (February 2016) – used as base level from which scour occurs
Design extreme beach level	+ 0.84m	Calculated using a design scour depth of 1.56m from average level (February 2016)
Beach level after construction	+ 2.8m	The level the beach will be replenished to after construction

Assumptions

The topographic survey from February 2016 was used to provide average beach level

Assumed 600mm of beach movement [5 yearly sediment transport plots from ESCP Coastal Process Study]

Assumed that beach level will not fall lower than lowest ever recorded through sediment transportation only, but that scour could account for further losses.

2.3 Standards & Guidance documents

The following standards and guidance documents were used to enable the design of the barrier rails:

Building Regulations 2010 – Approved Document K and Approved Document M - these documents outline the standards regarding minimum fall heights and barrier levels.

RoSPA Water Safety Information [www.rospa.com] – gives design guidance for barrier rails specific to the marine environment.

BS EN 1991-1-1 and the National Annexe to BS EN 1991-1-1 – the loading guidance for the barrier rails were taken from the Eurocodes.

2.4 Outline Design

The design levels for the beach (shown below in Figure 1) were calculated based on seasonal lowering of beach material and localised scour at the toe of the new sheet pile wall. This takes into account the possibility that ESCP may not necessarily maintain the current beach levels in the future. As this is a new structure, it is necessary to consult health and safety regulations on the provision of barrier rails. The drop from the top of the upstand to the extreme design beach level is 2.76m, which is large enough to justify the specification of a barrier rail.

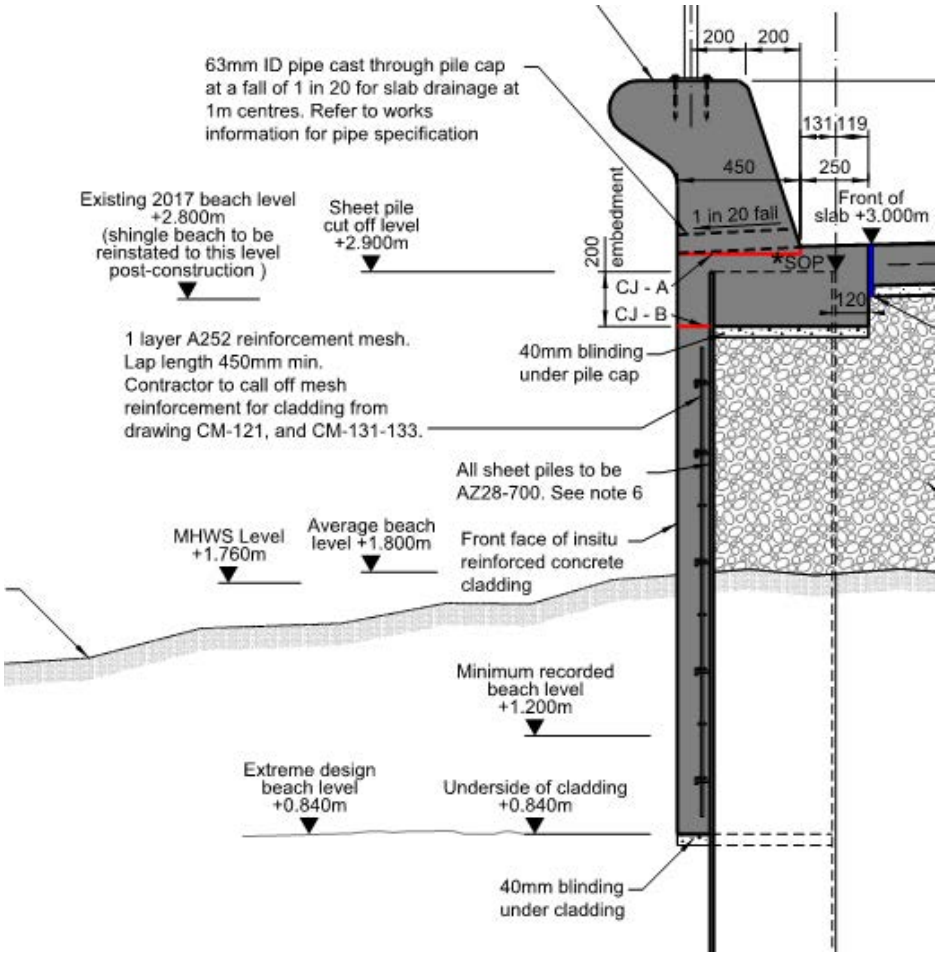

Figure 1: Cross Section through structure showing design beach levels

3 CDM Risk Assessment

A risk register was compiled during design to determine what hazards would exist due to the works being carried out at Hill Head, at stages before, during, and after construction. If these hazards could be avoided or have a reduced impact through design changes then those changes and mitigations were included wherever possible.

The relevant entries to the risk register for the design of the barrier rail system are included in Appendix A, which help to inform the decisions that led to our final design.

3.1 Health and Safety Legislation and Guidance

As Principal Designer for the client we had the responsibility of following the regulations for health and safety that are set out in the following legislation and guidance:

Health and Safety at Work etc Act (1974)

The Construction (Design and Management) Regulations (2015)

Health and Safety Executive (HSE), Managing health and safety in construction [L153] (2015)

Construction (Design and Management) Regulations (2015). Guidance on Regulations

Building Regulations (2010) Approved Document K and Approved Document M

3.2 Design Approach to Risk Register

The approach taken for the risk register was to provide a safe and accessible space with regards to future circumstances beyond our control. As designer we considered there to be a high risk to the public of falling if a barrier is not installed due to the mobility of the beach levels. We considered that the risk of falling may be increased in the circumstance where public beach users have previously used the promenade and beach when beach levels were higher, thus being unaware of the higher risk. A suggestion to counter this problem was to ensure that beach levels were maintained above an unsafe trigger level height – however, ESCP/ FBC could not confirm that this would be adhered to in the future.

The upstand wall has been included to reduce overtopping and to take into account future sea level rise as this was the prime purpose of the works. We believe this could cause increased risk of falling due to the public using this as a seat or children climbing on it. It is therefore considered important to counter this risk with the provision of a barrier rail.

Signage is recommended to be included as a mitigation action for several of the potential hazards, due to the residual risk of falling (i.e. there remains a residual of the barrier rails being used as climbing equipment not intended by design and also from the potential risk of people being trapped on the beach at high tide). Furthermore, as previously discussed, due to the highly mobile nature of this beach, levels may change significantly in a short period of time, meaning the risk presented by the drop in height may not be obvious, especially to people who have visited the beach at a time where the beach levels are high enough to diminish the risk of falling.

File Note

250760-00 10 July 2017

There has been an attempt to minimise maintenance necessary post construction as there is always an inherent risk that maintenance requirements will not be carried out. This has been reflected in the choice of barrier rail material so that is appropriate for a marine environment (to minimise rusting and thus need for maintaining).

4 Response to Instruction 11 raised by ESCP on 21/06/17

Below are Arup's responses to comments raised by a member of the public with regard to the proposed barrier rail. It should be noted that a revised version of the Risk Register will be issued to reflect these changes.

4.1 Confirmation why the hazard severity in Reference 38, 39, 40 decreases from a 5 –Very High to a 4-High, when the fall height remains the same, or potentially increases when falling from the top of the hand barrier.

It is agreed that severity should stay the same. However, when we returned to consider appropriate severity and likelihood of the risk of a fall, it was determined that without a barrier rail the risk of someone falling was a 4 – High, rather than a 3 – Medium. We came to this conclusion as we believe, as discussed in 3.1, that having the upstand wall with no barrier rail could present a higher risk due to people sitting on it, as well as the mobile nature of the beach leading to sudden considerable drops in beach level, and potential complacency of the public.

We firmly believe that the likelihood of a fall from height will be reduced by the inclusion of a barrier rail and signage warning the public of the danger, subject to the public risk assessment completed by FBC.

Although this means that the overall risk rating remains at a red, 'high' level, it does reduce the likelihood of the risk occurring, making the inclusion worthwhile. Our responsibility as designers is to the best of our ability to provide a safe and equitable space.

4.2 Confirmation of the role of the upstand wall in the Risk Assessment Reference 38, i.e. did the risk assessment consider a fall from the prom level or the top of the upstand wall.

The risk assessment has considered a fall from the top of the upstand wall – a level of +3.6m AOD. This is due to the importance of the upstand wall as part of the design for providing protection from overtopping and flooding over the 50 year design life. The design level took into consideration storm surge levels and likelihoods as well as expected future sea level rise within the design life.

4.3 Reference 38 - If we didn't have the 60cm upstand wall would a 1.1m barrier be required. What level / depth of fall would remove the need for a barrier rail?

Yes – following the building regulations a total barrier height of 1100mm from walkway level is required, thus 500mm from the top of the upstand wall, and therefore a full 1100mm of barrier rail would be designed if the upstand wall was not required.

Depending on what guidelines are being followed, this value can vary. According to the Building Regulations (Approved Document K) a drop of 380mm is considered substantial enough to require provision for safety.

4.4 Reference 38 - Confirmation that the risk assessment has considered the residual risks associated with the barrier rail and whether there is any additional/increase in risk/concern to children? Or provide an updated Risk Assessment to specifically address this query.

The profile of the upstand wall; and positioning of the barrier rail posts is intended to limit the ability of people mounting and walking on top of the parapet wall. There remains a risk with any structure of this type & in this environment that the general public will use the structure in unintended ways. Further attempts to control this would be through appropriately placed signage following a public risk assessment as outlined on our drawings/risk register. In addition, a secondary stepped access has been provided.

4.5 Reference 38. The residual risk mitigation proposes an ESCP/FBC public risk assessment and placement of appropriate signage to highlight dangers. Is the signage a requirement of the design or an outcome of a future public risk assessment(s)?

Outcome of future public risk assessment. Recommended that this is carried out to further identify and address any residual risks not eliminated through design.

4.6 Reference 55 – The updated design considers stainless steel, therefore the risk of rusting would appear to have been removed?

This is correct, the barrier rails will be made of stainless steel, and thus the residual risk of rusting will be very low. The risk register has been updated to reflect this change.

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Lucy Stephenson		
Signature			

File Note

10 July 2017

A1 Appendix A – Risk Register

Project Name	Hill Head Coastal Defence	**Client**	ESCP- Fareham Borough Council
Arup Job Number	250760-00	**Current Project Stage**	Detailed Design

Risk Reference	Title/ Description	Raised by	Date Added	Risk Status	Phase (During which the Hazard obtains)	Description of the Risk	Potential Hazards	Effect Summary (risk) incl. person(s) at risk	Severity	Likelihood	First Risk Rating	Owner of Risk	Mitigation or Action	Severity	Likelihood	Risk Rating after mitigation	Further Action Required	Continuation Risk Reference	Assumptions/ Actions/ Notes
38	H&S - Risk of falls from height	RSD	10/01/2017	Open	Construction and Post-Construction	The new upstand wall presents an increased drop to the beach (Drop dependent on beach levels throughout design life.).	Fall from height / Unguarded edge.	Potential increase risk to falls from height presented by upstand wall.	5	4	High	Arup/ESCP	A Kee Klamp or similar guardrail has been specified to be placed on top of the upstand wall to a height of 1.1m as required for pedestrian barriers. The upstand wall has been profiled so to minimise likelihood of climbing on top of the wall. DDA compliant handrail has been specified for the access stairs. During construction the Contractor should place appropriate temporary edge protection until capping beam/wall and handrail barriers are installed.	5	2	High	ESCP/FBC should carry out a public risk assessment and place appropriate signage to highlight the dangers of the coastal environment, tide times, access and emergency facilities.	RSK-38	Risk is adequately minimised though design and construction of barriers/handrail and public are made aware of remaining risk through signage.
39	H&S - Trip hazard	RSD	10/01/2017	Open	Post-Construction	The concrete capping beam or wave recurve may be a trip hazard if not extended sufficiently above the level of the walkway.	Trip hazard and Fall from height / Unguarded edge.	Potential increase risk to falls from height presented by upstand wall.	5	3	High	Arup/ESCP	Upstand wall has been designed to be 600mm high so will be sufficiently elevated above the walkway not to be a trip hazard. The capping beam will have a handrail incorporated into the design .	5	1	Medium	See RSK-38.		
40	H&S - Elevated platform at height	RSD	10/01/2017	Open	Post-Construction	The incorporation of seating into the wall may encourage climbing and access at height.	Potential for upstand wall to encourage climbing and present an increased hazard.	Potential increase risk to falls from height presented by upstand wall.	5	3	High	Arup/ESCP	The upstand wall has been profiled so to minimise likelihood of climbing on top of the wall. A 200mm width to the guardrail compromises on providing a short depth on which people can perch whilst minimising area for standing and sitting on top of the wall.	5	2	High	See RSK-38.		
41	H&S - Ramp accessibility	RSD	10/01/2017	Open	Post-Construction	The new ramp structure to beach means less able persons could find themselves in an area of danger on incoming tides.	Limited accessibility for less ambulant people and risk of becoming trapped at high tides.	Member of public trapped or injured as a result of accessing the beach at low water.	5	3	High	Arup/ESCP	No DDA compliant ramped access has been incorporated into the design as the scope was to replace existing access structures only - with additional set of stairs. It is therefore considered unlikely that a less ambulant person would easily access the beach to become trapped. A public risk assessment should be carried out and signage placed to highlight the risk of the coastal environment and tides. Beach levels should be maintained at 2.8mOD wherever possible to improve accessibility and egress.	3	2	Medium	Beach levels to be monitored throughout design life and public risk assessment to be updated as situation changes post construction.	RSK-41	ESCP/FBC continue to monitor beach levels, access and public safety risk. Local lifeguard are aware of changing situation over time.
55	Maintenance Consideration	LS	16/01/2017	Open	Post-Construction	Rusting of handrail and railing fixings.	Rusting of handrails could lead to failure.	Discomfort to use handrail if rusted. Potential risk to public falling from height if handrails fail. Cost of replacement to council.	4	4	High	Arup/ESPC	Stainless steel hand rails to be designed thus reducing the risk of rusting to very low. Maintenance instructions specified by supplier should be followed by ESCP/FBC. Regular inspections of the condition of the handrail should be carried out.	4	1	Medium	ESCP / FBC to carry out routine inspection and maintenance to ensure: - Handrails are in good condition and grub screws are tight.	RSK-55	ESCP / FBC incorporate the Hill Head sea wall, handrail and stairs into routine maintenance plans.

KEY

Severity of injury	
VH: (5)	Fatality
H: (4)	Major injury or illness with long term effects. Long absence from work
M: (3)	Injury or illness incurring which results in a reportable / lost time absence from work
L: (2)	Minor injury / illness. Operative requires first aid. Operative stops work
VL: (1)	Minor injury / inconveniences operative can continue work

Probability (Prob.)	
VH: (5)	Expect it will happen, will occur often and with some certainty
H: (4)	More likely to happen than not, it would be a common occurrence
M: (3)	It would not be a surprise occurrence an unusual event, it would not be common though
L: (2)	Unlikely to happen but not impossible, would be an unusual event
VL: (1)	Highly unlikely to occur and would be a total surprise

Risk rating (Row X Column)						
Probability (LMH)	M (5x1)	H (5x2)	H (5x3)	H (5x4)	VH (5x5)	**Note** – the purpose of risk rating is to determine which risks are significant. It is a subjective process, not an absolute or precise
	M (4x1)	M (4x2)	H (4x3)	H (4x4)	H (4x5)	
	L (3x1)	M (3x2)	M (3x3)	H (3x4)	H (3x5)	
	L (2x1)	L (2x2)	M (2x3)	M (2x4)	H (2x5)	
	VL (1x1)	L (1x2)	L (1x3)	M (1x4)	M (1x5)	
	Severity (LMH)					

Appendix B – Site Visit Photographs

Pre Works

During Construction


DAWSON