Portsmouth City Council  
Portsea Island Coastal Strategy Study  
Technical Addendum to the Coastal Defences Report

Contents Amendment Record

This report has been issued and amended as follows:

<table>
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<tr>
<th>Issue</th>
<th>Revision</th>
<th>Description</th>
<th>Date</th>
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<td>1</td>
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<td>Draft for Internal Review</td>
<td>April 2010</td>
<td>IAT</td>
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<td>1</td>
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<td>Final</td>
<td>April 2010</td>
<td>IAT</td>
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<tr>
<td>2</td>
<td>0</td>
<td>Additional mapping in Section 4</td>
<td>Sept 2010</td>
<td>IAT</td>
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1 Introduction

1.1 Background

The Portsea Island Coastal Strategy Study (the Strategy) was submitted by Portsmouth City Council to the Environment Agency National Review Group (NRG) for approval in September 2009. The NRG board reviewed the documents and agreed that the Strategy should be approved subject to a number of chairman’s actions being satisfactorily addressed. This Addendum to the Portsea Island Coastal Strategy Study Coastal Defences Report, Halcrow 2009 (the Coastal Defences Report) has been prepared to address a number of these chairman’s actions.

1.2 Actions to be addressed

Table 1.1 below outlines the chairman’s actions that this addendum has been prepared to address:

<table>
<thead>
<tr>
<th>Ref</th>
<th>NRG Issue</th>
<th>NRG Action</th>
<th>Action Response</th>
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<tr>
<td>4.1</td>
<td>Sub-cell 1b - There is no mention of undertaking any form of structural improvements to the main seawall in order to extend its residual life to 100 years.</td>
<td>Sub-cell 1b - Please confirm that the preferred option over this length is realistic for the full 100 year appraisal period, and that the cost estimate is robust.</td>
<td>Provide Clarity on the options being assessed. See section 2.</td>
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<tr>
<td></td>
<td>Sub-cell 4j - On what basis are you confident in existing structural integrity to raise the crest by 0.91m as opposed to re-build the whole structure?</td>
<td>The choice of demountable defence should be explained in the Strategy Approved Report (StAR) and supported by a risk assessment demonstrating the residual risk of failing to erect the defence.</td>
<td>Also See Technical Addendum to the Economics Report for description of the demountable defences risk assessment.</td>
</tr>
<tr>
<td></td>
<td>Sub-cell 4k - The suitability of the existing wall is unknown.</td>
<td></td>
<td>Note the preferred option for this length has reverted to a permanent solution.</td>
</tr>
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<td></td>
<td>Sub-cell 4k - Does space allow a new embankment without surcharging the existing wall of unknown structural integrity leading to collapse, exposing the new embankment to erosion/undermining?</td>
<td>Sub-cell 4j/4k - Please confirm that the preferred option over these lengths is realistic for the full 100 year appraisal period, and that the cost estimates robust.</td>
<td></td>
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Provide Clarity on the options being assessed. See section 2. Also See Technical Addendum to the Economics Report for description of the demountable defences risk assessment. Note the preferred option for this length has reverted to a permanent solution.
Table 1.1 - Chairman’s Actions to be addressed in this Addendum

A further Section 4 has been added to this report to include additional mapping prepared by Portsmouth City Council and Havant Borough Council to provide greater clarity of the priority areas for flood defence improvement works.

2 Updated Option Assessment Sheets

2.1 General

The information shown on the following pages are an update of the existing Coastal Defences Report Appendix C. These updates have been prepared to address the issues raised by NRG shown in Table 1.1. The updated sheets provide additional information where requested and in the instance of flood cell 1b include a whole new option (provision of a permanent defence for Clarence Pier 571/3232 Option 2 – see Table 2.8), where additional assessments (see the Technical Addendum to the Economics Report, Halcrow 2010) found that the provision of demountable defences should no longer be presented as the preferred option for this frontage.

2.2 Amendments to Options for Sub-Cell 1b

Table 2.1 to 2.11 show the amendments made to the sheets included in the Coastal Defences Report Appendix C to address the issues raised by NRG in September 2009.
Typical Proposals: Sub-cell 1b, Defence lengths 571/3230 a and b – 280m and 360m

Option b1 – Build wave return wall and raise level of promenade by approximately 1.2m

The existing bullnose section of seawall would be replaced with a larger structure. It is assumed that the full structure will be replaced in year 0 and again in year 50 at the end of its residual life representing a conservative estimate of costs. In order to maintain sea views from the promenade, an increase in the level of the promenade would also be required. Concrete repair works to the wall in years 25 and 75 would be allowed for as well as annual maintenance costs.

For
- Increased protection provided to the promenade, road and common including protection of recreational facilities and historic features such as the Royal Naval War Memorial
- Closure of the promenade and road would occur less frequently
- Increased safety would be provided to pedestrians under extreme events
- Protection of land designated within Southera Frontage Conservation Area
- The wall and promenade raising works could be combined or phased over a number of years

Against
- The additional weight may create stability problems for the existing structure
- A greater footprint may be required
- The reduction in overtopping may lead to scour at the toe of the seawall
- Expensive

Table 2.1 – Description of Option 1 for Defence Length 571/3230b

Option b2 – Build Flood Embankment

To prevent the landward migration of flood water, the embankment proposed for Clarence Esplanade (571/3231) could be extended to the Westerly limit of the existing defences, at the terminus of Serpentine Road. An allowance for replacement of the existing seawall and cladding works in year 0, with replacement in year 50 would be required. An allowance for concrete repair to the existing wall in years 25 and 75 would also be included as well as annual maintenance to both the wall and embankment to ensure functionality is maintained for the scheme life. Additional rock toe protection works may be required to the seawall in the future to provide long term scour protection. Note this option could only be promoted if the preferred option for defences 3231 and 3232 involved the construction of the secondary embankment also to ensure that the embankment is not outflanked.

For
- The views of the sea from the promenade and road would remain unchanged
- The embankment would blend in with the surrounding natural environment

Against
- Structural damage to the promenade still likely to occur and would be more frequent with sea level rise
- Flooding allowed to propagate a long way inland and would adversely impact upon common and the Royal Naval War Memorial
- Closure of the promenade and road would occur more frequently with sea level rise
- Possible interruption of the sea view from ground floor properties by the secondary flood defence

Recommendations for defence length 571/3230b
The preferred option for this section of frontage is:
- Sea defence length 571/3230b1 - building a wave return wall.

The defences will provide protection to a large flood area comprising a wide variety of residential and commercial properties in addition to the promenade, recreational facilities and a Conservation Area. It is therefore considered that this scheme will be given a high priority and improvements will form a part of the medium term investment plan for Portsea Island.

Table 2.2 – Description of Option 2 for Defence Length 571/3230b
Option a1 – Raise Promenade by 1m and build a Wave Return Wall
Note that option a1 is in a different location along this defence length than option b1

Although overtopping is unlikely to propagate landward of the Battery it should be considered that the effect of sea level rise will decrease the standard of defence below tolerable limits and risk structural failure. For this reason an extension of the seawall proposed for the Sealife Centre would be the most obvious option. It is assumed that the full structure will be replaced in year 0 and again in year 50 at the end of its residual life representing a conservative estimate of costs. An allowance for concrete repair to the existing wall in years 25 and 75 would also be included as well as annual maintenance to both the wall and embankment to ensure functionality is maintained for the scheme life. Additional rock toe protection works may be required in the future to provide long term scour protection. Costs for these works are included in the economic assessment.

For
- Increased protection provided to the promenade and parkland
- Closure of the promenade and would occur less frequently
- Increased safety to pedestrians during extreme events
- The wall and promenade raising works could be combined or phased over a number of years

Against
- Expensive
- Sea views would be restricted from the promenade

Recommendations for defence length 571/3230a
The preferred option for this section of frontage is:
- Sea defence length 571/3230a - building a wave return wall and promenade.

The defences will provide protection to a large flood area comprising a wide variety of residential and commercial properties in addition to the promenade, recreational facilities and a Conservation Area. It is therefore considered that this scheme will be given a high priority and improvements will form a part of the medium term investment plan for Portsea Island.

Table 2.3 – Description of Option 1 for Defence Length 571/3230a

Option 1 – Build Wave Return Wall

It is assumed that the full structure will be replaced in year 0 and again in year 50 at the end of its residual life representing a conservative estimate of costs. An allowance for concrete repair works in years 25 and 75 would also be included as well as annual maintenance. Due to the wave climate and increased scour along this frontage an allowance for rock protection to the seawall in year 0 has been made.

For
- Increased protection provided to the promenade, road and common including protection of recreational facilities and historic features such as the Royal Naval War Memorial
- Closure of the promenade and road would occur less frequently
- Increased safety to pedestrians during extreme events
- Protection of land designated within Southsea Frontage Conservation Area

Against
- Obscure the existing uninterrupted views of the sea from the promenade, road and common
- Reduce the amenity value of the promenade and road
- The reduction in overtopping may lead to scour at the toe of the seawall
- Potential access restrictions to the hovercraft terminal during the construction works

Table 2.4 – Description of Option 1 for Defence Length 571/3231
Option 2 – Build Splash Wall

Year 0 works would require replacement of the existing seawall as well as the construction of a new splash wall this represents a conservative cost estimate with a full rebuild of the existing structure. Both would require replacing/upgrading in year 50. Concrete repair works would be required in years 25 and 75 as well as annual maintenance. Due to the wave climate and increased scour along this frontage an allowance for rock protection to the seawall in year 0 has been made.

For
- Increased protection provided to the road and common including protection of recreational facilities and historic features such as the Royal Naval War Memorial
- Closure of the road would occur less frequently
- Cheap and effective
- No visual intrusion along the promenade to the sea
- The creation of a clear demarcation between the promenade and road, would improve safety for pedestrians

Against
- Reduced visual amenity for small/low vehicles as the views of the sea would be restricted
- Access between the road and promenade would be reduced
- Increased risk of structural damage to the promenade with sea level rise
- Reduced promenade width
- Street furniture such as tall street lights and chairs would need to be removed or sympathetically realigned around the

Table 2.5 – Description of Option 2 for Defence Length 571/3231

Option 3 – Build Flood Embankment

Year 0 works would require replacement of the existing seawall with piling and cladding as well as the construction of a new flood embankment. This represents a conservative cost estimate with a full rebuild of the existing structure. The existing seawall would also require replacing in year 50. Concrete repair works to the existing wall would be required in years 25 and 75 as well as annual maintenance to the seawall and embankment. Due to the wave climate and increased scour along this frontage an allowance for rock protection to the seawall in year 0 has been made.

For
- The views of the sea from the promenade and road would remain uninterrupted
- The embankment would blend in with the surrounding natural environment once seeded
- Option works with natural processes allowing the sea/intertidal habitats to migrate inland

Against
- Increased risk of structural damage to the promenade with sea level rise
- Increased risk of possible structural damage to the road with sea level rise
- Flooding allowed to propagate a long way inland and would adversely impact upon common and the Royal Naval War Memorial
- Potential loss of terrestrial/freshwater habitats
- Road traffic disruptions would occur more frequently with sea level rise
- Possible interruption of the sea view from ground floor properties

Recommendations for defence length 571/3231

The preferred option for this section of frontage is to improve the existing defences along the current alignment of defence by constructing a wave return wall (option 1). Option 1 is considered preferable to the other alternative options as it provides protection from flooding to the promenade, road and Southsea Common.

Table 2.6 – Description of Option 3 for Defence Length 571/3231
Typical Proposals: Sub-cell 1b, Defence length 571/3232 – 200m

**Option 1 – Provide Flood Boards (Provide Demountable Defence)**

An initial allowance for construction of permanent foundations for the demountable structures is included in year 0. Piling and cladding works would be required for year 20 to form a new permanent flood defence when it is assumed that Clarence Pier will no longer be a sustainable business due to the impacts of sea level rise and structural deterioration. An allowance for concrete and cladding repair to the proposed permanent wall 25 years after initial construction. Additional rock toe protection works may be required in the future to provide long term scour protection.

**For**
- Increased protection provided to the promenade, road and common including protection of recreational facilities and historic features such as the Royal Naval War Memorial
- Closure of the promenade and road would occur less frequently
- Increased safety provided to pedestrians during extreme events
- Protection of land designated within Southsea Frontage Conservation Area

**Against**
- Reduce the amenity value of the promenade and road
- The reduction in overtopping may lead to scour at the toe of the seawall
- Potential access restrictions to the hovercraft terminal during the construction works
- Technical suitability of flood boards in area with strong wave climate (See Addendum to Economics Report).

**Table 2.7 – Description of Option 1 for Defence Length 571/3232**

**Option 2 – Provide New Permanent Seawall**

An initial allowance for construction of a sheet piled wall with a residual life of 50 years capable of providing the required improved flood protection and structural capabilities. Allowance is included for this new wall to be replaced after 50 years. An allowance for concrete and cladding repair to the proposed wall in years 25 and 75 would be required. Additional rock toe protection works may be required in the future to provide long term scour protection.

**For**
- Increased protection provided to the promenade, road and common including protection of recreational facilities and historic features such as the Royal Naval War Memorial
- Closure of the promenade and road would occur less frequently
- Increased safety to pedestrians during extreme events
- Protection of land designated within Southsea Frontage Conservation Area

**Against**
- Reduce the amenity value of the promenade and road including reduced views
- The reduction in overtopping may lead to scour at the toe of the seawall
- Potential access restrictions to the hovercraft terminal during the construction works
- Structural damage to the promenade and street furniture still likely to occur

**Table 2.8 – Description of Option 2 for Defence Length 571/3232**
Option 3 – Build Flood Embankment

In addition to the new flood embankment, the existing sheet piled wall fronting Clarence Pier will be replaced. Due to the proximity of the road, promenade and buildings to the existing flood defence the existing walls would be replaced in year 0 to their current standard of protection and replaced in year 50. An allowance for concrete repair to the wall in years 25 and 75 would also be included as well as annual maintenance costs. Additional rock toe protection works may be required in the future to provide long term scour protection. Additional allowance is included for future capital works to rebuild the flood embankment in response to sea level rise and to ensure long term stability.

For

- The views of the sea from the promenade and road would remain uninterrupted
- The embankment would blend in with the surrounding natural environment once seeded

Against

- Increased risk of structural damage to the promenade and street furniture with sea level rise
- Flooding allowed to propagate a long way inland and would adversely impact upon common and the Royal Naval War Memorial
- Possible interruption of the sea view from ground floor properties

Recommendations for defence length 571/3232

All 3 options are considered suitable for assessment in the economic analysis. However, the technically preferred option for this section of frontage is Option 2, to improve the existing defences along the current alignment of defence by constructing a new permanent seawall between Clarence Pier and the existing promenade. (see Technical Addendum to the Economics Report)

Option 1 is preferred over Option 3 as it maintains the existing defence alignment providing continued protection to the leisure facilities adjacent to Clarence Pier.

The defences provide protection to a large flood area comprising a wide variety of residential and commercial properties.

Table 2.9 – Description of Option 3 for Defence Length 571/3232

Typical Proposals: Sub-cell 1b, Defence lengths 571/3233 and 571/3234 – 140m and 210m

Option 1 - Raise Crest Level of Seawall

It is assumed that the full structure will be replaced in year 0 and again in year 50 at the end of its residual life representing a conservative estimate of costs. An allowance for concrete repair to the wall in years 25 and 75 would also be included as well as annual maintenance costs. Additional rock toe protection works may be required in the future to provide long term scour protection.

For

- Increased protection provided to the promenade, car park and Clarence Pub
- Closure of the promenade and car park would occur less frequently
- Increased safety would be provided to pedestrians under extreme events

Against

- Sea views would no longer be possible from the promenade
- The reduction in overtopping may lead to increased scour at the toe of the seawall
- Expensive

Table 2.10 – Description of Option 1 for Defence Length 571/3233 and 3234
Option 2 – Build New Splash Wall

Due to the assessed condition, of the existing sea wall this will be replaced in year 0 to the current standard of protection and repaired every 25 years. A new splash wall will be constructed to provide improved flood protection and then replaced in year 50 to make additional allowance for sea level rise. An allowance for concrete repair to the wall in years 25 and 75 would also be included as well as annual maintenance costs. Additional rock toe protection works may be required in the future to provide long term scour protection.

For
- Increased protection provided to the car park and Clarence Pub
- No restriction on views from the promenade to the sea
- Closure of the car park would occur less frequently
- Cheap and easy to maintain

Against
- Increased risk of structural damage to the promenade with sea level rise
- Closure of the promenade would occur more frequently

Recommendations for Defence Length

The preferred option is:

- Sea defence lengths 571/3233/3234 - building a new splash wall

Either of the two alternative options would prove to be effective for the required improvements. The construction of option 2 ‘build new splash wall’ is however preferred due to the reduced capital costs. This solution would also not affect the existing views of the sea for recreational users on the promenade.

Table 2.11 – Description of Option 2 for Defence Length 571/3233 and 3234

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2.3 Amendments to Options for Sub-Cell 4j

Table 2.12 shows the amendments made to the sheets included in the Coastal Defences Report Appendix C to address the issues raised by NRG in September 2009 for sub-cell 4j.

Typical Proposals: Sub-cell 4j, Defence length 571/3213, 571/3212, 571/3211 & 571/3220 – 210m, 250m, 460m & 490m

Option 1 – Raise Crest Level of Existing Seawall

The most sensible option for this frontage involves raising the crest level of the existing wall to provide the required standard of protection. Since the land behind the seawall is generally at a lower level there are very limited options for a set back alignment of the defences or any secondary defences.

For
- Defence would prevent flooding of potentially contaminated land in the hinterland reducing the risk of contaminants leaching into Langstone Harbour
- Work could be undertaken at the end of the residual life of the existing wall. Constructing a new slightly higher wall would cost only slightly more
- Views of the sea are already compromised by the existing seawall and the low level of the hinterland. The proposed crest raising works would therefore have little effect on the outlook from the road.
- Would not encroach upon Langstone Harbour SSSI, SPA and Ramsar site.
- Opportunities exist to develop informal recreational facilities along this stretch e.g. nature trails, cycle paths and Public Rights of Way

Against
- The proposed works would have an adverse visual impact as the flood wall would be between 1.3m and 2.8m higher than the path levels.

Recommendations

It is recommended that the option presented above is adopted for this section of the frontage where improve is economically and environmentally viable. However, without undertaking a structural survey it is not possible to confirm the suitability of the structure for raising. Construction cost estimates have taken a conservative approach assuming structures need to be rebuilt in Years 10 and 16.

Table 2.12 – Revised Description for proposed improvements to defences within sub-cell 4j

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2.4 Amendments to Options for Sub-Cell 4k

Tables 2.13 – 2.14 show the amendments made to the sheets included in the Coastal Defences Report Appendix C to address the issues raised by NRG in September 2009 for sub-cell 4k.

Typical Proposals: Sub-cell 4k, Defence length (571/3205) – 1350m

Option 1 – Raise Crest Level of Embankment

- **For**
  - Defence would fit in with the existing landscape character of the area
  - Improved level of protection of land designated within Hilsea Lines Conservation area
  - Construction should be straight forward
  - Minimal visual intrusion (Hilsea Lines Scheduled Monument already impairs views from the low-lying hinterland)
  - Defence would protect Hilsea Lines Scheduled Monument, which follows the entire length of Ports Creek between Langstone Harbour and Tipter Lake.
  - Proposal would protect Hilsea Lines Natural History Trail and would provide opportunities for developing informal recreational activities in this area including walking and angling.

- **Against**
  - Construction works may have temporary adverse impact upon angling activities in the brackish/freshwater moat of Hilsea Lines.
  - Construction works may disturb the established wildlife and protected species present at Hilsea Lines, which is considered by Portsmouth City Council to comprise the most varied wildlife haven at Portsea Island.
  - Some adverse visual impacts

**Recommendations**

The preferred option for this section of the frontage is Option 1 due to the lower construction costs and the more environmentally sympathetic materials being used. Option 1 also provides less visual intrusion. There are also opportunities for a footpath on the crest of the embankment.

<table>
<thead>
<tr>
<th>Table 2.13</th>
<th>Description of Option 1 for Defence Length 571/3205</th>
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Option 2 – Raise Crest Level of Wall

- **For**
  - Required standard of protection provided

- **Against**
  - Likely to be a more costly option than the embankment improvements
  - Excavation in this area may encounter potential contamination associated with Hilsea Lines military base and ammunition storage and Portsmouth airfield, which was constructed at the eastern end of Hilsea Lines.
  - Construction works may have temporary impact upon angling activities in the brackish/freshwater moat of Hilsea Lines.
  - Construction works may disturb the established wildlife and protected species present at Hilsea Lines, which is considered by Portsmouth City Council to comprise the most varied wildlife haven at Portsea Island.
  - Some adverse visual impacts

**Recommendations**

The preferred option for this section of the frontage is Option 1 due to the lower construction costs and the more environmentally sympathetic materials being used. Option 1 also provides less visual intrusion. There are also opportunities for a footpath on the crest of the embankment.

| Table 2.14 | Description of Option 2 for Defence Length 571/3205 |
3 Revisions to Appendix A

3.1 Updated Figures

The following figures are those which have been amended to reflect the previously incorrectly labelled defence lengths shown in the Portsea Island Coastal Strategy Study, Coastal Defences Report, Halcrow 2009 Appendix A.

Figure 3.1 – Revised labelling of defence lengths for sub-cell 1a
Figure 3.2 – Revised labelling of defence lengths for sub-cell 1b

Figure 3.3 – Revised labelling of defence lengths for sub-cell 1c
Figure 3.4 - Revised labelling of defence lengths for sub-cell 1d

Figure 3.5 - Revised labelling of defence lengths for sub-cell 2e
Figure 3.6 - Revised labelling of defence lengths for sub-cell 2f

Figure 3.7 - Revised labelling of defence lengths for sub-areas 2g & 3h
Figure 3.8 - Revised labelling of defence lengths for sub-cell 4i

Figure 3.9 - Revised labelling of defence lengths for sub-cell 4j
Figure 3.10 - Revised labelling of defence lengths for sub-cell 4k

Figure 3.11 - Revised labelling of defence lengths for sub-cell 4l
Figure 3.12 - Revised labelling of defence lengths for sub-cell 5m

Figure 3.13 - Revised labelling of defence lengths for sub-cells 6n – 6p
4 Additional Mapping

4.1 Introduction

The following Figures 4.1 – Combined Annual Probability of Flood and Residual Risk and 4.2 – Existing Residual Life maps have been provided to give additional clarity of the priority areas where flood defence works are required to best manage current and future flood risk.
Figure 4.1 – Combined Annual Probability of Flood and Residual Risk
Figure 4.2 – Existing Residual Defence Life