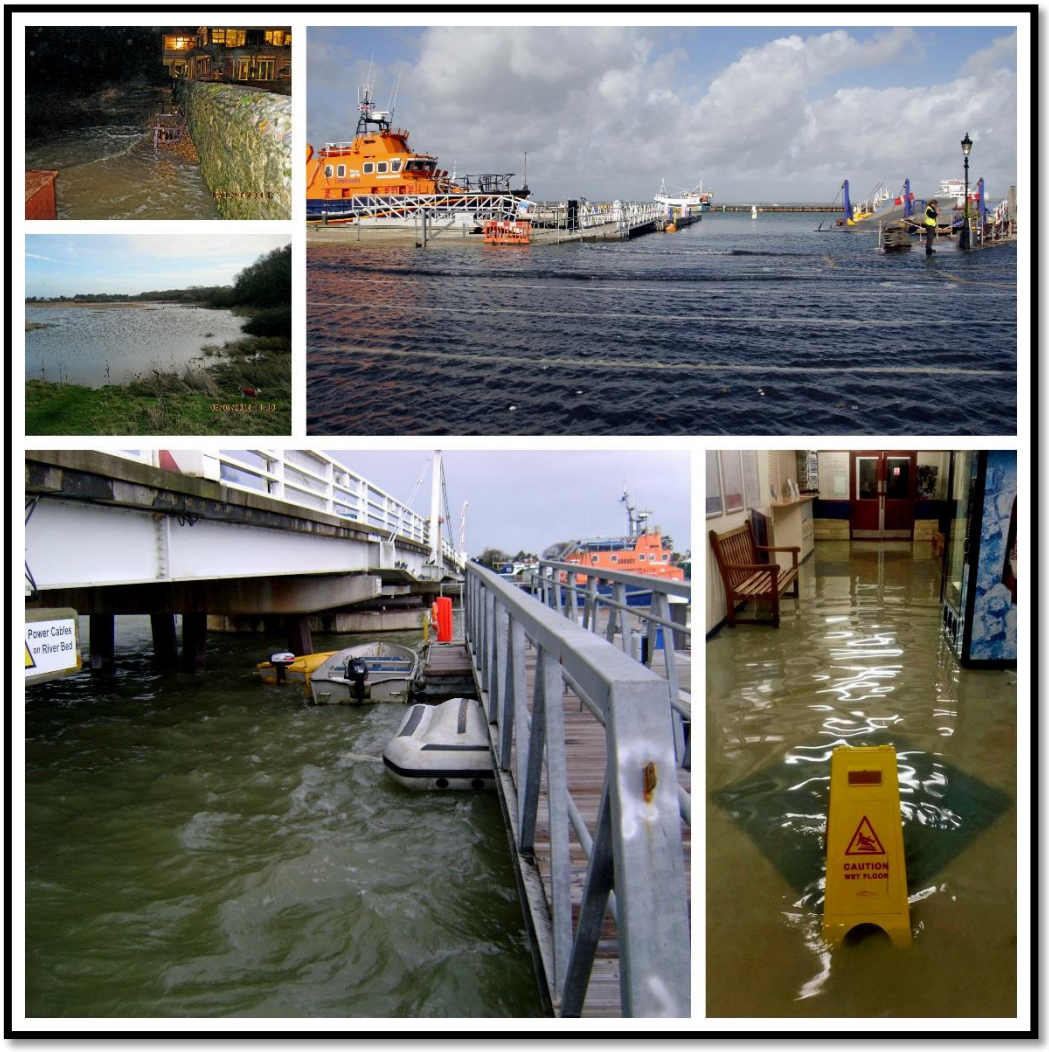
# 2014 UPDATE TO THE 2010 REPORT 'ADAPTING TO COASTAL FLOODING IN THE YARMOUTH AREA IN THE 21ST CENTURY'

REPORT BY YARMOUTH COASTAL DEFENCE WORKING GROUP



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## INTRODUCTION

Much of the town of Yarmouth and the surrounding area lie only a couple of metres above mean sea level and a combination of a Storm Surge and High Spring Tide can cause flooding. To date the effects of such flooding have been relatively minor but, with sea level predicted to rise at increasing rates this century, flooding will become more serious and more frequent. In 2010 the Coastal Defence Working Group prepared a report (Adapting to Coastal Flooding in the Yarmouth Area in the 21st Century) with the aim of raising awareness of the associated issues with policy makers and the local community. It outlined the scientific basis for concern, identified local assets that may be at risk and suggested possible measures to alleviate any impact. The Working Group also aimed to increase the profile of Yarmouth in discussions on the priorities and funding of Isle of Wight coastal defence.

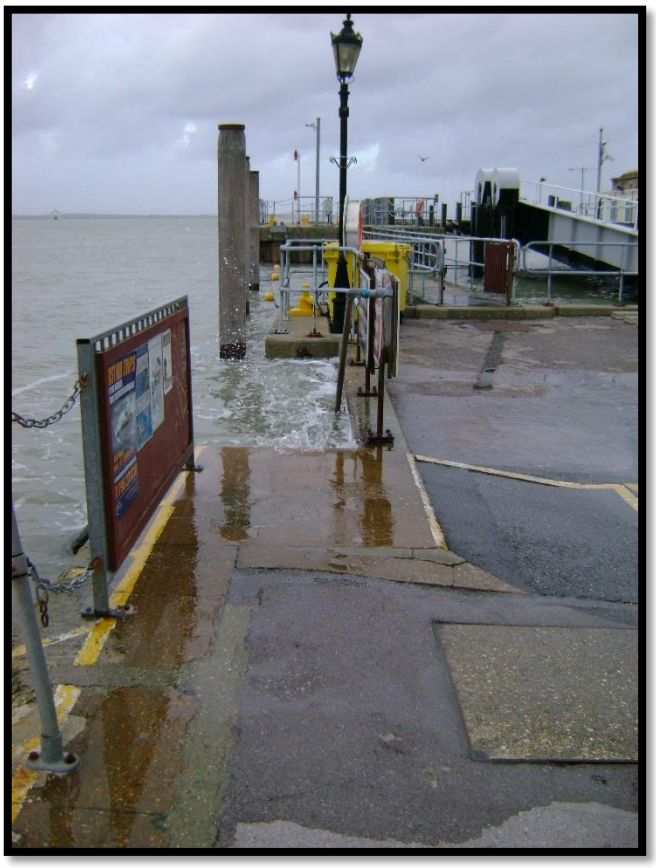
Since producing the report the Working Group has remained active in raising awareness of coastal flooding in Yarmouth, both with policy makers and the local community. It has continued to monitor storm surge and flood levels and based on this information has revised previous estimates both for the height and frequency of the storm surge likely to be seen and the costs associated with proposed actions.

## CHANGES SINCE 2010

There has been considerable progress in many areas and this summary has been produced to provide an update to the original 2010 report. The following points are the main areas of change relevant to coastal flooding in Yarmouth and the surrounding area:

- Storm surges and flooding events in Yarmouth since 2010, including the flooding associated with the storm surge on 14th February 2014.
- Production of the Yarmouth Community Flood Plan in 2013.
- Adoption of the Isle of Wight Shoreline Management Plan in 2011.
- Discussion about the trialling of temporary flood barriers in Yarmouth.
- The predicted lifespan of the existing Yarmouth Harbour breakwater (20 years) and the completion of a scoping document regarding its future.

- Coastal Communities Adapting to Coastal Change (CCATCH) was part of the EU funded CC2150. The existence and previous activities of the Working Group was a major factor in the selection of Yarmouth as one of the six sites around the Solent to receive funding and actions from the project. The project created a 3D fly-through of the area at various levels of tide, now and predicted. It also developed an award winning schools programme to investigate and discuss the issues associated with flooding from the sea.
- The Totland to Colwell seawall collapse (in 2012) and the impact of the 2013 / 2014 winter storms on the Island's coastal defence resources.
- Substantial structural work carried out on the Bouldnor Road in 2013 / 2014.
- Change in political control of the Isle of Wight Council (IWC) in 2013 and the need to involve all political parties and develop a long term, sustainable strategy.
- The impact of unprecedented spending cuts within IWC.
- In 2013 *Island Roads* replaced the IWC Highways department under a 25 year PFI contract.
- The Marine Management Organisation (MMO) began operating in 2010 and was established under the Marine and Coastal Access Act 2009. It is an executive non-departmental public body that brings together key marine decision-making powers and delivery mechanisms. It deals with marine planning, licensing, protected areas and fisheries.
- Proposals for a Marine Conservation Zone along the coast and the potential impact that associated management may have on the future development of coastal defence structures.
- Increased public demand for clarity regarding the balance between property and wildlife in flood defence policy.
- Public interest and confusion regarding the roles and responsibilities of Government, national agencies, local authorities and water companies.
- Impact of dramatic flooding in the UK on public consciousness.



## SUMMARY OF 2014 UPDATE

- In 2010 the conservative assumption of the maximum storm surge that Yarmouth would expect in 21st Century was 1.1 metres. As detailed in section 2, this has been revised upwards to 1.4 metres based on the events in October 2013 and February 2014. The frequency of storm surges is also likely to increase and the extent of flooding become more widespread.

- The 2010 report fed into the development of the Isle of Wight's second Shoreline Management Plan (SMP2) which was adopted by the IWC and Environment Agency (EA) in May 2011. Details about the policies set out for the sustainable management of the coast can be found at www.coastalwight.gov.uk/smp/

- Subsequent to the adoption of the SMP2, funding has now been secured by the IWC to resume work on the West Wight Coastal Defence Strategy Study. Work on an associated study in 2006 (by the consultancy Atkins) went no further than the first round of public consultation. Over the next two years the Working Group will assist in the development of the Strategy Study through the provision of local information and by raising awareness of public consultation(s).

- Funding constraints continue and local and national grant funding is likely to be increasingly difficult to obtain. The estimated costs associated with coastal defence work and flood adaptation have been revised from £190,000 to £270,000 before 2020, £9.8 million to £21 million by 2050 and £26.1 million to £30.1 million before 2100.

## THE SCIENTIFIC BASIS FOR CONCERN: UPDATE IN THE LIGHT OF STORM SURGES IN YARMOUTH HARBOUR OCTOBER 2013 – FEBRUARY 2014

***Extract**: Full version* of this updated section and references *are available at:* [*www.yarmouth-harbour.co.uk/news/coastal-defence*](www.yarmouth-harbour.co.uk/news/coastal-defence)

The UK Meteorological Office (Met Office) reported that the winter 2013/2014 was an exceptionally stormy season, with at least 12 major winter storms affecting the UK in two spells from mid-December to early January, and again from late January to mid-February. There were more very severe gale days than any other winter season in a series from 1871. It was also the wettest winter for England, Wales and Scotland in a series from 1910. Mean temperatures over the UK were well above the long term average with a notable absence of frosts.

The winter was also exceptional for Yarmouth in the number of times that the sea rose above the quay, flooding the marshalling area and adjacent roads at times. The frequency of major storm surges was much greater than Yarmouth had experienced before. It is important to stress that the flooding in Yarmouth was due to storm surges, driven by the patterns of wind and air pressure in the storms moving into northwest Europe from the Atlantic, and not due to the heavy rainfall.

The storm surges experienced in Yarmouth covered a greater span of time than those in the Met Office assessment above. The first major storm surge arrived on 28th October 2013 and the last on 14th February 2014 ('the St Valentine's Day storm'). Prior to this winter's events, the last major storm surge experienced at Yarmouth occurred on 10th March 2008. That event was discussed in detail in the 2010 report and, at that time, it was thought that comparable storm surges could be expected to occur roughly every 20 years.

The average height of the quay in Yarmouth is about 3.9 metres above Chart Datum. If one defines a significant storm surge (for Yarmouth) as one which reaches or exceeds the height of the quay, six such events were observed between October and February, as shown in the table below.

| Date | Predicted tide (UK Hydrographic Office) | | Observed tide (at Yarmouth) | Height of storm surge |
|---|---|---|---|---|
| 10th March 2008 | Noon | 3.0m | 4.1m | 1.1m |
| 28th October 2013 | 05:23 | 2.6m | 4.01m | 1.4m |
| 4th November 2013 | 10:26 | 3.1m | 3.97m | 0.9m |
| 5th November 2013 | 11:02 | 3.1m | 3.85m | 0.75m |
| 6th December 2013 | 00:16 | 3.1m | 3.83m | 0.7m |
| 3rd January 2014 | 11:18 | 3.1m | 3.80m | 0.7m |
| 14th February 2014 | 22:37 | 2.9m | 4.15m | 1.25m |

**Table 1. Storm surge observations in Yarmouth Harbour, March 2008 and 2013/2014.**

There may have been a few large storm surges, comparable to those in the table above, which were not identified at Yarmouth. This was because they did not coincide with the astronomical prediction of high water. Many more, smaller storm surges were also observed. However, the 14th February flooding was more widespread than that of 2008, possibly due to the very strong south westerly wind (Force 12 at times), which also caused waves on top of the flood water. Affected areas were the whole

of the quay area and adjoining properties, ferry terminal, most of Quay Street and northern part of Wheatsheaf Lane, western part of Bridge Road, parts of the A3054 road from the School to a good way west of the Yar Bridge, Gasworks Lane, the River Yar Boatyard, part of the estuary's eastern footpath and those by the Mill, Mill Field and part of the old railway line, Gossips Cafe and northern end of Pier Square. Damage also occurred to some jetties and seawalls of private properties in High Street and Port La Salle, to The Common seawall and parts of the Harbour. The height of flooding in these areas varied considerably due to different ground levels and wind exposure.

The heights of the storm surges observed in Yarmouth were consistently greater than those recorded at Weymouth and Portsmouth, presumably due to tidal processes in the Solent.

| Date | Weymouth | Portsmouth | Yarmouth |
|---|---|---|---|
| 28th October 2013 | 0.65m | 0.9m | 1.4m |
| 4th November 2013 | 0.3m | 0.5m | 0.9m |
| 5th November 2013 | 0.25m | 0.2m | 0.75m |
| 6th December 2013 | 0.15m | 0.6m | 0.7m |
| 3rd January 2014 | 0.35m | 0.5m | 0.7m |
| 14th February 2014 | 1.0m | 1.0m | 1.25m |

**Table 2. Comparison of storm surge heights at Weymouth, Portsmouth and Yarmouth.**

The largest storm surge observed in Yarmouth from October 2013 to February 2014 occurred during neap tides on 28th October 2013, resulting in minimal flooding. Scientists at the University of Southampton were particularly interested in this event, identifying a seiche in which the seawater oscillates back and forth across the Channel.

## SUMMARY OF SCIENTIFIC BASIS FOR CONCERN

- In the 2010 report it was assumed that the maximum storm surge that Yarmouth would experience in the 21st century would be 1.1 metres – the height of that experienced on 10th March 2008. This figure was then used to predict, taking into account sea level rise, the maximum sea level heights that Yarmouth could expect in 2050 and 2100. It is now clear, only six years after the March 2008 surge, that this figure should be revised upwards to 1.4 metres. This may still be a conservative assumption, but it remains important to use a figure which is firmly tied to the data. Hence the predictions for maximum sea level height in Yarmouth above Chart Datum in the 2010 report can be revised as follows:

| Year | Highest Astronomical Tide | Maximum Storm Surge | Sea Level Rise | Maximum Sea Level Height |
|---|---|---|---|---|
| 2050 | 3.1m | 1.4m | 0.3m | 4.8m |
| 2100 | 3.1m | 1.4m | 0.9m | 5.4m |

**Table 3. Revised prediction of maximum sea level height above Chart Datum at high water for a high Spring Tide.**

| Year | Height of High Tide | Maximum Storm Surge | Sea Level Rise | Maximum Sea Level Height |
|---|---|---|---|---|
| 2050 | 2.6m | 1.4m | 0.3m | 4.3m |
| 2100 | 2.6m | 1.4m | 0.9m | 4.9m |

**Table 4. Revised prediction of maximum sea level height above Chart Datum for a typical high water Neap Tide.**

- The frequency of occurrence of storm surges in Yarmouth also needs to be revised. In the 2010 report, it was thought that storm surges comparable to the March 2008 event could be expected to occur roughly every 20 years. Of the six significant storm surges experienced in Yarmouth in the five months from October 2013 to February 2014, three can be considered to be comparable to the March 2008 event. However, it is difficult to predict from this the frequency of occurrence of storm surges in decades to come without understanding more about long term weather trends. All one can say at present is that storm surges are likely to be more frequent in future than hitherto thought, and therefore that the chance of storm surges coinciding with high Spring or Neap Tides, and hence causing flooding, has increased.

- The heights of storm surges at Yarmouth were consistently greater than those observed for the comparable events at Weymouth and Portsmouth.

- Some scientists have claimed that one of the consequences of climate change will be increased storminess. In February 2014, a paper entitled "The Recent Storms and Floods in the UK" was published by the Met Office. The question of whether climate change contributed to the severity of the weather and its impacts is discussed. It recognises that "Although no individual storm can be regarded as exceptional, the clustering and persistence of the storms is highly unusual." However, the paper concludes: "In terms of the storms and floods of winter 2013/2014, it is not possible, yet, to give a definitive answer on whether climate change has been a contributor or not."

## LOCAL ASSETS AT RISK – 2014 UPDATE

The local assets at risk are largely the same as those outlined in the 2010 report, however the threat of closure of the Military Road has been averted through remedial works and is now likely to be treated within the PFI contract.

### BOULDNOR ROAD (A3054)

The road is the main approach to Yarmouth from the east and required stabilisation. Substantial structural geotechnical work was carried out between November 2013 and April 2014. The work involved strengthening a 700 metre stretch of the highway between the Viewpoint Car Park and Yarmouth Common with 750 steel sheet piles driven up to 16 metres into the ground. A process called 'soil nailing' was also used to stabilise the road at the Yarmouth end of the scheme.

### AMENITIES AND UTILITIES

It is important not to overlook public amenities and utilities such as roads, rights of way, water mains, sewage pipes, electricity cables, gas pipes and the harbour. These will all require significant investment by the relevant authorities in order that they may be protected.

Concern has been raised about the location of substations in the area and their vulnerability to flooding.

### A POSSIBLE FUTURE SCENARIO

In Yarmouth **IF** a high Spring tide (e.g. 3.1 metres) coincided with a storm surge of 1.4 metres, giving a total tide height of 4.5 metres, the flood water is likely to go into the Squares, more of Bridge Road and to a greater extent of River Road than before. There could also be further flooding of the A3054 west of the Yar Bridge. Depending on weather conditions, the Causeway and its nearby roads and properties are also likely to be flooded.

## FUNDING AND LEGISLATIVE CONSTRAINTS - 2014 UPDATE

Not a great deal has changed since 2010 except that Government money and grants have become even more difficult to obtain. Future coastal defence work is likely to require an element of private funding in partnership with the increasingly limited public funding.

The updated Shoreline Management Plan (SMP2) covers the entire coastline of the Isle of Wight, including estuaries. It is overarching and sets out sustainable management policies for every section of the Island's coast. Further details can be found at www.coastalwight.gov.uk/smp.

Funding for coastal defence work will be linked to a Strategy Study that has to comply with the SMP2 management policies and will provide the detail required for each area. In early 2014 the IWC obtained government funding from the EA to work on the West Wight Strategy Study and this work is due to commence in 2014. It is a two year project which means it is unlikely that the Yarmouth area will manage to obtain any substantial central government funding for coastal defence until 2016 at the earliest.

There have been some changes to the constraints on the water with the establishment of the MMO. Coastal defence work will require a licence from the MMO and any work will need to take into account marine wildlife and commercial fisheries. The Marine and Coastal Access Act also set up the mechanism to create Marine Conservation Zones (MCZ), one of which is proposed along the coast from Yarmouth to Cowes. The management measures associated with any new protected area, such as an MCZ, may impact upon future coastal defence schemes including the breakwater.

Constraints ashore remain largely the same as those outlined in the 2010 report.

Further changes to legislation are unlikely to occur until after the General Election in May 2015.

## SOME POSSIBLE SOLUTIONS – 2014 UPDATE

The possible solutions and costs from 2010 have been reviewed and revised based on increased understanding. These are suggested by the Working Group and do not necessarily represent the views of the member organisations.

The costs below remain estimates of expenditure to take forward the suggestions and are grouped by relevant or responsible organisations. **Private and businesses properties are not included in the estimates.**

| Estimated Costs | £ |
|---|---|
| Ten years to 2020 | 270,000 |
| Thirty years 2020 – 2050 | 21,040,000 |
| Fifty years 2050 – 2100 | 30,100,000 |

**Estimated Total Cost to 2100 £51,410,000**

**N.B. All costs are approximate and are at 2014 levels.**

### BY YEAR TEN – 2020

| | |
|---|---|
| BY YEAR TEN – 2020 | TOTAL £270,000 |

#### CENTRAL GOVERNMENT GRANTS

Gates 0.5 metres high in lanes which lead from High Street to the shore (six).

Gate at Pier entrance.

Gates on harbour slipways (four).

Reinforce sea wall at western end of the Common.

### BUSINESSES / HOUSES

Flood boards for doors and other devices – part grant funded.

### YARMOUTH HARBOUR COMMISSIONERS

Temporary Flood Barriers (+ Environment Agency).

Raise wavebreak on Norton Spit by 0.3 metres – completed 2013.

### YARMOUTH TOWN COUNCIL

Community Flood Plan – introduced in 2013.

## BY YEAR FORTY – 2050

| | |
|---|---|
| BY YEAR FORTY – 2050 | TOTAL £21,040,000 |

### CENTRAL GOVERNMENT GRANTS

Gates on Bridge Street and Quay Street entrances into the town centre.

Raise gate to Thorley Brook.

Reinforce Causeway at Freshwater, allow use as a ford.

### YARMOUTH HARBOUR COMMISSIONERS

Raise wavebreak on Norton Spit by 0.5 metres.

New breakwater one metre higher than existing breakwater cost depending on construction type and location.

Raise pier by 1 metre.

Raise Gossips Cafe by 1 metre.

Raise ferry pier, linkspan etc by 1 metre.

Raise river bank around the Green by 1 metre.

### UTILITIES

Water Companies: Sluices on overflow pipes to prevent ingress of water through drains.

Electricity Companies: Raise substations above flood level.

## BY YEAR NINETY – 2100

| | |
|---|---|
| BY YEAR NINETY – 2100 | TOTAL £30,100,000 |

### CENTRAL GOVERNMENT GRANTS / ISLE OF WIGHT COUNCIL

Raise road A3054 to a maximum of 1 metre from Tennyson Road to the bottom of Halletts Shute, including the Yar Bridge.

Reinforce revetments on A3054 to support the road.

Raise old railway footpath by 1 metre and reinforce to act as riverbank.

Install raised bank on south side of Yarmouth close to Thorley Brook to protect properties.

Raise sea wall by 1 metre on north side of the Common to protect the main road to Newport.

Allow ingress of water to land on both sides of River over this 50 year period as sea level rises.

Replace the Causeway at Freshwater.

Install gates to 1 metre on High Street lanes (six).

### YARMOUTH HARBOUR COMMISSIONERS

Norton Spit – No further expenditure.

Raise quay wall by 1 metre.

Install gates to 1 metre at harbour slipways.

### UTILITIES

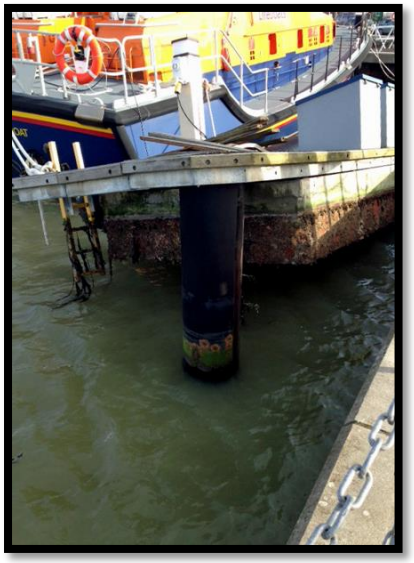
Raise utilities under road.

## PUBLIC AWARENESS

We continue to urge the public to remain alert to all these issues and to seek help, if needed, in understanding problems as they arise. Members of the general public could have a considerable impact on politicians and officials if they are well informed and engaged with coastal defence issues, especially funding. Granted that it is easy to put off thinking about such long term issues or to be a sceptic, the alternative is to leave others to make decisions now that will affect many people over time, in the hope that all will be well.

The Working Group will continue to monitor, lobby where possible, raise awareness and report to officials and to the community. Members of the Group are representatives of the Harbour Commissioners, Yarmouth Town Council and the three neighbouring Parish Councils, a geophysicist who has specialised in oceanographic sciences, the Estuaries Officer, an environmentalist, a local resident, and the West Wight County Councillor.

We welcome comments on the update and input via email to coastaldefence@yarmouth-harbour.co.uk or letter to Yarmouth Coastal Defence Working Group, c/o The Harbour Master, The Quay, Yarmouth, PO41 0NT.



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## LINKS TO FURTHER INFORMATION

- The 2010 report **Adapting to Coastal Flooding in the Yarmouth Area in the 21st Century** and the full version of the updated *Scientific Basis of Concern* (2014) are available at: www.yarmouth-harbour.co.uk/news/coastal-defence

- Environment Agency : www.environment-agency.gov.uk

- Isle of Wight Council: www.iwight.com/planningpolicy and www.coastalwight.gov.uk/smp/

- Yarmouth Community Flood Plan for information on resistance and resilience equipment: www.yarmouthtowncouncil.co.uk

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