Chatham Maritime Trust

St Mary's Island

Flood Risks to CMT Estate

Updated June 2022

Executive Summary

Whilst the proximity of Chatham Maritime to the tidal Medway tends to lead people to worry about flooding from the river, the risk of this happening is considered to be Low to Medium Risk, as shown through the most up to date Environment Agency Mapping.

Parts of Chatham Maritime are below both the predicted and, more significantly, the historic high-water level in the River Medway and these areas are dependent upon the flood defences. Maintenance of flood defences is therefore **of considerable importance.**

This briefing paper describes the flood risks at CMT and attempts to put them into context. The conclusion is that the risk of coastal or fluvial (river) flooding is much higher than the risk than pluvial flooding (from rainfall) which is much more localized across the Maritime area. The incidence of extreme intense localised rainfall appears to be on the increase and the estate is dependentupon the storage capacity of a designed drainage system, which would need to be effective.

One of the most up to date reports, The Medway Estuary and Swale Strategy (MEASS) highlights that this area (BA2.3) is in fair conditions (Grade 3) in terms of the existing flood defences and therefore should provide an adequate and appropriatelevel of protection against coastal or fluvial flooding for some years to come. This report highlights that the primary policy recommendations for this is 'Hold the Line/Sustain' the existing defences, however, a preferred option for the future, as highlighted within the report, would be to raise the defences (walls, Floodgates, embankments and revetments to 6.3m AOD within 50 years to provide a betterment to the defences.

This paper will be reviewed regularly to ensure that it reflects latest published information or guidance.

1 Introduction

The Chatham Maritime Estate is situated adjacent to the tidal River Medway. This close proximity to water brings with it obvious potential for flood risk.

This paper considers the extent of the risk and the actions taken to minimise any danger to life and property. It is based on a review of published reference papers and planning information, detailed in Appendix 1.

The paper was first prepared in the summer of 2011, circulated to Trustees in February 2012 and updated in February 2013. In June 2022 it was updated with latest advice and input from Medway Council's Flood Risk & Drainage Officer and then circulated to Trustees.

2 General Flood Risk

In general flooding could occur from three main causes: tides (coastal), river (fluvial) and rainfall (pluvial) flooding.

Coastal flooding can occur near the sea, including tidal river estuaries. Tides are the result of solar and lunar gravitational pull on bodies of surface water and to that extent are predictable. Extreme high tides occur due to a combination of factors including distant events; offshore storms, low atmospheric pressure or more dramatically, seismic events (tsunami effect). In tidal river estuaries the height of water experienced can also be influenced by heavy rainfall up-stream resulting in high river flows. The fact that this type of flooding occurs due to a combination of effects means that it is not possible to forecast long term precisely when it might happen. (Although short term it would only occur during high tide events). The flooding in Lewes in October 2000 is an example of these factors coming together with the result that the tidal River Ouse broke its banks (overtopped the flood defences).

Fluvial flooding is when a river cannot cope with the quantity of water flowing through it and it breaks its banks. The flooding in Uckfield in 2000 (upstream from Lewes) is an example of river flooding.

Pluvial flooding from localised excessive rainfall is more difficult to predict. In recent years this type of flooding caused significant problems in Hastings where extreme localised and relatively short duration rainfall was experienced. The incident in Hastings occurred because a poorly maintained culvert restricted the flow of surface water.

At Chatham Maritime adjacent to the tidal River Medway there is the obvious risk of coastal or fluvial flooding; less obvious is the risk of pluvial flooding, which could occur if the surface water drainage system fails to operate effectively.

3 Key Issues and Historical Evidence

The key issues are:

- The height of future flood events
- Flood defence levels around St Mary's Island
- Flooding 'by the back door' through Medway Port
- The design of the surface water drainage system
- The correct operation of the surface water drainage system

3.1 The height of future flood events

Looking at known history the North Sea Flooding of 1953 is the most significant event in the past 100 years. It was probably the most significant flooding event for several 1000 years (Anything greater would have left evidence, even if only anecdotal). It was caused by a heavy storm that occurred on the night of Saturday 31 January 1953 and morning of 1 February 1953. The floods struck the Netherlands, Belgium, England and Scotland with a death toll more than 2000. In Medway, the event was recorded as a low-level tidal flood with levels at Rochester Bridge reaching 4.84M above Ordnance Datum (mean sea level).

Other recorded high levels were 3.93M OD in 1927, 4.54M OD in 1949, 3.8M OD in 1960, 4.6M OD in 1965 and 4.51M OD in 1978.

In recent years, the Riverside Walk has flooded occasionally and this indicates that high waterlevels, above +4.0M OD and up to about +4.2M OD are experienced from time to time.

Historically the major event in 1953 achieved about 300mm higher water level than recorded before or since. The1949, 1965 & 1978 levels were circa 600mm higher than other recorded events. Recent events (last 10 years) have been about 300mm lower than levels recorded in 1965 & 1978.

Using this historic data, it could be suggested that a future flood event 300mm or 600mm higher than ever recorded before would be an extreme event.

In recent years flood prediction has been the subject of significant study. Concerns over global warming and its possible effects on sea level rise, plus the use of statistical methods, means

that flood protection levels are set significantly higher than would be determined by historic evidence.

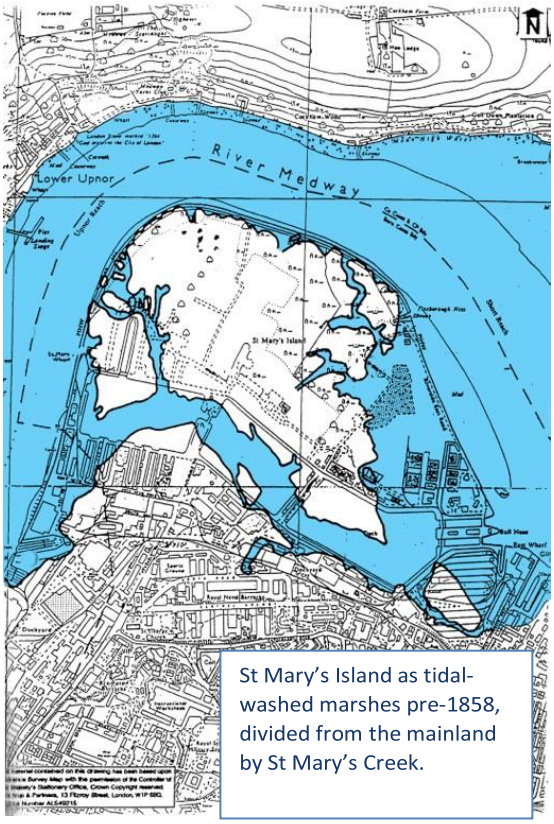
3.2 Flood defence levels around St Mary's Island

The flood defence levels around St Mary's Island, protecting against tidal flooding are determined to suit a predicted 1:1000 year event, plus estimated sea level rise to 2050 plus an allowance for "greenhouse" effects and the development of waves above this theoretical standing water level.

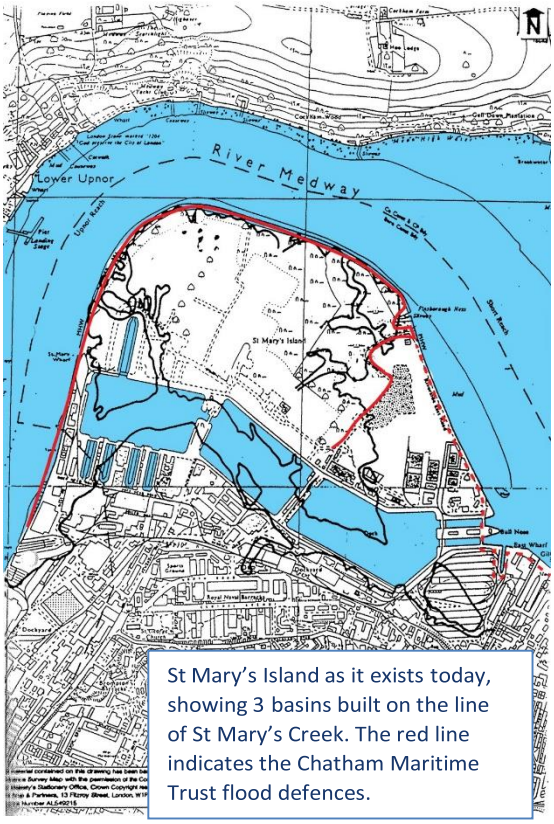
The 1:1000 year event is determined by statistics, being the 0.1% probability level based upon a standard deviation curve. This is a factual exercise based on data from the past and there should be nothing wrong with the mathematics in this respect. To what extent this is a "real" risk is another matter. It is using information from past events and detailed modelling to look at future climate change scenarios to predict the future.

The current flood defence level around St Mary's Island is +6.2M OD. This is 1.36 metres above the highest level experienced in the area and therefore a very dramatic, unprecedented step change would be necessary to result in over-topping of the current flood defences. "Global warming" or the "greenhouse effect" might create such a step change, which has been evidenced by a number of recent events and surges. Recent academic studies indicate an increase in frequency of surge tides which could be attributed to Climate Change. The risk of over-topping though is still considered to be low (less than 0.1% for the "here and now". Probability of over-topping will have to be reexamined in the future as the effects of Climate Change become more apparent.

It is relevant to note that flood protection levels are not standardised and many areas in the UK are subject to flood risk from 1:100 year or 1:200 year events. In this respect St Mary's Island is very well protected. It is interesting that St Mary's Island flood defences are at the same level as those protecting the Medway Tunnel, which is locally a very significant major element of infrastructure.



St Mary's Island as tidal-washed marshes pre-1858, divided from the mainland by St Mary's Creek.



St Mary's Island as it exists today, showing 3 basins built on the line of St Mary's Creek. The red line indicates the Chatham Maritime Trust flood defences.

3.3 Flooding "by the back door"

According to the 1993 Ove Arup & Partners report the flood defence level at Medway Port is generally at about +5.6M OD (about 600mm lower than the St Mary's Island defences) but at the dock entrance the protection is only at about +5.15M OD for a length of about 100M. This lower defence level over a defined length could be regarded as the weak link being overtopped earlier than other defences in the area. The arrangement could lead to flooding "by the back door" and this scenario was considered by Ove Arup by modelling the lower defences as a wide crested weir.

The report (paragraph 6.3.3) considers the impact of the lower flood defence levels in the port taking account of the mitigating effects of storage within the basins. Overtopping through the gap in the flood defences would only occur for a limited period at the top of the tidal cycle and the overtopping water would initially fill Basin 3 above its normal operating water level. The report suggests that the storage capacity of Basin 3, above its normal operating level, could cater for an event with river levels up to +5.75M OD. For more extreme events Basin 3 would overflow into Basin 2 and ultimately into Basin 1. This would provide significant additional storage capacity and the Ove Arup report suggests that this would provide buffer storage against a flood of +5.95M OD(N) in the river.

It could be deduced from the above that the protection afforded by the effects of storage is more than 1.0 metres above the highest river level experienced in the area. Therefore, the risk of coastal/fluvial flooding remains low (less than 0.1% for the "here and now", possibly rising to 0.1% probability in circa 2065).

The above assumes that the existing flood defences are in good condition and well maintained. Failure of the flood defences could affect the assessment dramatically.

Sea level rise and the effects of global warming are forward predictions. To a degree they are "crystal ball gazing" and could be wrong in either direction. Therefore, the assessments need tobe reviewed and updated from time to time.

Photo courtesy of Countryside Maritime

3.4 The design of the surface water drainage system

The surface water drainage systems at Chatham Maritime are tidal-locked and only discharge to the River Medway at mid-tide level and below. For approximately 6 hours out of every 12 the systems rely upon the storage capacity of over-sized pipes.

The drainage systems should have been designed to British Standards and should therefore cope with normal worst case predicted rainfall. The designs should have taken account of the area of impermeable surfacing and the time taken for the water to run off the surfacing and travel along the pipes. Given the size of Chatham Maritime, the nature of the developments and the fact that the systems are locked above mid-tide level the storage capacity of the systems should have been designed to cater for quite severe and prolonged storm conditions.

The details of the designs are not known but they were carried out in more than 12 years ago, before Chatham Maritime had been developed. The catchment areas of actual developments and/or the intensity of rainfall could therefore vary from the design criteria used at the time. This might not become critical until all parts of the estate have been fully developed. Given the risks and the incidents of extreme rainfall that have occurred in recent years (e.g. at Boscastle, Cumbia & Hastings), it would be sensible to verify and confirm the suitability of the systems for the estate as it nears completion.

The installation of the systems is not complete as further large diameter pipework and another outfall are still to be constructed on the west side of St Mary's Island. An opportunity still exists therefore to vary the provision to suit the development if necessary.

3.5 The correct operation of the surface water drainage system

In addition to verifying that the design of the systems remains valid it is important to verify that they have been installed correctly so that they function effectively. The imminent adoption of the drainage by Southern Water should go a long way to verifying the condition of the systems.

It is vital that the storage capacity in the systems is available for five to six-hour periods, twice a day every day. If a system does not empty through the low tide cycle or if it just refills as the tide rises (due to failure of a flap for example) then adequate capacity might not exist to cater for an extreme rainfall event. Maintenance is therefore very important. It is worth remembering that incidents of flooding from heavy rainfall are often found to have been caused or exacerbated by poor maintenance vis the example of flooding in the Hollington area of Hastings in July 2009, where an obstructed culvert could not cope with the intensity of rainfall experienced. This example is evidence that extreme localised rainfall events are not restricted to the West Country & Cumbia.

4 Effects of flooding and forward planning

The cope level (basin edge level) at Basins 1 & 2 and the dry docks is approximately +4.5M OD(N). This dictates local levels, is below the flood defence level and below the highest water levels experienced in the River Medway. There are developments both north and south of the basins with ground floor levels at or below this level. Therefore, parts of Chatham Maritime aredependent upon the flood defences.

Some ground floor levels at Chatham Maritime are at cope level but most residential ground floors are above about +5.15M OD(N).

Ground levels in the central part of St Mary's Island are lower with parts of Central Walk at +3.6M OD(N). It is believed that flooding would affect these parts first. This is particularly the case with pluvial flooding.

Assuming the flood defences remain effective the storage capacity of the basins should prove adequate even for extreme events. If extreme events become more regular contingency plans could be explored to lower the water levels in Basins 1 to 3 on the low tide prior to an impending spring high tide, associated low pressure and predicted North Sea surge. This would provide increased storage to cover the peak event. This might not prove adequate in itself and it might be necessary to close the gap in the flood defences at the entrance to Basin 3 – a strategic action outside the scope of CMT.

5 Conclusions & Recommendations

Whilst the proximity of Chatham Maritime to the tidal Medway tends to lead people to worry about flooding from the river, the risk of this happening is considered to be very low.

Parts of Chatham Maritime are below historic high-water level in the river and are dependent upon the flood defences. Maintenance of flood defences is therefore very important.

The risk of pluvial flooding is considered much higher than the risk of coastal or fluvial flooding. The incidence of extreme intense localised rainfall appears to be on the increase and the area is dependent upon the storage capacity of a designed drainage system, which would need to be effective.

It is recommended that the design of the surface water drainage systems should be reviewed and verified as being adequate for the development as implemented and now envisaged. The review should take account of the increased occurrence of high intensity localised rainfall. This review should be completed before completion of the current development so that the storage capacity can be increased if necessary.

It is recommended that the surface water drainage systems are subject to regular inspections. It is particularly important to check and confirm that flap values are effective (that the systems empty through the low tide cycle and that they remain empty through the high tide cycle). Such simple checks should be possible from ground level without the need to enter manholes and therefore it would not be unreasonable to check the systems at least once per year – probably best done in the early autumn each year.

16th June 2022

Appendix 1

1 Sources of Information

1.1 **"Medway Strategic Flood Risk Assessment (SFRA)", Main report August 2006, Addendum February 2011.** This report provides an excellent reference for this subject. It provides background history and explains how the SFRA was prepared and describes the findings concisely for the main geographic areas. The study relates to tidal (coastal) or fluvial flooding.

1.2 **Chatham Maritime, Flood Protection Report by Ove Arup & Partners for English Estates March 1993.** This provides on overview covering the whole of Chatham Maritime including the Historic Dockyard and Medway Port.

1.3 Record drawings showing the design of the surface water drainage system at Chatham Maritime (but some are known to be inaccurate). The design criteria or the design in terms of catchment areas is not known. The drawings by Parkman are dated January 2001 but some works had already been completed by that date.

1.4 Records and surveys showing general site levels as available.

1.5 **"Medway Flood Defence Strategy Strategic Flood Risk Assessment Addendum", Final Report February 2011.** This report updates the SRFA by ten years, to baseline 2010.