# Coastal Communities Adapting to Change (CCATCH)

*Images courtesy of Peter Taylor*

## Upper West Itchen and St Denys Flood Risk Fact Guide: April 2013

## Introduction

Flood risk can be a worrying topic for many people who live or work near to rivers or the coast, especially given the flooding that has occurred in many areas across the UK in recent years. Sometimes it is not always clear what is meant by the term 'flood risk', and looking at a flood map can simply add to the confusion. This guide serves to make sense of the terms relating to flood risk covering topics such as flood maps, flood management and tidal patterns. The information included relates to the Upper West Itchen and St Denys areas of Southampton. We hope you find the guide useful.

The Coastal Communities Adapting to Change (CCATCH) project is a European funded project which began in 2011, due to finish autumn 2013. The project is lead by Hampshire County Council in partnership with Southampton City Council who work with local communities identified as being at risk of coastal issues such as climate change and rises in sea level. The project aims to raise awareness and understanding of coastal change in Southampton (and several other communities in Hampshire), helping people adapt and become more resilient to future changes and the threat of flooding.

## Sources of Flood Risk

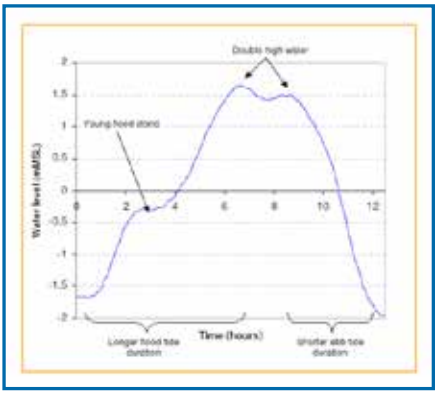
The risk of flooding can come from a number of different sources or a combination of many. Management of flood risk is not as simple as it sounds since the responsibility for managing flood risk is split between Local Authorities and the Environment Agency, depending on the source of the risk. In Southampton there are 4 main sources of flood risk, each described below along with who is responsible for leading on its management.

| Flood Source | Description of Flooding | Responsibility for management |
|---|---|---|
| Fluvial (Rivers) | Flooding from rivers occurs when water levels within the channel rises above that of bank level, causing extensive flooding to the surrounding areas (floodplain). | Main Rivers: Environment Agency<br>Smaller watercourses: Lead Local Flood Authority (Unitary & County Councils) |
| Pluvial (Surface Water) | Surface water flooding is the result of rainfall exceeding the capacity of the local drainage network, causing water to accumulate on the surface for a short term. | Lead Local Flood Authority |
| Tidal (coastal) | Flooding of coastal areas when flood defences (if any) are breached or overtopped, allowing water to flow to the areas behind. Flooding is usually short term and water recedes with the tide. | Coastal Flooding: Environment Agency.<br>Coastal Erosion: Local Authority (Unitary & County Councils) |
| Groundwater (Sub-Surface) | Flooding from sub-surface water occurs when the water table rises above the surface level, mainly as a result of heavily saturated ground. Distinguishing between surface and groundwater flooding can be difficult. | Lead Local Flood Authority |

## Southampton Water Tidal Patterns

Water levels rise and fall naturally over the course of the day in relation to the tide. The tidal regime for Southampton Water (figure 1) is unique, with a double high water and a young flood stand (where the water level slowly increases for up to 2 hours during the early to mid part of the flood tide phase). The double high water results from the irregular depths and width restrictions of the Channel between the Isle of Wight and the Cherbourg Peninsula, causing water levels to drop after peak high tide and rise slightly again before the tide goes out. The flood tide (period of the tide coming in) lasts approximately 8 hours in contrast to the ebb tide (period of the tide going out) which is much more rapid at less than 5 hours. Southampton Water is therefore an ebb dominated system, meaning that tidal currents are stronger on the ebb tide than they are on the flood tide.

*Figure 1: Southampton Tide Characteristics*



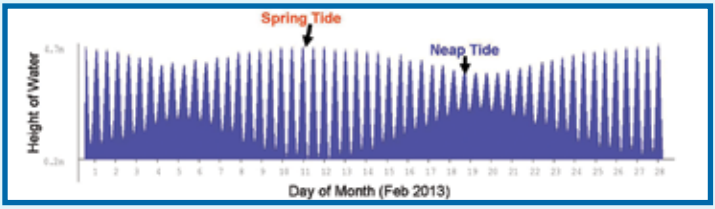

## What is the Difference Between Above Ordnance Datum and Chart Datum?

Figure 1 is shown in meters Above Ordnance Datum (mAOD) which is the height above mean sea level. Rather than mAOD, many tide tables and nautical charts display data in Chart Datum (CD) which is the approximate lowest tide level due to astronomical effects excluding meteorological effects. For tides in Southampton you can convert data between CD and mAOD by subtracting 2.74m, or adding 2.74m if switching mAOD to CD. Figure 2 is shown in CD.

## What Are 'Spring' and 'Neap' Tides?

As a result of the gravitational effects of the moon and sun, and the rotation of the earth, tides change in height with a variation of high and low water levels on a monthly cycle. Tides reach a maximum and fall to a minimum twice a month. Spring tides refer to tides where the difference between high and low water is at the greatest, whereas tides with little difference between high and low water are called neap tides (see figure 2). Spring tides are not related to seasons but instead occur 36-48 hours after the full or new moon when gravitational effect is strongest. Neap tides occur when the moon is in its first or third quarter when the gravitational effect is lowest. Flooding is most likely to occur during spring tides when tide levels are approaching maximum level, especially if weather conditions are poor.

*Figure 2: Southampton Tide Patterns (Source: tidetimes.org.uk)*



## I have heard the Term 'Tide Locking' but what does it mean?

Tide locking is the term used to describe the interaction of the sea and the drainage network. At high tide, the level of the water can make it difficult for surface water to drain away from surface water sewers causing a backlog of water that can cause surface water flooding away from the coast. Some sewers are fitted with tide flaps or non return valves to prevent tidal entry, however these can reduce the drainage efficiency, and can sometimes become stuck open, which can allow sea water to enter the drainage network at high tide.

## What is a Flood Map?

A flood map is a visual display of flood risk created by layering data from a combination of historic records and future prediction models over a base map of an area. They show the locations of potential water inundation and the water depths associated with flooding events of different magnitudes. Flood maps are a useful tool in the management of flood risk as they can help identify the areas at risk of flooding and the number of properties potentially at risk, which helps to target funding and resources to the areas of greatest need.

## My Property is in a Flood Risk Zone. Does This Mean it Will Flood?

Flood maps are intended to be used as a guide to highlight the risks of flooding. If a property falls in a flood risk zone, it does not mean it will flood nor does it mean it will not flood in the future, since the maps are based upon models and flood events of different probabilities. It is also important to note that flood maps do not account for properties with multiple floors, such as upper floor flats, which would be out of the immediate risk zone. It is however, recommended that those residing within the flood zone are aware of the flood risk and take appropriate action to be prepared if a flood were to occur.

## Why Are There Different Flood Maps?

Several flood maps have been produced by Southampton City Council as part of the Coastal Strategy. These maps look slightly different to those produced by the Environment Agency (EA) due to the differences in data and modelling techniques used. The Coastal Strategy maps were produced using detailed modelling and the most up-to-date climate change projections available, enabling precision mapping and details such as the potential depths of flood waters to be determined. Each map is based upon the hypothetical scenario of 'do nothing' which means that any existing defences (where they exist) are not maintained and no further defences are built. This was to define a baseline state to show how the risk to Southampton is likely to increase with projected sea level rise and to facilitate development of the options to manage this risk. Some maps show specific sources of flooding, for example there are maps showing just surface water, rivers or tidal sources, whereas others (such as the EA) show combinations such as main rivers and coastal sources. Maps produced by the EA are updated on a regular basis to ensure accuracy.

## What is Meant by the Term 1 in 200 Year Flood?

It is a common belief that the term 1 in 200 year flood means that it will only flood once every 200 years, however this is not the case. Instead it is a description of the likelihood or probability of a particular flood event occurring on a yearly basis. A 1 in 200 year flood is a low likelihood flood event as it has just a 0.5% chance of occurring in any given year, unlike a more frequent 1 in 50 year flood which has a 2% chance of occurring in any year. Although rare, floods with a low likelihood have greater impacts that are often far more severe.

## What Would a 1 in 200 Year Flood Look Like in My Area?

A 1 in 200 year flood is a damaging, extreme event. If a flood of this magnitude were to occur today, flood water could reach the properties highlighted in figure 5, causing flooding to a depth anywhere between 0.25m and 0.75m, which is enough to cause significant damage to property and pose a threat to vulnerable people.

Floodwaters will recede with the tide and could take approximately 2 ½ hours to subside, yet it could be longer as Southampton Water has a unique double high tide meaning water level drops slightly before increasing again.

Drainage efficiency could be reduced significantly as a result of tidal entry into the drainage system. This can mean that properties further inland from the coast may also be affected by flooding as water backs up within the drainage network, spilling out of sewers onto road surfaces, or even directly into homes via toilets/sinks.

Contamination of flood water is possible if water tries to drain into the foul network, plus the nearby raw sewage treatment plant could pose a risk should onsite flooding occur. It is therefore essential that contact with floodwater is minimal.

*These photos were taken during a 1 in 20 year flood event in St Denys which occurred on 10th March 2008 (Courtesy of Peter Taylor). Despite the lesser magnitude, it still has the potential to cause damage and disruption.*

## Climate Change: The Facts


Scientific research provides evidence that climate change is happening now and will continue to worsen if nothing is done. Past greenhouse gas emissions have already committed the globe to unavoidable change in climate, meaning adapting to the impacts is now of high importance.

The UK Climate Projections 2009 (UKCP09) report is based upon detailed modelling and predicts that weather patterns will become more extreme, with increased winter and decreased summer rainfall, increased storm intensity and frequency and increases in temperature by 3-4°C. The report also includes information designed to inform people on how to adapt to the changing climate.

## Sea Level Rise

Sea levels are predicted to rise by up to 1 metre over the next 100 years as a result of climate change. There are three main factors contributing to sea level rise. The first is the melting of the glacial ice sheets as a result of the climate warming on a global scale, causing the release of water that would otherwise be stored. Oceans trap heat and in doing so the water warms and expands in a process called thermal expansion. Surface waters are quick to release heat; however heat absorbed into the deeper ocean takes longer to be released and is generally stored. With temperatures rising, more heat is trapped and the oceans continue to expand. The third contributing factor is a process called isostatic rebound. This is the readjustment of the land masses in response to pressure exerted on the land by ice during the last glacial period. In the past much of Britain was covered by glacial ice which caused land masses to sink. As a result of the ice melt the North of the UK is slowly rising, whilst the South-East is sinking to compensate, making it appear that sea level rise is happening faster in the South. In the future sea level rise could mean land becoming flooded permanently but will also put pressure on local drainage systems, as tidal entry to culverts and drainage networks will reduce the drainage efficiency, which could in turn lead to flooding in areas away from the immediate coast.

## Weather Conditions and Storm Surges

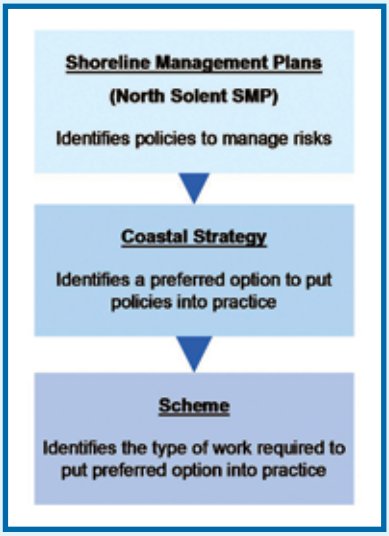
As well as the tide, weather conditions can influence the height of water. Offshore winds can decrease the height of water by moving it away from the coast, whilst onshore winds exert drag on the surface bringing it up towards the coast, increasing the height. The greatest effect from weather comes from atmospheric pressure. A change in pressure by 1 millibar can cause a 1cm change in water level, with the sea falling under high pressure and rising under low pressure. A storm surge results from these adverse conditions and has the potential to cause a flood event, especially when they coincide with high tide. A drop in pressure combined with high tide can create a powerful driving force that can cause large waves to break through any existing defences (breach) and/or cause the water level to reach above the defence (or land) level, allowing water to reach the land behind.

## How Is Flood Risk Managed?: Coastal Flood Risk Hierarchy

The current hierarchy for managing the risk of coastal erosion and flooding is summarised in figure 3. The Shoreline Management Plan (SMP) is a high-level non statutory planning document that provides a large scale assessment of the risks associated with coastal processes. It is the overarching document in coastal flood risk management, presenting the long term policy framework to reduce the risks to people and the developed, historic and natural environment in a sustainable manner.

Following the SMP is the Coastal Strategy, which focuses on a smaller geographical area and proposes relevant management options and the schemes to implement the policies identified in the SMP. The Southampton Coastal Strategy was completed in 2012 and is available to view on Southampton City Council's website. At scheme level, the type of work required to deliver the risk management measures is identified, and the appropriate funding is sourced before implementation can begin.

*Figure 3: Coastal Flood Risk Management Hierarchy*




## Other Flood Risk Management Plans

Catchment Flood Management Plans (CFMPs) are produced by the Environment Agency and used in the management of flood risk from all sources of inland flooding including rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea as this is covered in the SMP. They give and overview of flood risk across each river catchment and recommend ways of managing those risks now and over the next 50 to 100 years, taking into account the likely impacts of climate change, land use management and requirements for future development. Southampton falls under the Test and Itchen CFMP.

The Southampton Surface Water Management Plan (SWMP) identifies the hotspot areas within the city at risk of flooding from surface water, detailing the preferred approach to their management. The objective of the SWMP is to determine the causes and effects of surface water flooding and identify the most cost effective way of managing surface water risk for the long term.

The Local Flood Risk Management Strategy (LFRMS) is a statutory requirement of the Flood and Water Management Act 2010, prepared by Lead Local Flood Authorities. It considers flood risk from surface water, ground water and ordinary watercourses. Flood risk from main rivers and the sea is usually managed by the Environment Agency, however due to the interaction of flood risk sources in the city; the Southampton LFRMS will consider all sources of flood risk, in order to provide a complete overview of flood risk within Southampton and coordinated the approach to their management. The Southampton LFRMS is currently in the development stages, due for completion autumn 2013.

## Hierarchy of Flood Risk Management Measures

Flood risk has traditionally been managed using a variety of methods from the use sandbags in an emergency to prevent water entry when flooding is imminent, to the construction of permanent flood walls to protect larger areas.

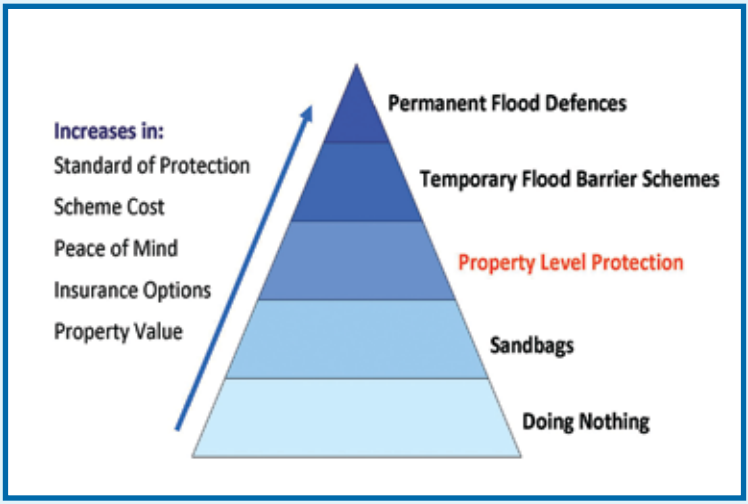
Figure 4 shows the hierarchy of measures that are commonly used in the management of flood risk, from doing nothing to the construction of a flood wall. Moving up the hierarchy the standard of protection increases along with the number of benefits they offer, however the cost of implementation also increases.

Before a method of management is decided, areas are assessed on their current and future flood risks, as well as the need for protection on an economic, social and environmental basis. After the initial decision, it will then be decided whether a short, medium or long term strategy for management is required.

Properties that have been identified as being in an area where flood risk exists, yet do not currently benefit from raised defences, or where there is not a strong enough case to attract public funding for a permanent front line defence could benefit from a new level of flood risk management known as Property Level Protection (PLP). This type of flood defence provides a standard of protection greater than that of sandbags, and similar to that of a temporary flood barrier. PLP is explained later in this guide.

Since no method of flood defence can entirely stop flooding from happening, the key to effective flood risk management is through the raising of awareness of the risks. Being prepared for flooding and knowing what to do should a flood occur can help reduce the damage, aid recovery and ultimately save lives.

*Figure 4: Hierarchy of Flood Management Measures*



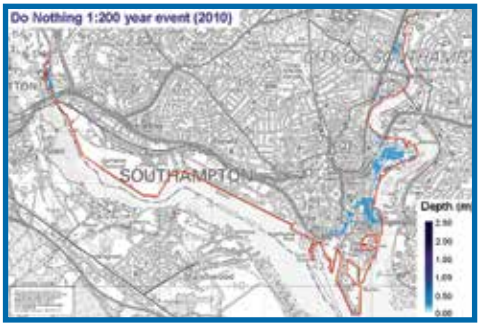
## Funding for Flood Defences

There is a strong need for investment in flood defences in order to safeguard Southampton's future. Funding comes from the Department of Environment Food and Rural Affairs (Defra) and is administered annually by the Environment Agency, who prioritises and distributes the Government's budget for all capital flood defence works. Flood risk management plans provide an estimate of the cost of proposed flood risk management measures, yet it is important to note there is no guarantee that any or all of the required funding will be secured through this mechanism. All flood risk and coastal erosion schemes being promoted by Local Authorities from across England are eligible to bid for a portion of this funding, hence the number of applications tend to far exceed the funding available. Defra have recently introduced a new funding system which requires contributions towards the costs of defence schemes from those who will benefit. Funding is allocated dependent on the contribution of the scheme towards meeting Government targets (outcome measures), the cost to benefit ratio and the level of third party cash contributions secured.

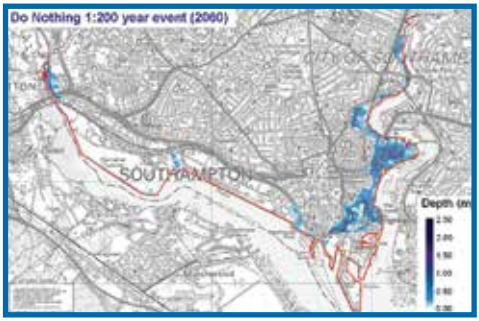
## Planning for the Future

*Figure 5: Tidal Flood Risk in Southampton*

In order to plan for the future and direct resources to where they are needed to most, flood risk managers use flood risk maps and data modelling to help understand how the risk is likely to change over time. Figure 5 shows two flood maps taken from the Southampton Coastal Strategy to illustrate the changes in tidal flood risk over the next 50 years if no defences are built.




The maps show the areas that are most at risk of flooding, along with the potential depths that flood waters could reach during a high impact, low frequency 1 in 200 year tidal flood event.




At present tidal flood risk affects approximately 175 properties and 7 businesses, with potential flood water depths of 25-50cm. However looking forward 50 years, the risk will increase, putting over 630 properties at risk, as well as many roads, rail links and other sites of critical infrastructure, with flood waters potentially reaching 75cm in parts of St Denys and Upper West Itchen.

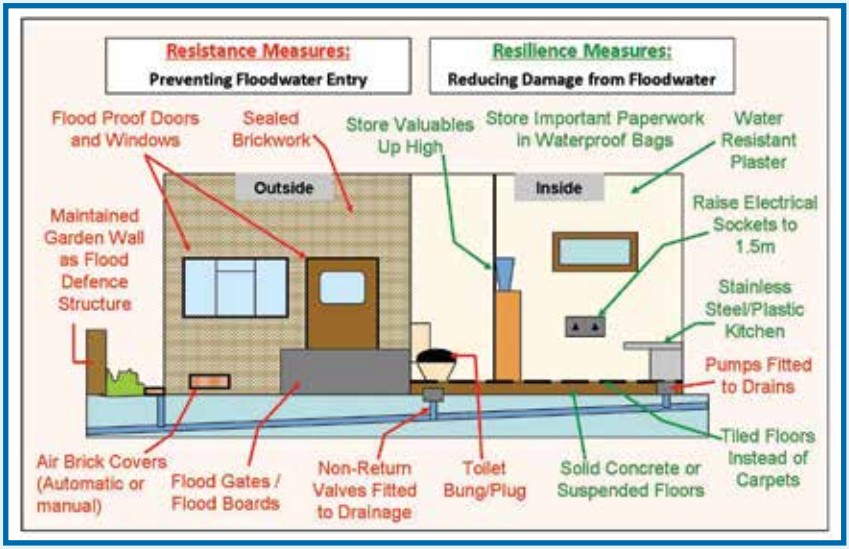
## Property Level Protection

PLP is the incorporation of flood protection measures to individual properties rather than a whole area. The aim is to make a property both resistant (preventing water entry) and resilient (reducing damage should water enter) during a flood event, making it quicker and easier to recover. This is achieved through the use of commercially available, industry credited (Kite marked) products ranging from air brick covers, flood doors and non-return valves fitted to drains, to the incorporation of building fabrics such as brick sealants, water resistant plaster and raised suspended or solid concrete floors (as figure 6 displays).

There are two types of PLP, manual and automatic. Manual measures, such as flood gates, are those that need physically installing when a flood warning is issued. These are often lightweight and easy to move and store, however some may need assistance from neighbours to ensure they are installed correctly. Automatic measures are those that are in place all the time, such as flood doors, that once closed seal water out of the property. Kite marked products have been tested and proved to provide adequate protection against flooding of up to 0.6m, which is enough to withstand a present day 1 in 200 year flood.

PLP measures are a cost effective way of reducing the risk of flooding, offering peace of mind to property owners by reducing the stress and worry of flood events, and reducing the uncertainty surrounding the aftermath. Since many PLP measures are temporary, they can be removed and stored until needed, therefore they will have little visual impact on your property. The National Flood Forum provides free and reliable advice on PLP, the types of products available and where you can purchase them. The link to the National Flood Forum Website and the 'Blue Pages' are listed in the further information box at the back of this guide.

*Figure 6: Examples of PLP Measures*



## What Can I Do?: Be Prepared for Flooding

Living and working close to a river or in a coastal community such as West Itchen and St Denys can be an enjoyable lifestyle; however it carries the risk that your property may be flooded. Even if a flood only lasts a few hours, it can still be a frightening and stressful event, however thinking about flooding in advance and knowing what to do before, during and after a flood can help to avoid damage to your property and personal possessions, and help to avoid the stress of clearing up.

Simple things like keeping your insurance documents together with a list of important contact numbers in a waterproof bag, and storing cherished or irreplaceable items such as photographs in places where floodwater cannot reach, can help offer peace of mind.

Lots of tips can be found on how to prepare for flooding can be found on the Environment Agency's website, including advice on putting together a 'grab bag' (a bag including essential items such as a torch, first aid kit and rubber gloves) and creating a flood plan so that you and your family know what to do and when to do it should a flood occur.

The Environment Agency also provides a flood warning service, which is FREE to sign up to and sends you a direct message when flooding from rivers or the sea is likely. This is therefore a good way of knowing when you should be prepared to take action against flooding before it happens.

## If There is a Flood

*Remember!* Flood water is dangerous. Just 6 inches (15cm) of fast flowing water can knock an adult over, and 2 feet (61cm) can float a car.

**In the event of a flood you should:**

- Remain calm, but be prepared to act quickly.
- DIAL 999 if you or anyone else is in danger.
- Cooperate with the emergency services and evacuate if told to do so.
- Check on elderly or disabled neighbours.
- Do not walk or drive through flood water as there may be hidden dangers such as raised or missing manhole covers, sharp objects or contaminants such as sewage.
- Avoid contact with flood water as it may be contaminated. If unavoidable, remember to wash your hands thoroughly afterwards.
- Do not let children or pets play in flood water as it may be contaminated.
- Do not walk along flooded river banks or coastal areas.

## After a Flood

When flood waters have receded and it is safe to return to your property, it is time to assess any damage.

**You should:**

- Contact your insurance company immediately and tell them what has happened.
- If you rent a property, contact your landlord and explain what has happened.
- If your electricity supply is not already switched off at the mains, get a qualified person to do it. DO NOT touch sources of electricity when standing in flood water.
- Throw away all food that may have been in contact with flood water, including all fridge and freezer food.
- Wash taps thoroughly and run them for a few minutes. Unless advised otherwise, mains water should be safe to drink.
- Clean all surfaces with disinfectant.
- If making an insurance claim, take photos of any damage, and do not throw anything away until the insurance company says so.

## Further Information

To find out more about flooding, the CCATCH project or anything else mentioned in this brief guide, you can visit the following websites:

**The Solent Forum and CCATCH -** www.solentforum.org

**Southampton City Council and the Coastal Strategy -** www.southampton.gov.uk/flooding

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

**National Flood Forum -** www.floodforum.org.uk/

**The North Solent Shoreline Management Plan -** www.northsolentsmp.co.uk

**Climate Change and Sea Level Rise -** ukclimateprojections.defra.gov.uk/

**The 'Blue Pages' Flood Advice -** www.bluepages.org.uk/

**Southampton Tide Times -** www.tidetimes.org.uk/southampton-tide-times

**National Oceanography Centre** - noc.ac.uk/

**This guide has been prepared by Southampton City Council on behalf of the Solent Forum.**

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