

Southampton Local Flood Risk Management Strategy

Main Strategy Report (2014 – 2019)

October 2014



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Glossary of Acronyms

Acronym	Meaning
ABP	Associated British Ports
BGS	British Geological Survey
EA	Environment Agency
EU	European Union
F&WMA	Flood and Water Management Act 2010
HRA	Habitats Regulations Assessment
LA	Local Authority
LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
mAOD	Metres Above Ordnance Datum
PFRA	Preliminary Flood Risk Assessment
PLP	Property Level Protection
SAC	Special Areas of Conservation
SCC	Southampton City Council
SEA	Strategic Environmental Assessment
SINCs	Sites of Interest for Nature Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Urban Drainage System
SWMP	Surface Water Management Plan
UKCP09	UK Climate Projections 2009
WFD	Water Framework Directive

1. Introduction

1.1 Why has this Strategy been done?

As a unitary authority, Southampton City Council (SCC) is designated as a Lead Local Flood Authority (LLFA) under the Flood & Water Management Act 2010 [F&WMA]. The F&WMA places a statutory duty on LLFA's to develop, maintain, implement and monitor a Local Flood Risk Management Strategy (hereafter referred to as the 'Strategy') to manage local flood risk¹ in its area.

1.2 What is the purpose of the Strategy?

The purpose of the Strategy is to help individuals, communities, businesses and authorities to better understand and manage flood risk within Southampton.

1.3 What types of flooding does the Strategy cover?

The Strategy must consider flooding from surface water, ground water and ordinary watercourses as they are local sources of flooding for which SCC as a LLFA has operational responsibility for managing; however, it was decided to also include other types of flooding (tidal and main river). It can be difficult to identify the type of flooding during an incident and often it can be a combination of different types. Also for those who suffer flooding the type of flooding causing the problem tends to matter little. By including all sources of flood risk within this Strategy it provides a clear overview of flood risk within Southampton and the co-ordinated approach to managing these risks.

1.4 What area does the Strategy cover?

The Strategy covers the administrative boundary of Southampton (Figure 1-1).

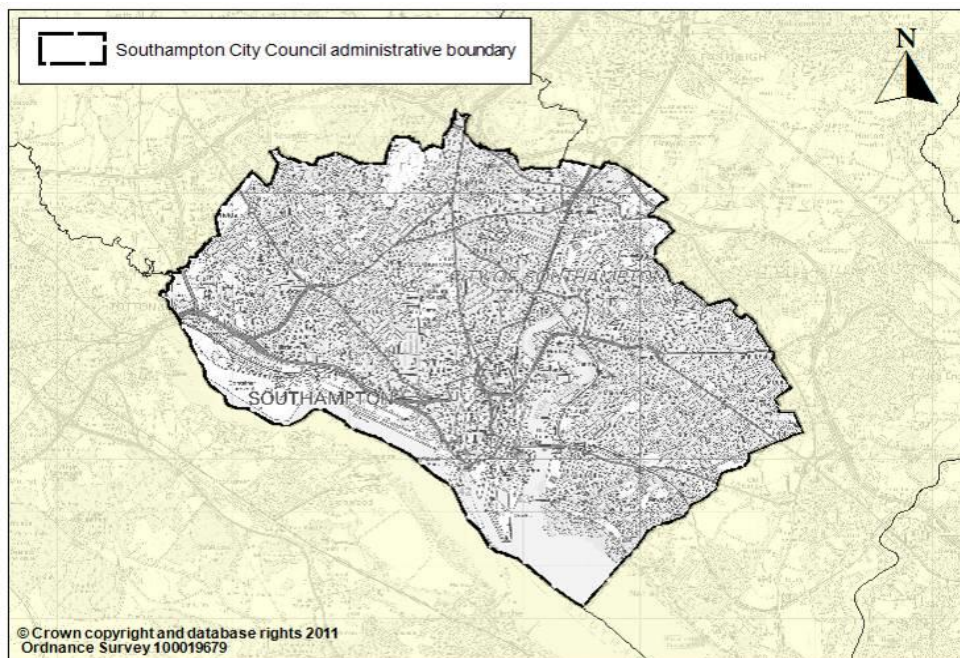


Figure 1-1: Area covered by the Strategy

¹ Local sources of flood risk, as defined by the Flood & Water Management Act 2010, include surface water, groundwater and ordinary watercourses.

Southampton is bordered to the north-east by Eastleigh Borough Council, to the north-west by Test Valley Borough Council and to the south (across Southampton Water) by New Forest District Council. Hampshire County Council is the designated LLFA for each of these areas. As water knows no boundaries we cannot ignore the potential impact that activities taking place upstream on the rivers and watercourses which cross administrative boundaries could have on flood risk within Southampton so we endeavour to continue to work closely with our neighbouring authorities.

1.5 What is not included in the Strategy and why?

Coastal erosion has not been included within the Strategy. This is because coastal erosion within Southampton is largely limited to relatively short sections of the frontage along Weston Shore where properties are not at immediate risk.

1.6 How will the public be involved?

The draft Strategy was made available for public comment from 17th January 2014 until 11th April 2014. With the Strategy finalised and signed off, the next phase is implementation of the actions. Where actions are location specific, every opportunity to involve members of the community will be undertaken throughout development and implementation of the work. Where actions are city-wide, effort will be made to keep the public informed of progress and involve people where possible.

1.7 Will the Strategy be kept up to date?

The Strategy has been developed to look over the next 5 years, up to 2019. However, it may be necessary to review the Strategy sooner if there are any changes required from external factors, such as, implementation of new regulations.

2. Objectives of the strategy

2.1 Strategy aim & objectives

The aim of the Strategy is to better understand, communicate and manage the risk of flooding in Southampton through viable, sustainable and coordinated approaches, for the benefit of people, property, land and the environment, both now and in the future.

The objectives of the Strategy are to:

1. Improve the knowledge and understanding of all sources of flood risk across the City.
2. Work in partnership with other authorities and stakeholders who have a role in flood risk management, including across administrative boundaries.
3. Identify ways to increase public awareness of flood risk across the City.
4. Identify ways of improving support for people at direct risk to promote appropriate individual and community level planning and action.
5. Ensure that planning decisions are properly informed by flooding issues so future development assists with reducing and mitigating flood risk.
6. Identify appropriate measures which reduce the likelihood of harm to people and damage to the economy and the environment and assign a lead organisation to facilitate delivery.
7. Maintain, and improve where necessary, affordable and sustainable flood risk management infrastructure and systems to reduce flood risk.
8. Identify all available funding mechanisms to enable delivery of flood risk management interventions.

2.2 Guiding principles

The Strategy must be consistent with the National Flood & Coastal Erosion Risk Management Strategy (2011) (hereafter referred to as the 'National Strategy'). One way to comply is to have consistent guiding principles between the two strategies, which include:

- Community focus & partnership working
 - Engagement with local communities to increase understanding of the risk and encourage involvement with decision making/flood risk management actions
 - Work in partnership to develop & implement the Strategy
- Catchment & coastal cell based approach
 - Include neighbouring LLFA's in partnership
 - Strategic plans (SMP, CFMP) should help set local priorities
- Sustainability
 - Consider all impacts of flooding & whole life cost of investment in flood risk management
 - Include opportunities to enhance the natural environment & work with natural processes
 - Take account of potential future risks & adapting to climate change
- Proportionate, risk-based approaches
 - It is not technically, economically or environmentally feasible to prevent all flooding altogether
 - Assessment of risk should identify where the highest risks are and therefore the priorities for taking action
 - All aspects of risk management should be carried out in a proportionate way that reflects the size & complexity of risk
 - Target resources to those areas where they have greatest effect
 - A range of appropriate measures to manage the probability & consequence of flooding can be used over different timescales
- Multiple benefits

- Flood risk management can bring significant economic, environmental & social benefits
- Include opportunities to work with natural processes & provide environmental benefit, including those required by Habitats, Birds & Water Framework Directive
- Consider measures such as Sustainable Drainage Systems (SuDS) to manage risk wherever possible to deliver benefits for amenity, recreation, pollution reduction & water quality
- Beneficiaries should be allowed & encouraged to invest in local flood risk management
 - Consider opportunities to seek alternative sources of funding other than relying solely on Government funds
 - Consider the balance needed to be achieved between local contributions required for schemes to manage different sources of flood risk

3. Our understanding of flood risk in Southampton

3.1 What is classed as a flood?

A flood includes any occasion where water covers land which is not normally covered by water and it can result from one, or a combination of sources and influencing factors. The level of risk and significance of a flood depends on the depth, velocity and areal extent of the water. Under the F&WMA, the following are not considered as a “flood”:

- Water from any part of the sewerage system (unless an increase in the volume of rainwater entering or affecting the system is a contributing factor);
- Water from a burst water main.

3.2 What is flood risk?

Flooding is a natural process which occurs when specific environmental factors or a combination of factors occur but it only becomes a problem when it has the potential to adversely impact on people, property, infrastructure and the environment. Flood risk, by definition, is the combination of the probability of a flood occurring and the potential consequences should that flood occur. To put it more concisely $RISK = LIKELIHOOD \times IMPACT$, which is illustrated in Figure 3-1.

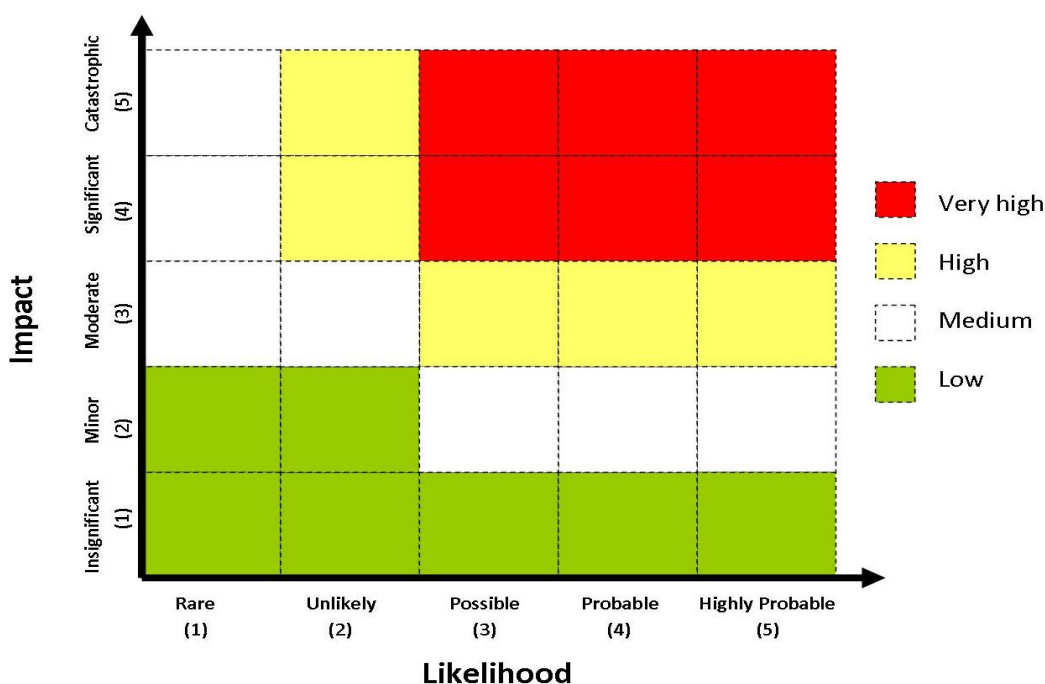


Figure 3-1: Risk Matrix

The likelihood (or probability) of flooding is described as the chance that a location will flood in any given year. These are often expressed as a percentage and/or return period as outlined in Table 3-1.

Table 3-1: Expressing the probability of flooding

Probability	Percentage range	Return period
High (Significant)	Greater than 1.3% (e.g. 2%)	1 in 75 or greater (e.g. 1 in 50)
Moderate	Between 0.5% - 1.3%	Between 1 in 200 to 1 in 75
Low	0.5% or less (e.g. 0.1%)	1 in 200 or less (e.g. 1 in 1000)

The lower the percentage, the less chance there is of that flood event happening in any one year; the higher the percentage then the more chance there is of that flood event happening in any one year. Although rare, floods with a low probability are likely to have greater impacts that are often far more severe compared to the high probability, more frequent, events.

The consequences of flooding depend on the nature of the flood and the vulnerability of the area. The nature of the flood determines the potential for it to cause damage and will be influenced by the following factors:

- Depth of flood water
- Velocity of flood water
- Rate of onset
- Duration
- Wave action effects
- Water quality

The vulnerability of the area affected by flooding determines the potential for damage to be caused and will be influenced by the following factors:

- The number of properties and/or the size of the area affected
- The type of development
- The nature of the population at risk
- The presence and reliability of mitigation measures to manage flooding

The combined influence of these factors will determine the potential flood risk in any area. A summary of these factors and the additional economic, social and environmental issues associated with flood risk are highlighted in Figure 3-2.

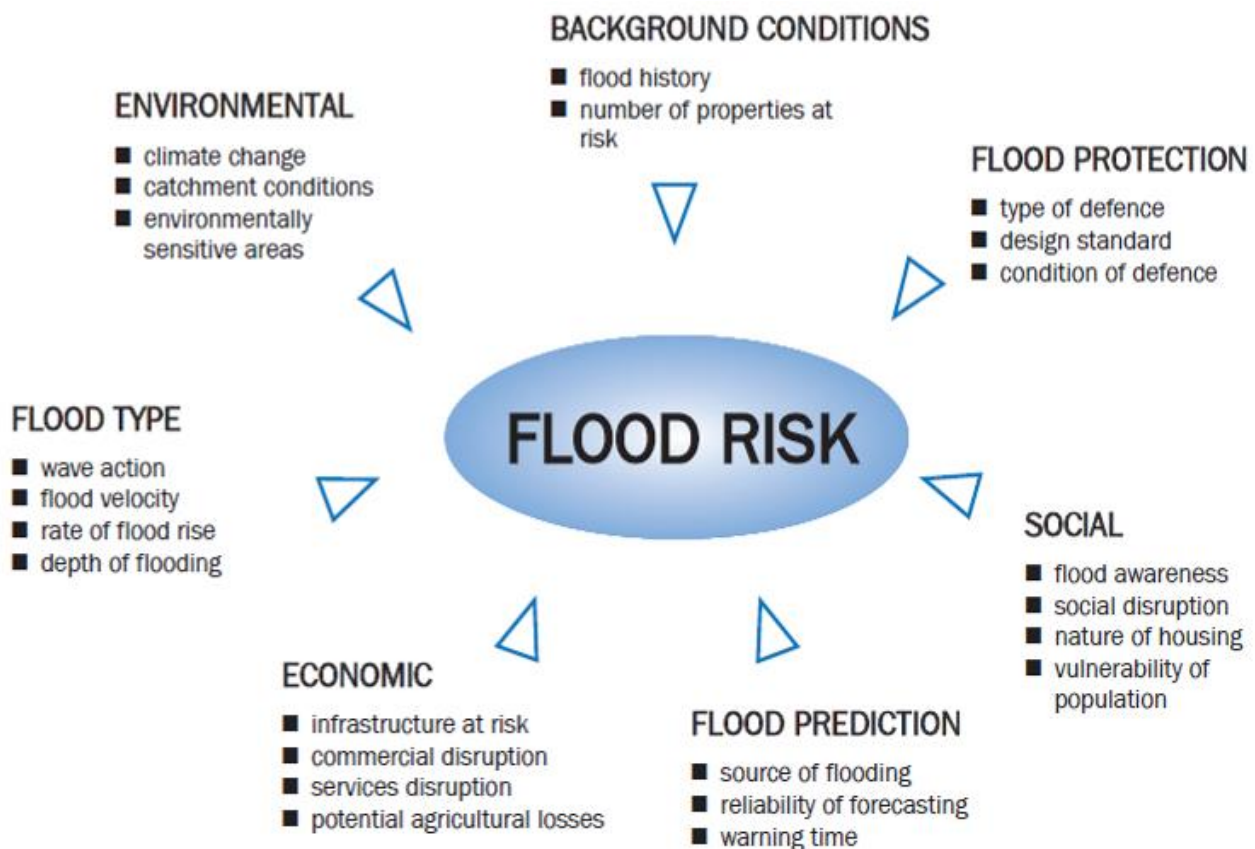


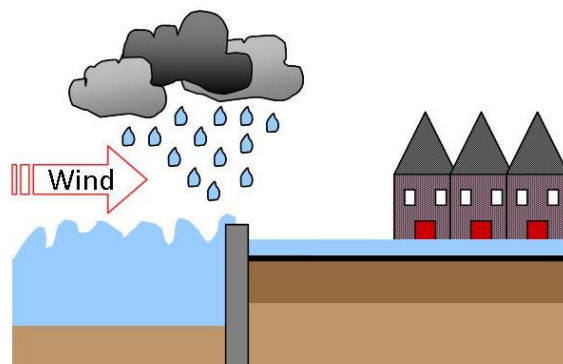
Figure 3-2: Factors affecting flood risk (CIRIA, 2004)

3.3 What are the different types of flood risk?

In reality flooding can happen anywhere, at any time, but there will always be a source (or combinations of sources) which has caused the flood to occur. A description of each of the different sources (types) of flooding is detailed in the following sections.

3.3.1 Tidal (coastal)

Tidal (coastal) flooding happens when there are high tides and stormy conditions. If low atmospheric pressure coincides with a high tide, a 'tidal surge' may happen causing higher than normal sea levels that may go over the top of defences/structures or existing land levels.



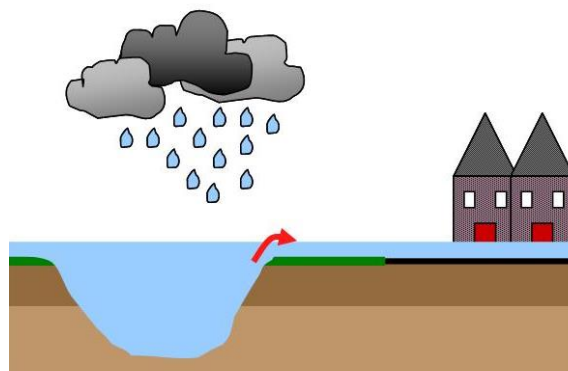
Tidal (coastal) flooding is represented as three different 'Flood Zones' corresponding to different probabilities of flooding which are likely to result in that location to experience flooding. The different zones and their probability bandings are shown in Table 3-2.

Table 3-2: Tidal (coastal) flood zones and corresponding probability bands

Flood Zone	Percentage	Return period
3	0.5% or greater annual chance of tidal flooding	1 in 200 or greater (e.g. 1 in 50)
2	Between 0.5% - 0.1% annual chance of tidal flooding	Between 1 in 200 to 1 in 1000
1	Less than 0.1% (e.g. 0.05%) annual chance of tidal flooding	Less than 1 in 1000 (e.g. 1 in 2000)

3.3.2 River (fluvial)

River flooding occurs when the river channel cannot cope with the water draining into it from the surrounding land causing the water level to rise above the level of the channel banks and flood the surrounding areas (floodplain).



River (fluvial) flooding can include main rivers and ordinary watercourses. Main rivers are those watercourses which have been designated as such because they are considered to perform a critical function in flood risk management.

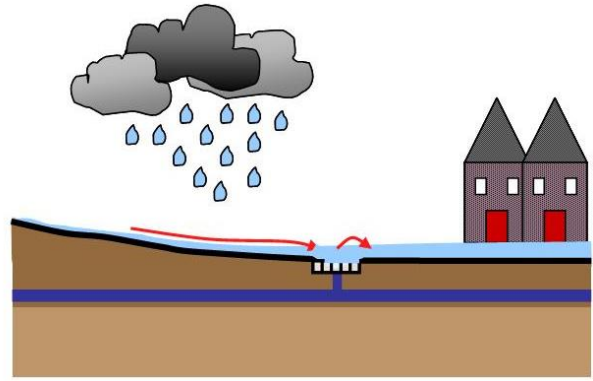
River (fluvial) flooding is represented as three different 'Flood Zones' corresponding to different probabilities of flooding which are likely to result in that location to experience flooding. The different zones and their probability bandings are shown in Table 3-3.

Table 3-3: Fluvial flood zones and corresponding probability bands

Flood Zone	Percentage	Return period
3	1% or greater annual chance of fluvial flooding	1 in 100 or greater (e.g. 1 in 50)
2	Between 1% - 0.1% annual chance of fluvial flooding	Between 1 in 100 to 1 in 1000
1	Less than 0.1% (e.g. 0.05%) annual chance of fluvial flooding	Less than 1 in 1000 (e.g. 1 in 2000)

3.3.3 Surface water (pluvial)

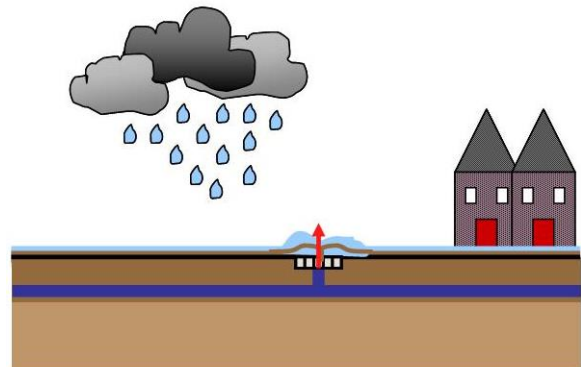
Surface water flooding occurs when intense rainfall is unable to soak into the ground or enter local drainage networks causing water to run across the ground. Surface water runoff travels quicker over hard surfaces and through sewers than it does over natural surfaces and along natural streams which can create flooding which occurs quickly during or after a rainfall event. Surface water flooding can be quite localised accumulating at local depressions and low points on the ground surface. Surface water flooding can occur anywhere where rainfall has the potential to accumulate on the surface but it can be made worse by certain conditions such as:



- Very dry ground conditions after long periods of warm and dry conditions which can cause rainfall to runoff across the surface rather than soak into the ground;
- Saturated ground conditions after long periods of wet weather which can cause rainfall to runoff across the surface as it is unable to soak into the ground;
- Large areas of hard standing (impermeable surfaces) which do not allow rainfall to soak into the ground;
- Rainfall events which exceed the capacity of local drainage networks.

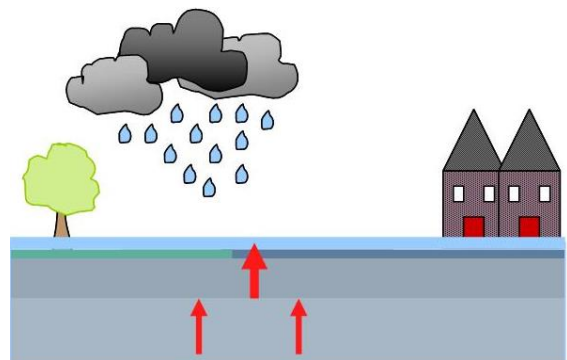
3.3.4 Sewer

In urban areas, rainwater is usually drained into surface water sewers or combined sewers containing both surface and waste water. Surface water sewers are generally designed to manage runoff from rainfall events up to a 1 in 30 year rainfall event. Flooding from sewers occurs when rainfall exceeds the capacity of the network (that is a rainfall which is greater than a 1 in 30 year rainfall event, such as 1 in 100 year rainfall event) or when the infrastructure doesn't function normally (for example, a blocked or collapsed sewer pipe).



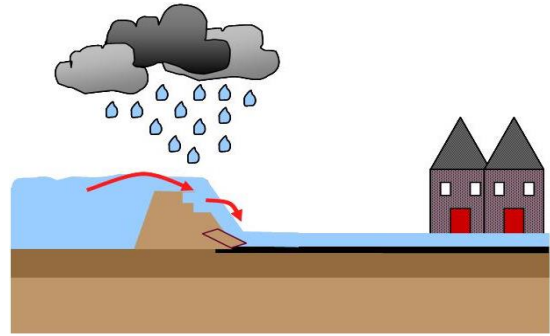
3.3.5 Groundwater

Groundwater flooding occurs when water levels in the ground (the water table) rise above the ground surface elevation or from water flowing from intermittent springs or streams. Water levels in the ground normally fluctuate throughout the year where they rise during wet months and fall during dry months as the water flows out into rivers. Groundwater flooding tends to occur in low-lying areas underlain with permeable rocks (aquifers). These may be major aquifers, such as chalk or sandstone, but also localised sand and river gravel floodplains. It is also possible for areas with higher topography to experience groundwater issues where perched water tables exist. A perched water table is formed when there is a localised impermeable layer of bedrock that prevents infiltration of water to deeper layers within the soil. Groundwater flooding tends to occur slower than other types of flooding and typically last longer than other types of flooding due to the nature of groundwater movement.



3.3.6 Reservoir

Reservoirs can hold large volumes of water above ground level, contained by dams. Although the safety record for reservoirs is excellent, it is still possible that a dam could fail which would result in a large volume of water being released very quickly.



3.3.7 Residual risk

Flood risk to people and property can be managed but it can never be removed completely. Even with flood management or mitigation measures put in place to reduce one (or a number of) sources of flooding, a residual risk will still remain. Examples of residual flood risk include:

- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, failure of a flap-valve, overtopping of an upstream storage area, or failure of a pumped drainage system; or
- a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the piped drainage cannot cope with.

There are a number of different factors that can influence the level of residual risk in an area benefitting from flood management and mitigation measures, including (but not limited to):

- Types of measures in place (temporary or permanent);
- Level of protection provided;
- Condition of the existing infrastructure;
- Topography of the area;
- Capability of the emergency planning response.

3.4 Is Southampton at risk of flooding at present?

Yes. At present, Southampton is susceptible to flooding from each type of flood risk described above: tidal, river, surface water, sewer, groundwater and reservoir. However, the likelihood and potential impact of each type varies greatly geographically across the city. Tidal flooding poses the greatest risk in terms of the potential consequences (impact) that could occur if an extreme event took place but surface water flooding is more likely to occur, especially due to the effect of tide locking when heavy rainfall events coincide with high tide conditions. Our current understanding of the risk facing the city from each of these sources is described in more detail in the following sections.

3.4.1 Tidal (coastal) flood risk in Southampton

Due to the tidal nature of the River Itchen and River Test and along Southampton Water, there is a risk from tidal flooding to the low-lying frontages within Southampton. The tidal extent of these rivers is illustrated in Figure 3-3. Tidal flooding is generally well understood and

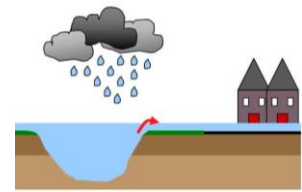


has been extensively modelled (and mapped) to illustrate the potential extent of flooding that could occur. The tidal flood map (Figure 3-3) shows the low-lying areas within Southampton which are at risk from tidal flooding (assuming no flood defences) if an extreme 1 in 200 year flood event (that is, one which has 0.5% chance of occurring in any given year) were to occur at present. The area within the city identified at greatest risk from tidal flooding presently is the west bank of the River Itchen (north of Ocean Village). Although there are structures in place along much of Southampton's tidal frontage (for example, quay walls and coastal erosion defences), they are not formal flood defences so the flood map is a very close representation of the current situation.

For tidal flooding to be experienced a certain set of conditions need to occur simultaneously (generally high spring tides, a low pressure system which creates a storm surge and high winds in a south/south westerly direction). Each of these conditions can be forecast in advance so it is possible to predict up to 24-48 hours in advance if tidal flooding is likely to occur.

3.4.2 River (fluvial) flood risk in Southampton

There are a number of main rivers which run through Southampton, namely the upper River Itchen, Tanners Brook and Rolles Brook as well as a network of ordinary watercourses (see Figure 3-4).

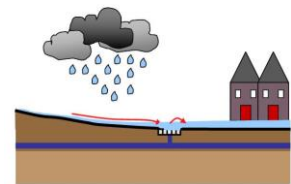


Flood risk from main rivers is generally well understood and has been modelled (and mapped) to illustrate the potential extent of flooding that could occur. The fluvial flood map (Figure 3-3) shows the areas within Southampton which are at risk from main river flooding (assuming no flood defences) if a 1 in 100 year flood event (that is, one which has 1.0% chance of occurring in any given year) or an extreme 1 in 1000 year flood event (that is, one which has 0.1% chance of occurring in any given year) were to occur at present.

Flood risk from the smaller rivers (known as ordinary watercourses²) within Southampton have not been as extensively modelled (and mapped) as main rivers. However, the surface water flood modelling gives an indication of the areas where water is likely to accumulate adjacent to the ordinary watercourses (see Figure 3-5 & Figure 3-10), although this doesn't take into account the potential impact of upstream runoff where the watercourse extends beyond the city boundary.

3.4.3 Surface water (pluvial) flood risk in Southampton

Southampton is an urban environment with approximately 90% of the land covered by existing development. Hence the majority of the land within the city is covered by buildings and impermeable surfaces which has an impact on the natural drainage processes by impeding the natural infiltration of water into the ground. As a result the majority of the rain which falls on these impermeable surfaces ends up as runoff which eventually makes its way into the sewer network. In reality, surface water flooding could happen anywhere in the city due to the reliance on a sewer network which has a finite capacity. If this capacity is exceeded or the surface runoff is prevented from entering the network then water will accumulate at the lowest point within that locality. The surface water flood map (Figure 3-5) identifies the locations which are at greatest risk of surface water flooding, but this does not mean that surface water flooding won't occur anywhere else within the city. Surface water flooding can occur almost anywhere when it rains hard enough for the local topography and circumstances to be unable to absorb the rainfall. To avoid the whole city being shown as wet the map has been filtered to remove any flooding which is less than 0.1m deep.



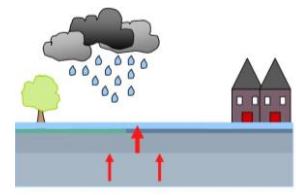
The locations within the city identified at highest risk from surface water flooding include areas in and adjacent to:

- Merging point of Tanners Brook/Holly Brook
- Millbrook Road West
- Southampton Central Station
- Western Esplanade/Harbour Parade
- A33 Kingsway/St Mary's Place
- A33 close to Queens Park
- Stoneham Way (junction with Wide Lane)

² An ordinary watercourse is defined by the Flood & Water Management Act (2010) as a watercourse that does not form part of a main river, including, but not limited to, all streams, ditches, culverts and ponds.

3.4.4 Groundwater flood risk in Southampton

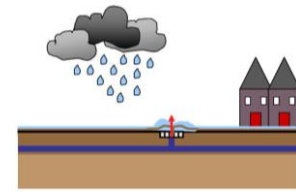
Current understanding of groundwater flood risk is very limited due to the complexities of representing the flow and where groundwater is likely to emerge. The existing approach to predict the risk focuses on the susceptibility of areas to groundwater flooding (Figure 3-6). There are believed to be a number of perched water tables within the city which increases susceptibility to potential groundwater flooding.



Groundwater issues tend to occur after periods of persistent rainfall and can continue for weeks/months.

3.4.5 Sewer flood risk in Southampton

Within Southampton surface water runoff from impermeable areas and wastewater from homes and businesses drain into the sewer network. In some areas, such as the east of the city and the Old Town in the city centre, surface water runoff discharges into the foul sewer network along with wastewater where it eventually ends up at the nearest wastewater treatment works. In most other areas surface water runoff is discharged into a separate sewer system from wastewater where it eventually ends up in the nearest river or watercourse. Sewer flooding could occur at any location at any time if the capacity of the system is exceeded or a failure/blockage of the infrastructure occurs, hence it is very difficult to predict where this type of flooding might occur within the city. The public sewer networks (surface water and foul water) within the city are illustrated in Figure 3-7.



3.4.6 Reservoir flood risk in Southampton

The risk of reservoir flooding within Southampton is considered low. Within the city there are three covered water service reservoirs at South hill, Southampton Common and Bitterne which are owned and operated by Southern Water. There are two water service reservoirs at Moorhill, near Telegraph Woods West End, also owned and operated by Southern Water, which lie within the Eastleigh Borough Council administrative area but are adjacent to the SCC boundary. There is a disused reservoir located at Mansbridge which also lies within the city.



3.4.7 Interaction between the different types of flood risk

In Southampton the interaction between different types of flooding can result in more severe flooding incidents so it is not possible to address each type in isolation. The following interactions are particularly evident within the city:

- *Tidal/surface water*

High tide conditions coinciding with heavy downpours can result in 'tide locking' of surface water sewers which discharge directly into the River Test and River Itchen, causing back up through the surface water sewer network.

- *Sewer/surface water/river*

High flows within rivers and ordinary watercourses coinciding with heavy downpours can prevent surface water sewers discharging into the channel, causing back up through the surface water sewer network.

- *Surface water/sewer*

Exceedance of the sewer capacity or failure of the infrastructure during heavy downpours can result in accumulation of surface water runoff from impermeable areas as it can't enter the drainage network.

- *Tidal/river*

High tide conditions can prevent discharge of water from rivers and ordinary watercourses into the River Test and River Itchen. Tidal inundation upstream within the river channel can also occur.

- *Tidal/groundwater*

Groundwater levels within the low lying areas of the tidal frontage are believed to be influenced by the state of the tide, fluctuating in response to the tidal ebb and flow.

3.5 Has Southampton experienced flooding in the past?

Yes. There have been over 200 different recorded flood events within Southampton from 1999 to present day which are documented, to varying extents, by the different authorities (Southampton City Council, the Environment Agency and Southern Water). There are accounts of historic floods which occurred prior to 1999 but formal records are not known to exist.

Flooding incidents in recent years have been a result of various sources of flooding at different times and locations across the city with varying degrees of severity and impact. The most frequent source of flooding within the city to date reflects the assessment that surface water is the most probable source of flooding within Southampton. A summary map indicating the locations of these events is illustrated in Figure 3-8.

3.6 Is the risk of flooding in Southampton likely to get worse in the future?

Yes. The projected impact of climate change and sea level rise over the coming century will inevitably increase the risk of all forms of flood risk within Southampton (with the exception of reservoir flood risk). There is clear scientific evidence that global climate change is happening now so it cannot be ignored. At a national level flood risk has been identified as one of the greatest climate change challenges facing the UK (Climate Change Risk Assessment, 2012).

Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation; however the broad trends are in line with projections from climate models.

Greenhouse gas levels in the atmosphere are likely to cause higher winter rainfall in future. Past emissions mean some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

We have enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we can't be sure about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day). It is plausible that the amount of rain in extreme storms (with a 1 in 5 annual chance, or rarer) could increase locally by 40%.

3.6.1 Key climate change projections for the South East

If emissions follow a medium future scenario, UKCP09 projected changes by the 2050s relative to the recent past are:

- Winter precipitation increases of around 18% (very likely to be between 2 and 39%)

- Precipitation on the wettest day in winter up by around 16% (very unlikely to be more than 34%)
- Relative sea level at Portsmouth very likely to be up between 10 and 40cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- Peak river flows in a typical catchment likely to increase between 11 and 24%

Increases in rain are projected to be greater at the coast and in the west of the South East regions.

3.6.2 Implications for flood risk

Climate changes can affect flood risk in several ways, although impacts will depend on local conditions and vulnerability. It is anticipated that climate change will increase the likelihood of flooding, and thus the severity and consequences will also increase. Wetter winters and more of this rain falling in wet spells may increase river flooding. More intense rainfall causes more surface runoff, increasing localised flooding. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected.

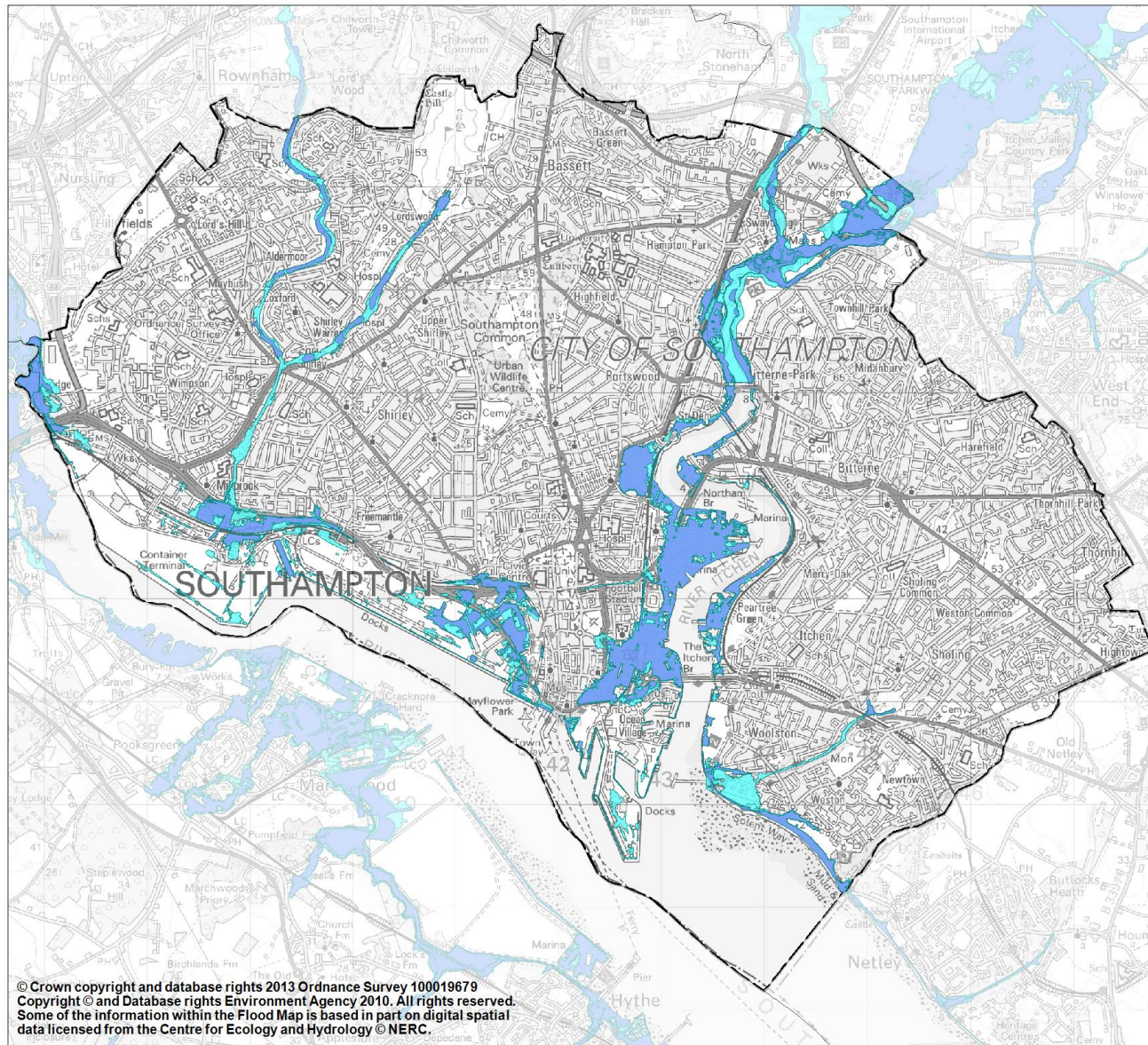
Rising sea or river levels will inevitably increase river and tidal flooding but this will have a knock on effect increasing other sources of flood risk because of interactions with drains, sewers and groundwater.

The potential implications of climate change and sea level rise for tidal flood risk (Figure 3-9) and surface water flood risk (Figure 3-10) have been modelled (and mapped).

With more intense rainfall, the sewer networks are likely to experience exceedance of capacity more often and increase the pressure on ageing infrastructure which in combination is likely to increase the frequency of sewer flooding in the future. An increase in peak river flows is likely to increase the risk of fluvial flooding. Groundwater levels are projected to rise in response to the rising sea levels, which is likely to increase the risk of groundwater flooding. In addition, the interaction between the various sources of flooding, which are all anticipated to become more frequent in the future, will mean even more extreme damaging flood events are likely to occur in the future. The number of overall flooding incidents is expected to increase in the future.

3.7 Understanding uncertainty

Our assessment of risk is inherently uncertain due to the data that we have used and the assumptions that have been made. The use of modelled flood mapping is a useful tool which gives us an indication of the areas that could flood but there are a lot of assumptions that are used in the modelling data and we can never be completely sure that these are correct. Modelled flooding also does not tell us what the impact to individual properties is likely to be. The use of past flooding data gives us a good idea of where it could flood in the future because it has experienced flooding in the past and this can help us validate the modelling outputs and the potential extents and impacts to individual properties. However, we also know that areas identified as being at risk of flooding may not have experienced flooding in the past, and this does not mean they will not experience flooding in the future. In addition, changes in land use and climate may affect the likelihood of flooding which cannot be shown in the records of past flooding.






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 Copyright © and Database rights Environment Agency 2010. All rights reserved.
 Some of the information within the Flood Map is based in part on digital spatial data licensed from the Centre for Ecology and Hydrology © NERC.



NOTE:
 This map indicates the areas likely to be at risk of tidal & fluvial flooding where no flood defences exist. The information is designed to only give an indication of flood risk to an area of land and is not sufficiently detailed to show whether an individual property is at risk of flooding. This is because we cannot know all the details about each property.

LEGEND

-  SCC administrative boundary
-  **Flood Zone 3**
0.5% (1 in 200) or greater annual probability of tidal flooding;
1% (1 in 100) or greater annual probability of fluvial flooding.
-  **Flood Zone 2**
Between a 0.5% (1 in 200) and 0.1% (1 in 1000) annual probability of tidal flooding in any year;
Between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of fluvial flooding.

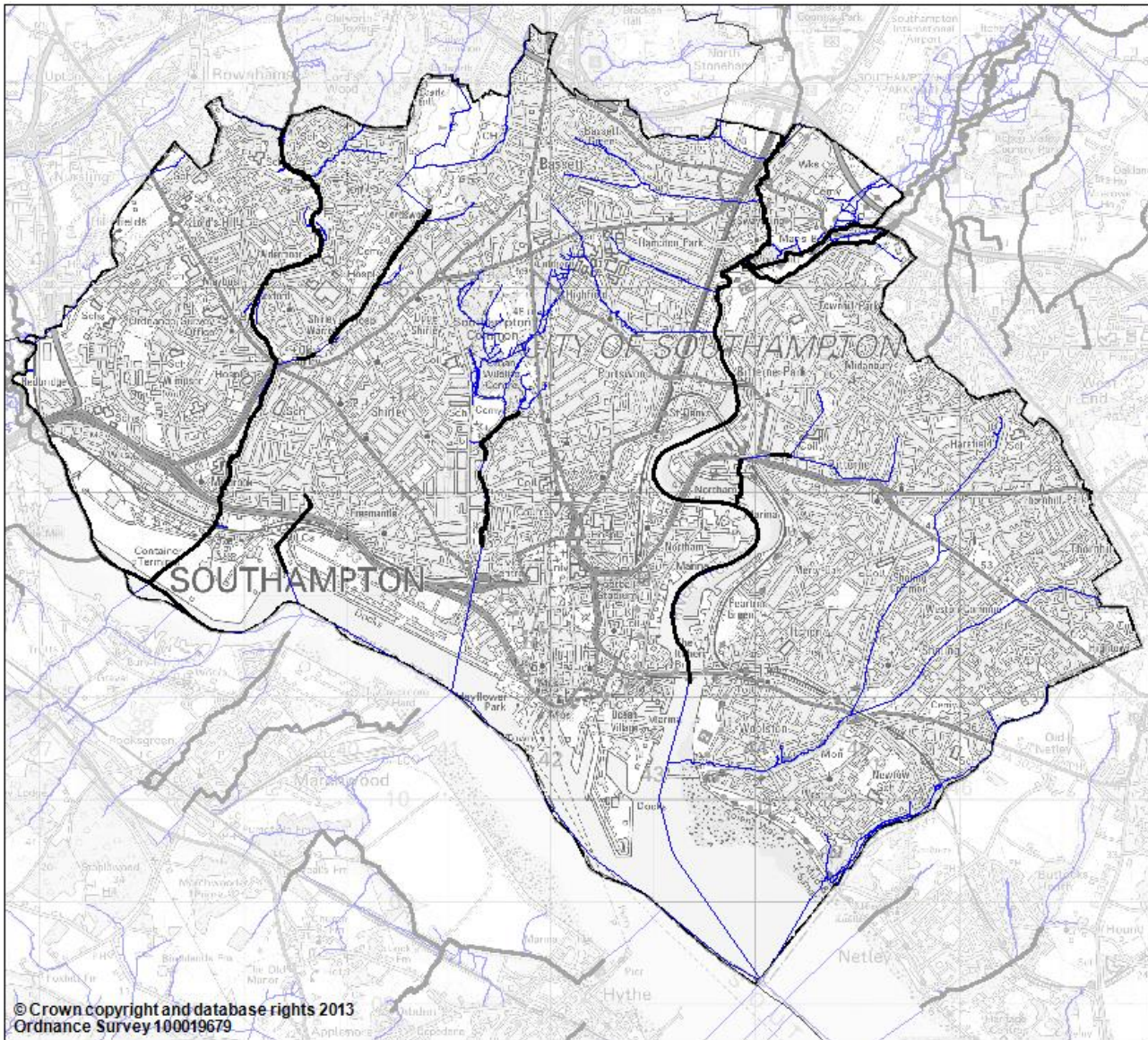
Scale:
 1 Centimetre = 0.5 Kilometres

Southampton Local Flood Risk Management Strategy

Present day tidal & fluvial (main river) flood risk in Southampton

Figure 3.3

Figure 3-3: Present day tidal and fluvial (main river) flood risk in Southampton (Environment Agency, 2013)



NOTE:
 This map is captured from the water features theme of the Ordnance Survey MasterMap topographic layer. It is known that within Southampton it does not capture all the culverted watercourses that exist within the City.

LEGEND

- SCC administrative boundary
- Main river
- Ordinary watercourse

Scale:
 1 Centimetre = 0.5 Kilometres

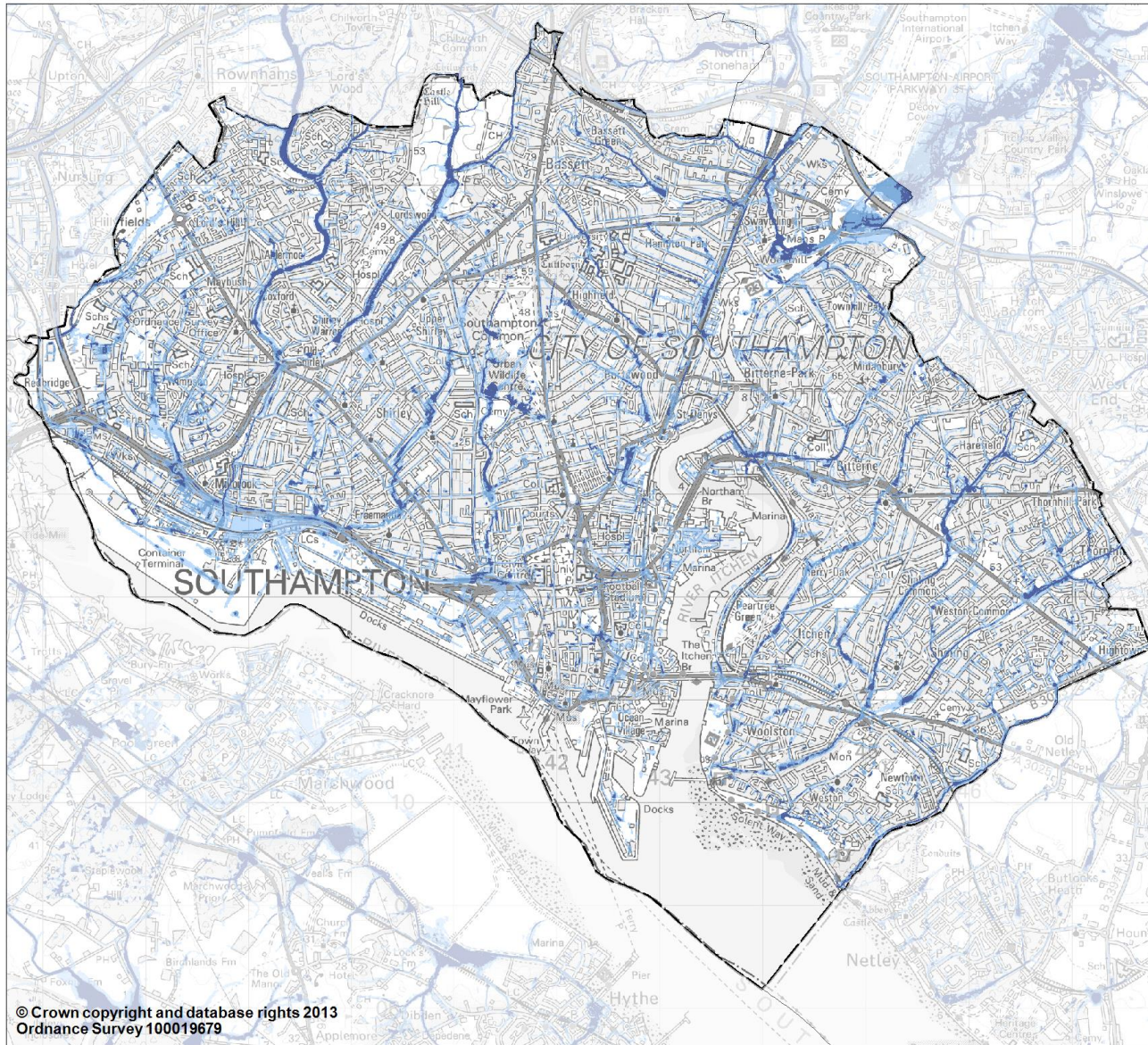
Southampton Local Flood Risk Management Strategy

River network in Southampton

Figure 3.4

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Figure 3-4: River network in Southampton (Environment Agency, 2012)




NOTE:


This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.


The nationally produced surface water flood mapping does not take account of the effect of pumping stations in catchments with pumped drainage.


No allowance is made for tide locking, high tidal or fluvial levels where sewers cannot discharge in to rivers or the sea.

LEGEND

 SCC administrative boundary

 High risk
Greater than 1 in 30 chance of flooding in any given year

 Medium risk
Greater than 1 in 100 chance of flooding in any given year

 Low risk
Greater than 1 in 1000 chance of flooding in any given year

Scale:
1 Centimetre = 0.5 Kilometres

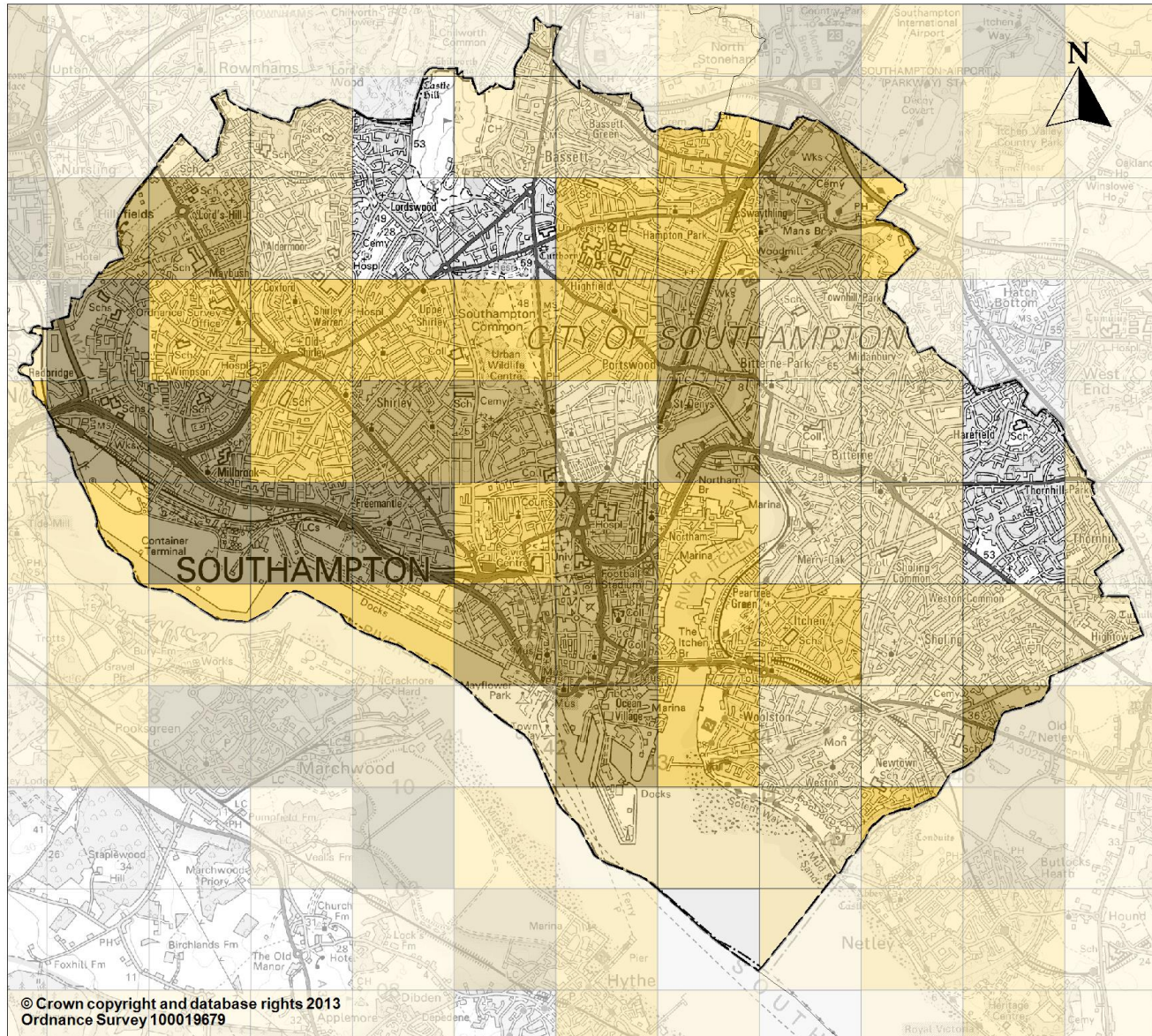
Southampton Local Flood Risk Management Strategy

Updated Flood Map for Surface Water

Figure 3.5

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Figure 3-5: Present day surface water flood risk in Southampton (Environment Agency, 2011)



NOTE:
 This map shows the proportion of each 1km grid square where geological and hydro-geological conditions show that groundwater might emerge. The susceptible areas are represented by one of four area categories showing the proportion of each 1km square that is susceptible to groundwater emergence. It does not show the likelihood of groundwater flooding occurring.

LEGEND

- SCC administrative boundary
- < 25%
- 25% to 50%
- 50% to 75%
- >75%

Scale:
 1 Centimetre = 0.5 Kilometres

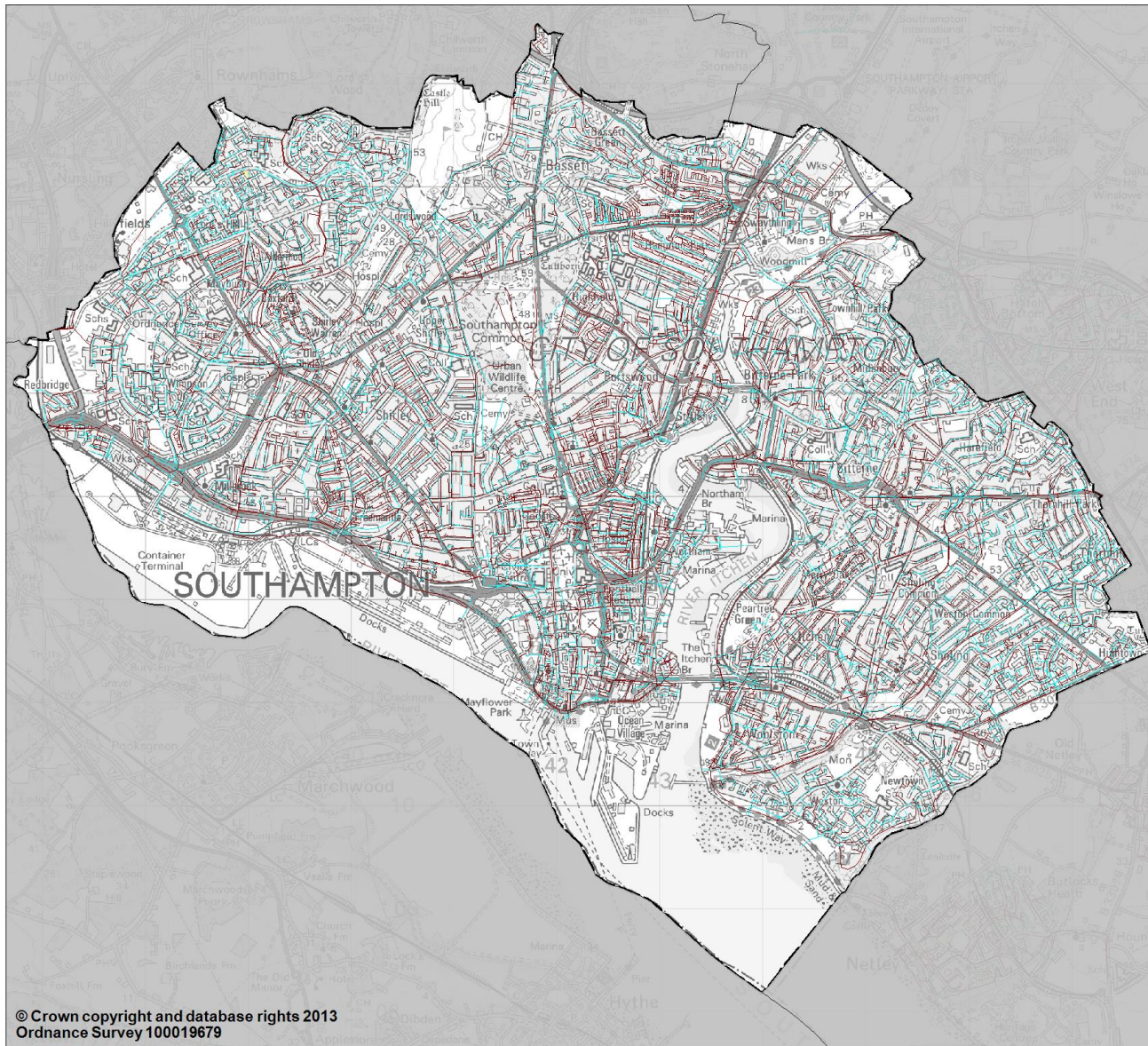
Southampton Local Flood Risk Management Strategy

Areas Susceptible to Groundwater Flooding

Figure 3.6

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Figure 3-6: Areas susceptible to groundwater flooding (Environment Agency, 2011)







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NOTE:

This map represents the public sewer network as provided by Southern Water.

LEGEND

-  SCC administrative boundary
-  Surface water sewer
-  Foul sewer
-  Combined sewer (foull & surface water)

Scale:

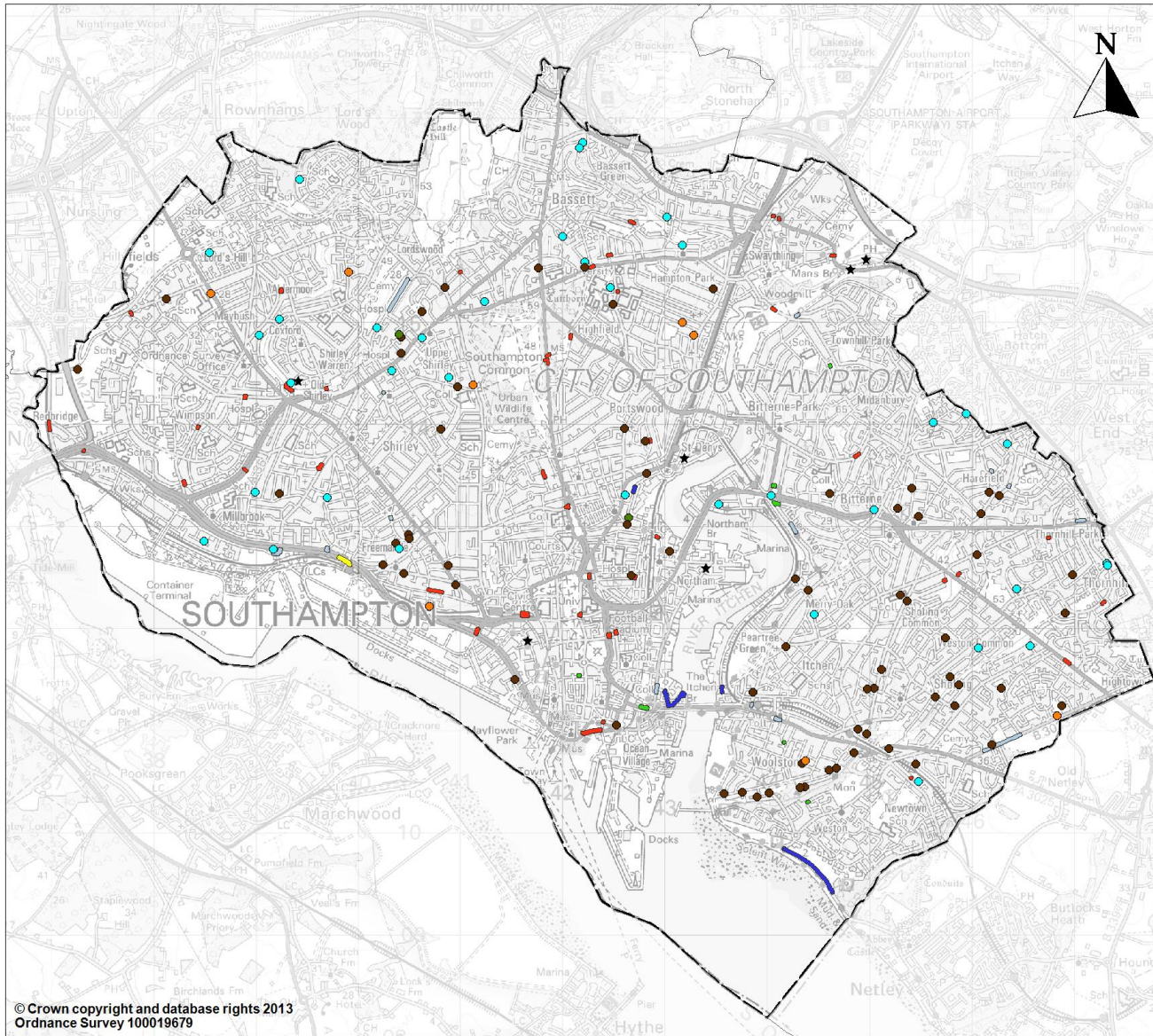
1 Centimetre = 0.5 Kilometres

Southampton Local Flood Risk Management Strategy

Public sewer network in Southampton

Figure 3.7

Figure 3-7: Public sewer network



LEGEND

- SCC administrative boundary
- Environment Agency Historic Flooding Record
- Southern Water Flooding Records**
 - SURFACE WATER
 - FOUL/COMBINED
 - FOUL
 - COMBINED
- Southampton City Council Historic Flooding Records**
 - Obstruction / Blockage
 - Water Overflow (drains/gullies)
 - High Tide & Heavy Rain
 - Groundwater
 - Other/Unknown

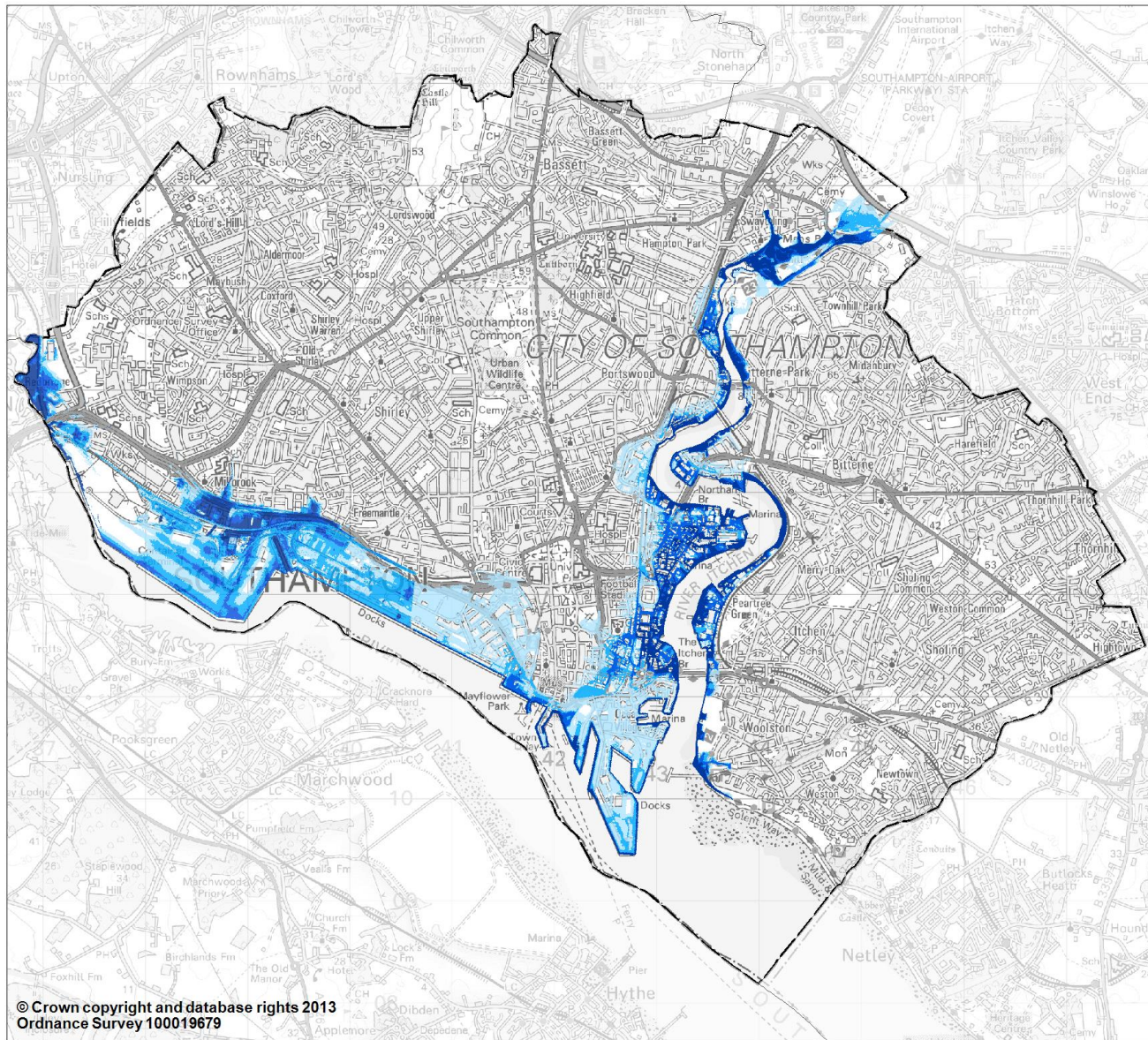
Scale:
1 Centimetre = 0.5 Kilometres

Southampton Local Flood Risk Management Strategy

Historic Flood Events

Figure 3.8






Figure 3-8: Past flood events in Southampton



NOTE:

This map gives an indication of the broad areas likely to be at risk of tidal flooding over the next 100 years.

LEGEND

-  SCC administrative boundary
-  2010 - extent of the modelled 1 in 200 year tidal flood event
-  2055 - extent of the modelled 1 in 200 year tidal flood event
-  2070 - extent of the modelled 1 in 200 year tidal flood event
-  2115 - extent of the modelled 1 in 200 year tidal flood event

Scale:

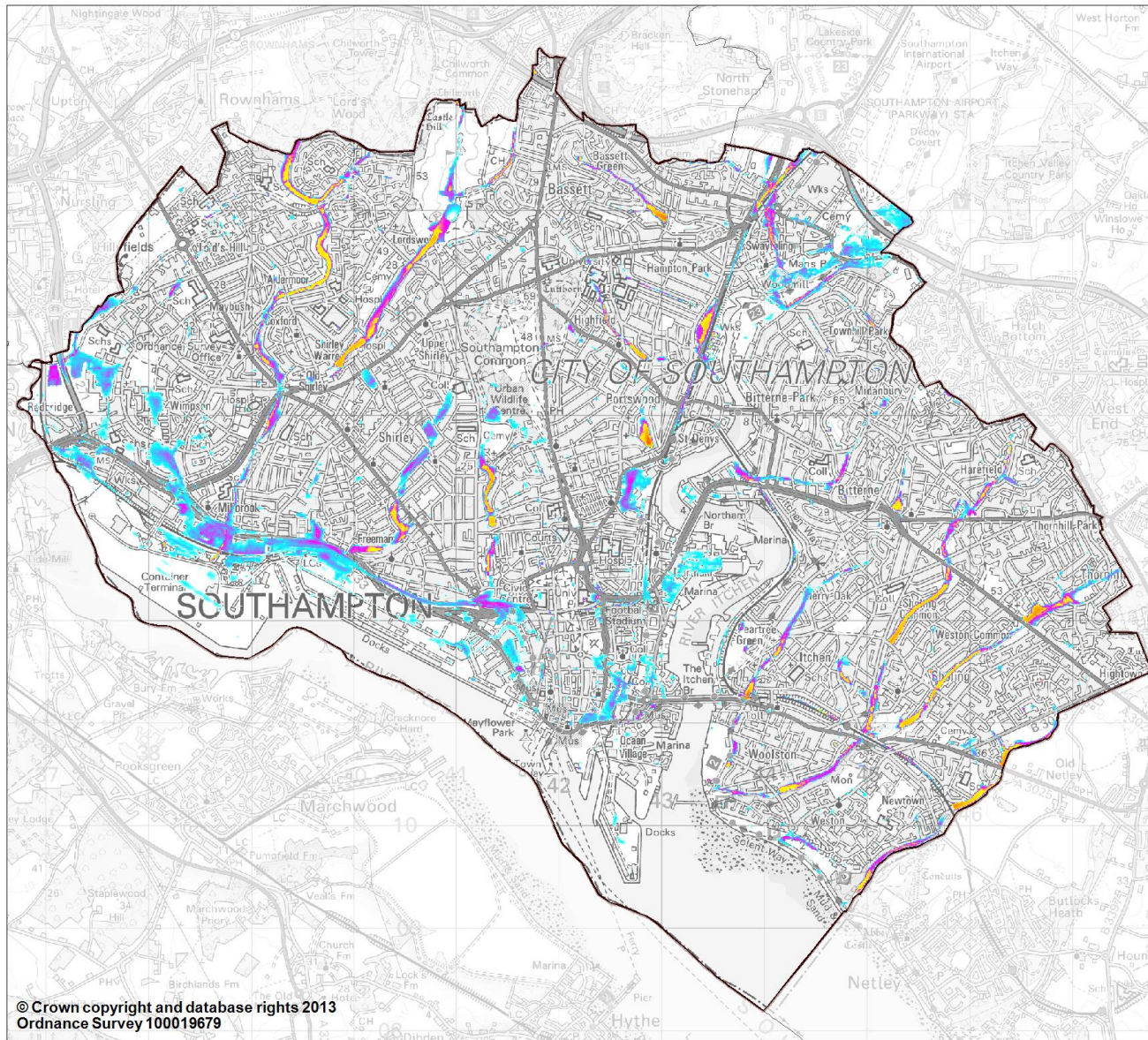
1 Centimetre = 0.5 Kilometres

Southampton Local Flood Risk Management Strategy

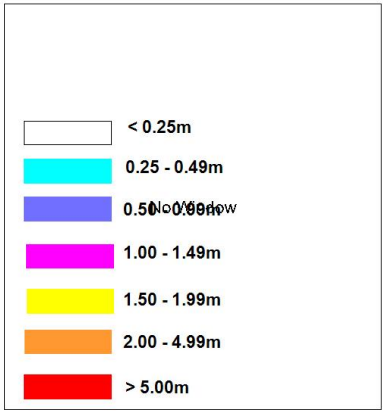
Projected future tidal flood risk in Southampton

Figure 3.9

Figure 3-9: Projected future tidal flood risk in Southampton (Environment Agency, 2010)



NOTE:
 This map shows the modelled overland flows indicating the areas likely to be at risk of surface water flooding during a 6 hour duration 1 in 200 year rainfall event (+ 30% allowance for climate change).



Scale:
 1 Centimetre = 0.5 Kilometres

Southampton Local Flood Risk Management Strategy

Projected future surface water flood risk in Southampton

Figure 3.10

Figure 3-10: Projected future surface water flood risk in Southampton - 1 in 200 year rainfall event plus 30% climate change allowance

4. Roles & responsibilities

Ultimately, managing flood risk is everyone’s responsibility. There is no legislation which states that anyone has the right to be protected from flooding, but different organisations do have certain roles and responsibilities to try to manage flood risk to reduce the potential harmful impacts it can have on people, property and infrastructure. The various roles and responsibilities of the different organisations, groups and individuals are outlined below. Table 4-2 summarises the main roles and responsibilities presented in this section.

4.1 Who are the ‘Risk Management Authorities’?

The following, applicable to Southampton, are specifically named as risk management authorities within the F&WMA:

- Environment Agency
- Lead Local Flood Authority (LLFA) – SCC
- Water company – Southern Water
- Highway authority – SCC/Balfour Beatty

It is imperative as part of the governance and successful delivery of services that all risk management authorities are aware of and take responsibility for the functions they exercise. Management of flood risk can involve risk management authorities exercising different activities to implement their functions in relation to flood risk management. These activities may include, but are not limited to, those outlined in Table 4-1.

Table 4-1: Activities that can deliver flood risk management functions

Activity	Example in relation to flood risk management
Building	Flood defences, highway drainage, sewers.
Cleaning	Culverts, gullies.
Co-operating	Working with others, co-ordinating activities.
Decision-making	Prioritisation of resources.
De-commissioning	A flood defence, weir, reservoir.
Defending	A property, town, city, designated site.
Development planning	Ensuring development takes place without increasing flood risk.
Dredging	A watercourse.
Draining	A highway, new development.
Enforcing	Highway enforcement, Land Drainage enforcement.
Forecasting	Rainfall, flooding, tidal surge.
Improving	Roads, safety of structures, defences.
Informing	Provision of data or information.
Investigating	Flooding incidents.
Maintaining	Rivers, structures, drainage systems, defences.
Managing	Strategies, studies, schemes.
Mapping	Historic or predicted flooding.
Monitoring	Beach profiles, river flows, asset condition.
Planning	Local development, schemes.
Protecting	People, the environment, infrastructure.
Recovery	After a flood.
Replacing	Drain covers, safety signs.
Reporting	To government.
Responding	To a flooding incident.
Supervising	Site works.
Surveying	Defence levels, asset locations, flood extents.
Warning	About flooding.

4.2 What is SCC's role in relation to flood risk?

SCC has a number of different roles and carry out a range of functions which work towards reducing flood risk across the city. These vary from regular day-to-day activities on the ground to strategic planning and everything in between. Different functions are undertaken by different departments within SCC but we try to co-ordinate our approach through the internal flood board and implementation of suitable processes to ensure regular communication between departments is maintained. The roles and activities undertaken by the different teams within SCC are outlined below.

4.2.1 Flood risk management

Role: Strategic management of flood risk (through development of plans & strategies), flood investigations, ordinary watercourse regulation, development management/planning advice on flood risk, asset register development and maintenance, designation of features, & scheme development and implementation (through powers to undertake works to reduce flood risk).

Activities may include: Co-operating, informing, investigating, decision-making, enforcement, managing, mapping, monitoring, planning, protecting, reporting, defending, supervising & surveying.

4.2.2 Emergency Planning

Role: Prepare & co-ordinate multi-agency flood incident management and recovery after a flood.

Activities may include: Co-operating, planning, informing, monitoring, responding & recovery.

4.2.3 Highways (Balfour Beatty on behalf of SCC)

Role: Management of highway drainage within the public road network.

Activities may include: Co-operating, building, cleaning, draining, improving, investigating, informing, enforcement, maintaining, planning, replacing, reporting, responding, supervising & surveying.

4.2.4 Parks & Open Spaces

Role: Management of parks & open spaces & riparian landowner.

Activities may include: Co-operating, cleaning, improving, informing, maintaining, managing, monitoring, planning, protecting, replacing, reporting & responding.

4.2.5 Planning Policy/Development Management

Role: Development of local planning policy & implementation of local/national planning policy through the development management process.

Activities may include: Co-operating, development planning, decision-making, planning, informing & enforcement.

4.2.6 Housing

Role: Management of housing properties and land.

Activities may include: Co-operating, improving, building, informing, investigating, maintaining, monitoring, protecting, replacing, responding & supervising.

4.2.7 Bridges & Structures (Capita on behalf of SCC)

Role: Management of bridges & highway culverts (>900mm width).

Activities may include: Co-operating, building, cleaning, improving, informing, maintaining, managing, monitoring, replacing, reporting, supervising & surveying.

4.2.8 Information Services/communications

Role: Management of internal & external communication, including informing the public.

Activities may include: Co-operating & informing.

4.2.9 Others

Other departments/teams may have a role in relation to flood risk management but their involvement tends to be ad hoc and it does not form part of their core business. These include Public Rights of Way, Car Parks, Property Services and Environmental Health.

4.3 What is the Environment Agency's role in relation to flood risk?

The Environment Agency have the strategic overview of all sources of flood risk which means they co-ordinate the various high level flood risk management activities across the country. They also plan and implement flood risk management activities such as maintenance of main rivers and building and maintaining flood defence assets to reduce flood risk from main rivers and the sea. Other roles that they carry out include regulation of the safety of reservoirs with a storage capacity greater than 10,000m³, partnership with the Met Office to deliver forecasting through the flood forecasting centre, provision of the flood warning service and supporting emergency responders during flood events.

4.4 What is Southern Water's role in relation to flood risk?

Southern Water's main role is to provide and manage the public sewer system (which includes the foul, surface water and combined systems), although they also provide the water supply in Southampton.

Although public sewers are owned and maintained by Southern Water, private drains are the responsibility of the property owner. As of October 1st 2011, property owners are only responsible for sewer pipes that drain only their property and not sections of pipe that are shared. Figure 4-1 illustrates which sewer pipes are public sewers, and which are private drains, since it varies depending on the type of property.

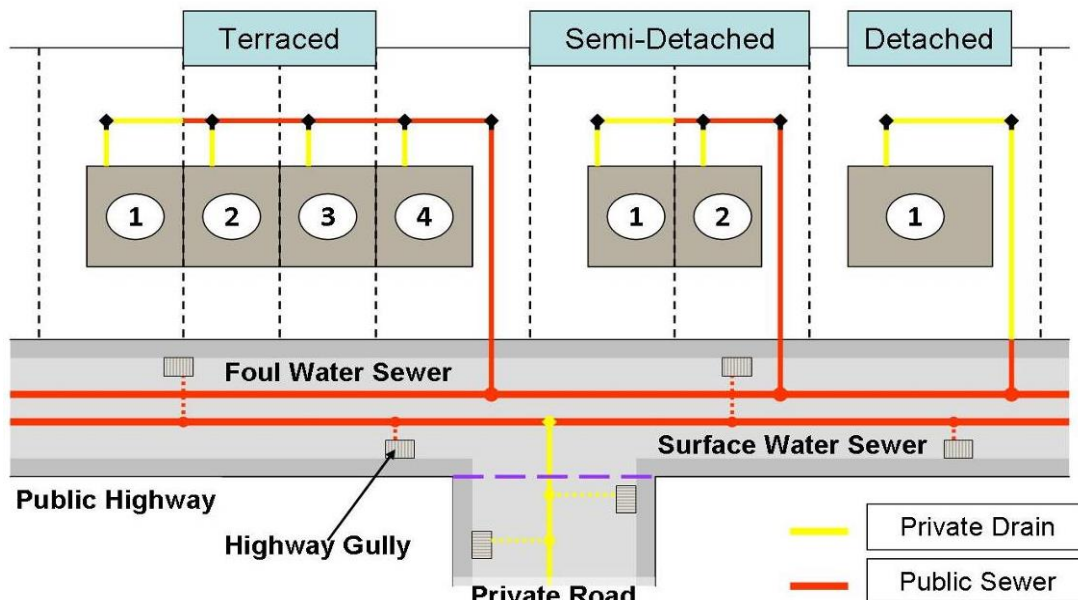


Figure 4-1: Sewer ownership overview

4.5 Are there any other agencies/organisations with a role?

Yes. In Southampton there are a number of other agencies and organisations with a role in relation to flood risk management, although these roles vary greatly:

- Associated British Ports (ABP) – operation & maintenance of the pumping stations on ABP land to discharge surface water when required.
- Network Rail – major landowner, with strategic drainage infrastructure within their land holdings.
- Emergency Services – emergency response during flood events where there is a threat to life.
- Local Resilience Forum – co-ordinates work on multi-agency response and recovery.
- Developers – need to properly consider and mitigate flood risk in the design and implementation of new development.
- Housing Associations – landowners.
- Natural England – advice and enforcement relating to activities on or near to important designated habitat sites/protected species.
- English Heritage – advice relating to activities on or near important heritage features.
- Universities – research & development.
- Local partnerships, forums & community groups – communicating the risks, informing, monitoring and reporting.

4.6 Does anyone else have a role?

Yes. There are certain responsibilities in relation to flood risk management which are clearly identified as being the responsibility of the landowner. These include:

- A common law duty for riparian landowners³ to maintain watercourses⁴ to prevent them causing a nuisance to other riparian landowners, the community and the environment.
- Private drains are the responsibility of the landowner as they do not fall under the public sewer responsibility of Southern Water.

Since there is no right to be protected from flood risk, it is the responsibility of individual residents, businesses and landowners to reduce the risk to their own property. This can be done in a number of ways including being prepared for flooding, acquiring appropriate insurance to cover against potential flood damage, and reducing the risk through implementation of structural measures.

Does a watercourse (either natural or culverted) flow within, or next to your land or property?

If **YES**, then read the ‘**Living on the Edge**’ guidance from the Environment Agency which sets out the responsibilities of riparian owners.

Available online at environment-agency.gov.uk/homeandleisure/floods/31626.aspx

4.7 What about surface runoff from neighbouring property?

There is no provision within any legislation for an individual to take action when flooding is caused by rainwater running from neighbouring property onto their land (surface-run-off), or for

³ If you own land or property next to a river, stream or ditch you are considered to be a riparian landowner.

⁴ A watercourse is any natural or artificial channel above or below ground through which water flows, such as a river, brook, beck, ditch, mill stream or culvert.

any of the risk management authorities to take action against the person whose action leads to this type of flooding. The existing powers under the Land Drainage Act 1991 only enable authorities (LLFA & EA) to deal with cases where a person who owns land abutting a watercourse does not clear it of obstruction which is causing flood risk to others.

.

Table 4-2: Summary of the main roles and responsibilities concerning the management of flood risk in Southampton

	Role	Activities
Southampton City Council	Managing flood risk from surface water, groundwater & ordinary watercourses	Planning flood risk management activities; flood investigations; develop & maintain an asset register; develop, implement & monitor the LFRMS; communicating the risk to residents; power to undertake works to reduce flood risk; power to designate features.
	Emergency planning	Plan and co-ordinate the multi-agency response to flooding incidents; provide supporting role to emergency services during an incident; flood recovery.
	Development management	Taking decisions on planning applications avoiding inappropriate development & ensuring development doesn't increase flood risk & where possible helps to reduce the risk.
	Highway authority	Providing & managing highway drainage & roadside ditches
	Strategic planning	Preparing local planning documents which set the context for future development.
	Riparian landowner	Ensure the flow of water through watercourses is not obstructed.
Environment Agency	Strategic overview	Co-ordinating flood & coastal erosion risk management activities; provide flood warning service; support emergency responders during a flood.
	Managing flood risk from main rivers, estuaries, the sea & reservoirs	Planning flood risk management activities; power to undertake works to reduce flood risk; power to designate features.
Southern Water	Managing flood risk from public sewers	Providing and managing surface and foul (or combined) sewer systems; working with developers to reduce amount of rainfall entering sewers
Associated British Ports	Managing surface water drainage which is conveyed to the pumping stations within ABP land	Operation and maintenance of pumping stations within ABP land to discharge surface water when required.
Emergency Services	Flood incident management	Respond to emergency incidents where there is a threat to people.
Hampshire & IOW Local Resilience Forum	Flood incident management & recovery after a flood	Co-ordinates work on risk assessment, contingency planning, training and exercises to enhance the multi-agency preparedness for emergencies, including flooding incidents.
Landowners	Riparian landowner	People who own land which adjoins a watercourse have to make sure that the flow of water is not obstructed. Where the watercourse is culverted (in a large pipe under ground) the landowner is responsible for the maintenance of the culvert within their land.
	Homeowner	Protecting your property from flooding.
Residents	Being prepared for flooding	Know what to do and how to respond in a flood event.
Developers	Managing flood risk in new developments	Properly considering flood risk in the design of new developments so they do not increase flood risk elsewhere and where possible help to reduce the risk.

5. Actions to address flood risk in Southampton

Flood risk is something that can be largely understood and its effects are generally predictable. This means that the impacts can be mitigated, up to a point, and response and recovery can be more effective and efficient. Flood risk can be managed using different measures which can be one, or a combination of, structural (generally engineered solutions) and non-structural measures that will manage the pathway and/or receptor (Figure 5-1).

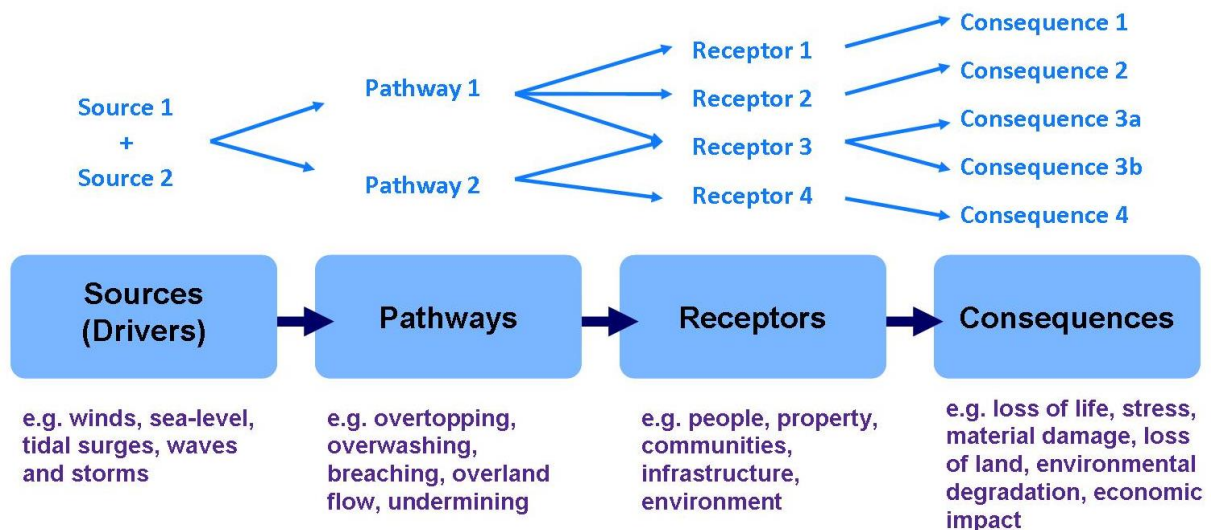


Figure 5-1: Source-Pathway-Receptor diagram

Physical intervention to manage flood risk can take a number of different forms from the use of sandbags in an emergency to reduce water entry to properties when flooding is imminent, to the construction of permanent flood walls to protect larger areas.

Figure 5-2 shows the hierarchy of measures, their scale of application and who could implement them. Moving up the hierarchy, the standard of protection and the cost to implement it increases along with the number of benefits the measure can bring.



Figure 5-2: Hierarchy of physical measures to manage flood risk

Since no method of flood defence can guarantee full protection from flooding, the key to effective flood risk management is to increase awareness amongst communities, and ensure they are prepared for a flood event. Being prepared for flooding and knowing what to do in the event of a flood occur can help reduce the damage, aid recovery and ultimately save lives. Although the strategy aims to manage the risk of flooding and the identified actions will work towards achieving this, ***it is important to recognise that it is not possible to prevent all flooding.*** Advice on what to do prior to and during a flood is outlined in Section 8

The actions, set out below, have been developed to help deliver the objectives of the Strategy in order to provide a cost-effective and risk-based approach to managing flood risk within Southampton. Considering the complexity of the different roles and responsibilities outlined in Section 4 it is important that everyone plays their part in contributing towards delivery of these (and relevant individual) actions to work towards collectively managing flood risk accordingly.

5.1 Existing activities

The F&WMA introduced a number of new duties and responsibilities which each LLFA has to implement. An overview of SCC's approach to implementation of these is detailed below.

5.1.1 Investigate flooding incidents

On becoming aware of a flood in its area, a LLFA must, to the extent that it considers it necessary or appropriate, investigate:

- a) which risk management authorities have relevant flood risk management functions, and
- b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

To implement this responsibility SCC have developed guidance and a protocol which are used to determine whether an investigation is necessary and if so how that investigation will be carried out. It is not the responsibility of the Investigating Officer to resolve the flooding, however they will investigate the cause and notify the relevant authority who then should exercise their roles and responsibilities to try to resolve the flooding. In Southampton these authorities could include:

- Southampton City Council
- Highways
- Southern Water
- Environment Agency
- Associated British Ports (ABP)

Private landowners also have responsibilities in relation to land drainage and riparian ownership (see Section 4.6).

Where an investigation has been carried out, a flood investigation report is produced and published on the SCC website. Further information on the flood investigation guidance and protocol is available on the [Flood Investigations webpage](#).

5.1.2 Register of flood risk assets

A LLFA must establish and maintain a register of assets (physical structures or features) that in their opinion are likely to have a significant effect on flood risk in the local area and record information, such as ownership and state of repair, about each asset. SCC has developed a database for the asset register and record and has commenced site investigations to identify any unknown assets to include in the database. Development of the asset register will be continuous as assets are identified over time, working towards developing a robust overview of all flood risk assets within the City. Once the asset register is sufficiently populated it is our aim to make it available to view on the SCC website.

5.1.3 Maintenance/regulating activities on main rivers

The Environment Agency undertakes a number of activities on main rivers as part of their role in managing flood risk from this source. Resources are prioritised in relation to the level of risk so activities will vary by location. The types of activities which the Environment Agency carries out on the main rivers in Southampton include:

- Operation and maintenance of flood risk assets owned by the Environment Agency
- Surveys of structures, such as culverts
- Visual condition assessment of channel and defence structures
- Regulating works (flood defence consenting and enforcement)

5.1.4 Regulating works on ordinary watercourses

As of the 6th April 2012, the powers of ordinary watercourse consent and enforcement were transferred from the Environment Agency to LLFA's. This means that any works (either temporary or permanent), that may alter or impact the flow or storage of water within an ordinary watercourse, including erection or altering a culvert, will require consent from SCC prior to any work being carried out.

Enforcement action may be taken where damaging or potentially damaging works have been undertaken without consent or are in contravention to an issued consent. The aims of enforcement in flood risk management are to ensure the proper flow of water in a watercourse and over the floodplain; the control of water levels and security of existing assets. To achieve these aims, enforcement action will be used to rectify unlawful and damaging, or potentially damaging works, always using a risk based approach.

Further information on the consenting process and enforcement is available on the [Ordinary Watercourse Consent webpage](#).

5.2 City-wide (strategic) actions

5.2.1 Implementation of completed flood plans & strategies

SCC have already completed a number of other flood related plans and strategies which assessed and outlined high level strategic options for managing certain types of flood risk. Rather than duplicating this work we have summarised the priority schemes from each below so this Strategy provides a complete overview of the flood risk management work we are taking forward over the lifetime of this Strategy.

5.2.1.1 SOUTHAMPTON (REDBRIDGE TO WOODMILL LANE) COASTAL FLOOD & EROSION RISK MANAGEMENT STRATEGY ("THE COASTAL STRATEGY")

The Coastal Strategy was developed to identify appropriate ways of delivering the high level policy within the North Solent Shoreline Management Plan (2010) by considering the sustainable options for managing tidal flood risk over the next 100 years along the frontage within Southampton from Redbridge, along the River Test and the west bank of the River Itchen to Woodmill Lane. The Coastal Strategy, which was finalised in January 2013, identifies short (2015), medium (2030) and long term (2060) options based on when implementation is likely be required to manage both the current and the increasing risk caused by sea level rise. The Coastal Strategy highlighted that the west bank of the River Itchen is the most vulnerable to tidal flood risk present day and the priority schemes identified to manage this risk include:

- River Itchen flood alleviation scheme – reduce tidal flood risk through the implementation of an interim height flood wall (with land raising on the redevelopment areas) along the west bank of the River Itchen from Ocean Village to Mount Pleasant Industrial Estate.

- Upper Itchen/St. Deny's property level protection scheme – reduce potential damages through the implementation of measures to prevent, as far as is practicable, water entering the properties in the areas at significant flood risk.

These schemes will be taken forward over the next 5 years, provided that suitable funding can be secured.

There are additional schemes identified in the Coastal Strategy that aim to address the increasing tidal flood risk over the medium and long term. The most significant is the preferred option to develop a continuous strip of raised land through gradual redevelopment of the waterfront as sites become available to eventually replace the proposed interim height floodwall along the frontage from Ocean Village to the Mount Pleasant Industrial Estate. The likely implementation of any required schemes identified along the remaining frontages from 2030 and beyond will depend on the actual sea level rise experienced and projected future rise based on the most up-to-date information at the time.

The identified preferred options for the frontage over different time periods can be found in the final Coastal Strategy documents which are available to view/download from the [Southampton Coastal Strategy webpage](#).

5.2.1.2 SOUTHAMPTON SURFACE WATER MANAGEMENT PLAN (“SWMP”)

The SWMP was developed to consider the most sustainable options for managing surface water flood risk within Southampton. The SWMP identified eight high risk hotspot areas and the feasibility of options for reducing flood risk for the following areas are currently being assessed:

- Lower Tanners Brook catchment
- Rolles Brook catchment

If an identified scheme(s) are found to be feasible they will be taken forward over the next 2-5 years, provided that suitable funding can be secured.

The final SWMP is available to view/download from the [Flood Risk Management webpage](#).

5.2.2 Spatial / land use planning

The proposed scale of development in Southampton from 2010 to 2026 will require 12,600 new homes, 162,100 sq m of offices and 65,700 sq m retailing (non food) to be delivered within the city. It will not be possible to deliver these targets without locating some development within areas at risk of flooding. However, spatial/land use planning and development can play an important role in helping to mitigate the potential impacts of flood risk and contribute to reducing the risk. A range of policies (both national and local) already exist to ensure new development takes account of flood risk, provides appropriate mitigation measures on the immediate site, does not increase flood risk elsewhere and reduces flood risk where opportunities exist. These policies are implemented through the planning process which is managed by the Development Management department within SCC. Further local information/guidance for developers on the flood risk they need to consider and how they should approach the management of it is available on the [Development & Flood Risk webpage](#).

Given the identified surface water flood risk outlined in Section 3, it is necessary that the approach to drainage within new developments is strengthened by introducing a system of targets for reducing and controlling surface water runoff from future development sites.

5.2.2.1 SUSTAINABLE DRAINAGE SYSTEMS

In accordance with policy CS20 (Tackling and Adapting to Climate Change) within the Southampton Core Strategy (2011) and Section 10 (Meeting the challenge of climate change, flooding and coastal change) of the National Planning Policy Framework, new developments

should incorporate Sustainable Drainage Systems (SuDS) instead of (or in addition to) conventional piped systems to manage surface water runoff from development sites.

Drainage should be considered at the outset of the design process when developing a site (this includes Greenfield and Brownfield sites), so that opportunities for incorporating sustainable drainage and maximising their potential multiple benefits are able to be realised. As such, it is important that details of proposals for site drainage are submitted along with planning applications to evidence that it has been considered at the appropriate stage. The level of drainage detail required is applicable to the type of application (see Table 5-1).

Table 5-1: Drainage design detail to be submitted at planning application stage

Type of application	Drainage design required
Outline planning application	Outline drainage design
Full planning application	Detailed drainage design

To assist in managing surface water flood risk in Southampton it will be a requirement for new developments to meet the following standards in relation to surface water runoff from the site to minimise the potential impacts from climate change:

Minor planning applications (1 - 9 number of dwellings)

For brownfield sites there must be no increase in volume or peak discharge from the site prior to redevelopment but development should aim to reduce the post development runoff by the greatest percentage rates and volumes that is possible in the context of cost, technical feasibility, viability and other planning objectives. Greenfield runoff rate and volumes apply for all other sites.

Major/large major planning applications (10+ number of dwellings)

For brownfield sites there must be a reduction in the post development runoff by the greatest percentage rates and volumes that is possible in the context of cost, technical feasibility, viability and other planning objectives. Development should aim to reduce volumes by 30% and limit the peak discharge from the site to as close to 5 l/s/ha as possible, unless there are overriding reasons (which must be clearly demonstrated) why they can't be achieved. Greenfield runoff rate and volumes apply for all other sites.

Any SuDS features are expected to be designed where possible to provide natural removal of pollutants and sediments to improve the quality of surface water discharge and enhance amenity and biodiversity within the locality. Well-designed SuDS can help enhance the existing green infrastructure network within the City which will work towards delivery of the aspirations within existing policy such as the Core Strategy (2011) and the Green Spaces Strategy (2008), and future policy such as the draft City Centre Action Plan.

5.2.3 Joint working / Duty to co-operate

As highlighted in Section 4 (Roles and responsibilities) there are many different organisations and groups who have an involvement with flood risk management activities within Southampton. Therefore, it is imperative that SCC works with others to provide a co-ordinated approach to managing flood risk within the City and across our boundary.

5.2.3.1 CO-ORDINATED INTERNAL APPROACH

Within SCC there are a number of different departments who have a role in helping to manage flood risk ranging from day-to-day activities to strategic planning across the City (see Section 4.2). To co-ordinate our flood risk management activities there is an Internal Flood Board which meets every quarter.

5.2.3.2 SOUTHAMPTON FLOOD BOARD

In order to assist with the co-ordination of flood risk management within Southampton, a formal Joint Flood Management Board ('Southampton Flood Board') was established in 2008, the purpose of which is to co-ordinate flood risk management across the various agencies in Southampton with the aim of reducing the probability and consequences of flooding in the city. The Southampton Flood Board meetings are held every quarter. An overview of the composition of the Flood Board is outlined in Figure 5-3.

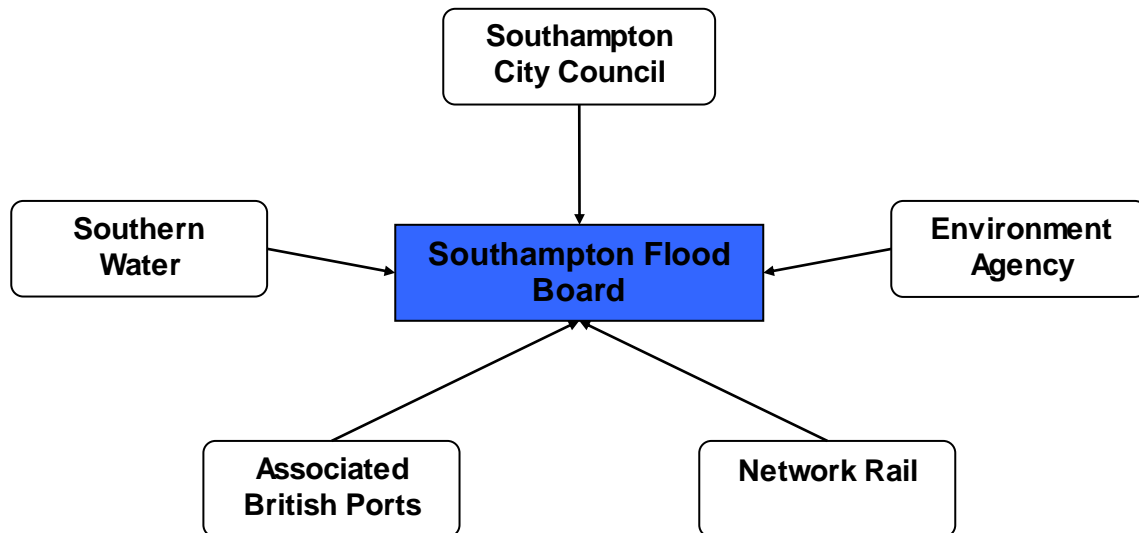


Figure 5-3: Southampton Flood Board composition

5.2.3.3 HAMPSHIRE STRATEGIC FLOOD GROUP

To ensure co-ordination and co-operation with our neighbouring LLFA, SCC engages with the Hampshire Strategic Flood Group which is organised by Hampshire County Council. Other organisations which engage with the group include Portsmouth City Council, Isle of Wight Council, Environment Agency, Southern Water and Hampshire Fire & Rescue. Group meetings are held on a regular basis.

5.2.4 Improve our knowledge & understanding of flood risk

5.2.4.1 GROUNDWATER

It has been identified that our current knowledge and understanding of groundwater within the City and the potential risk it poses is limited. In order to improve our knowledge base a network of monitoring stations across the City should be established in order to develop a thorough understanding of the temporal and spatial variations in groundwater levels. To achieve this it will be necessary to identify opportunities for installation of monitoring stations through other flood risk management related projects.

5.2.4.1 ORDINARY WATERCOURSES

Although the flood risk from ordinary watercourses is not deemed to be as significant as that from main rivers it is still important that we have a thorough understanding of it as they form an important part of the drainage network within the City. In order to improve our knowledge base it will be necessary to identify opportunities for monitoring flows within ordinary watercourses and where the potential risk deems it necessary, complete further modelling of the network where this would improve our understanding of the potential flooding pathways.

5.2.4.2 IMPROVE RECORDING OF FLOODING INCIDENTS

To date the record of flooding incidents has not been consistent or highly accurate and this needs to be improved to help build up a better understanding of the flood risk issues that are being experienced within the City so we can strategically identify the high risk areas, correlate these with the various modelling outputs and try to prioritise and manage these risks accordingly.

5.2.5 Raise awareness of flood risk

Prior to developing the Strategy SCC conducted a short online survey, distributed via email through existing communication channels, to get a snapshot of the level of awareness of flood risk within those who live and work in Southampton. A total of 86 responses were received over the course of a week. The headline results from the survey are presented below.

Do you feel that Southampton is at risk of flooding?

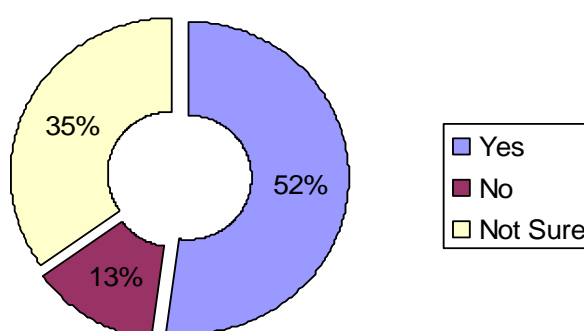


Figure 5-4: Survey response – level of awareness

Only 9 people reported to have been impacted by flooding in the past ten years. Of the 10 reported incidents, 2 were outside Southampton and 7 of the 8 experienced within the City, caused local roads to become impassable.

78 respondents felt they needed more information, although the type of information needed varies (see Table 5-2). Only 8 respondents felt they did not need any further information on flood risk.

Table 5-2: Survey response – type of information requested

Do you feel you need more information on.....	Number of positive responses
Areas of Southampton which are at risk of flooding	70
Information on the work being carried out in Southampton to prevent flooding	58
Flood warning services	45
Advice on how householders can prepare for a flooding incident	39
Information on the different types of flooding	38
On what different organisation's responsibilities are in relation to flooding	36
Advice on how businesses can prepare themselves for a flooding incident	13

When asked to consider their role in relation to flooding the responses were very positive (see Table 5-3)

Table 5-3: Survey response – individual role in relation to flooding

When thinking about flooding, I see it as my role to:	Number of positive responses
Help my neighbours in the event of a flood	64

Sign up to available warning systems	54
Prepare a flood plan for my home or business	40
Volunteer to help out during a flood event	33
Install flood protection for my home/ business	27
Let the council deal with it	20
Do Nothing	6
Start a local flood group	3

Although the results may not be highly representative of the entire population of Southampton it gives us an indication that more needs to be done to raise awareness and improve the information available on flood risk in Southampton. The following actions have been identified to try to address this issue.

5.2.5.1 IMPROVE COMMUNICATION & INVOLVEMENT

A number of measures have been identified to work towards improving communication and involvement, including:

- Targeted communication with riparian landowners to inform them of their responsibilities under the Land Drainage Act (1991).
- During scheme development, undertake targeted and City wide engagement to get as many residents involved at a meaningful stage in the process.
- Utilise social media and the website to provide up-to-date information on the development of flood risk management schemes.
- Utilise social media to inform the public about adverse weather forecasts and flood warnings.
- Work with the Environment Agency/Emergency Planning department to distribute advice about preparing for flooding incidents to those communities at significant risk of flooding.
- Improve and regularly update the SCC flood risk web pages so they are more informative and easier to navigate.

5.2.6 Improve existing drainage infrastructure & rivers/watercourses with available resources

5.2.6.1 PRIORITISE DRAINAGE WORKS (CLEANSING, MAINTENANCE AND IMPROVEMENT) AT HOTSPOT FLOOD RISK LOCATIONS THROUGHOUT THE CITY

Given that resources are limited, it is our intention to prioritise the available resources for cleansing, maintaining and improving highway drainage infrastructure at locations within the city which have been identified as hotspots due to either recurring problems and/or potential for significant impact. Implementation of this prioritisation will be carried out in accordance with guidance provided in the 'Guidance on the management of highway drainage assets' document (DfT, 2012).

5.2.6.2 IDENTIFY OPPORTUNITIES FOR IMPROVING RIVERS/WATERCOURSES

Where funding opportunities can be pursued SCC will work with other risk management authorities, where applicable, to deliver improvements to watercourses for the purposes of achieving multiple benefits which might include, reducing flood risk, improvements to habitats, increased amenity value and delivering Water Framework Directive objectives. The focus for pursuing any opportunities will largely focus on the watercourses where SCC is the riparian landowner.

5.2.7 Designation of structures/features

As a LLFA, under Schedule 1 of the F&WMA, SCC has the power to designate structures or features which affect flood and coastal erosion risk and are not directly maintained by any of the designating authorities (in Southampton the designating authorities are SCC and the Environment Agency). Designation is a form of legal protection or status which is expressed as

a legally binding notice served by the designating authority on the owner of the feature and is protected as a local land charge. Designation is intended to address and mitigate the risk of the alteration or removal of a structure or feature that is situated on private land and which contributes to flood or coastal erosion risk management

The structures and features (natural or man-made) eligible for designation will include a wide range of things from garden walls and other structures or buildings to raised areas of land and embankments which, in the opinion of the designating authority, affects a flood or coastal erosion risk, but which were not necessarily designed or constructed for that purpose.

There are four conditions that must be satisfied to enable a structure or feature to be designated, which are listed in Table 5-4.

Table 5-4: Conditions for designation of structures/features

Condition	Explanation
Condition 1	that the designating authority thinks the existence of the structure or feature affects a flood or coastal erosion (or both) risk.
Condition 2	that the designating authority has flood or coastal erosion risk management functions in respect of the risk being affected.
Condition 3	that the structure or feature is not already designated by another designating authority.
Condition 4	that the owner of the structure or feature is not a designating authority.

Designation of structures/features in Southampton will be directed, using a risk-based approach, to those areas where the considered flood risk and vulnerability to potential damage justifies such intervention. When a structure or feature is identified as potentially affecting flood or coastal erosion risk the designating authority will carry out an initial assessment on its current status to determine if the flood risk and vulnerability to potential damage is sufficient to pursue designation. The designation process will be implemented in accordance with the guidance in the 'Designation of structures and features for flood and coastal erosion risk management purposes - Information note' publication (Defra, 2012).

5.3 Localised actions

5.3.1 Property level protection schemes

Where residential properties are at significant risk of flooding, or have suffered internal flooding in their property in the past, and are unlikely to benefit from a wider flood alleviation scheme SCC will work with the homeowners/residents to implement a property level protection scheme, where national grants can be attracted to finance delivery.

5.3.2 Support establishment of local community flood groups

If local residents express an interest in establishing local community flood groups, SCC will support their establishment through provision of advice, guidance and flood risk information, attendance at group meetings as requested, providing links to other risk management authorities and internal departments.

5.3.3 Retrofitting SuDS schemes

Where opportunities (and funding) become available SCC will work with other risk management authorities to retrofit SuDS schemes to reduce flood risk, improve the quality of surface water runoff and enhance amenity/biodiversity through the scheme where feasible.

5.4 Completed schemes

5.4.1 Southampton City Golf Course Flood Alleviation Scheme (Holly Brook)

The Environment Agency has implemented a flood alleviation scheme on the Holly Brook watercourse within the Southampton City Golf Course to reduce the risk of flooding to more than 90 properties and improve the habitat for local wildlife in the area. This work was carried out in partnership with Southampton City Council and Mytime Golf.

At Southampton City Golf Course, the culvert (the pipe under the ground through which the Holly Brook flowed), has been replaced by a new natural channel to carry water. This means that the Brook can store more water when water levels are high, such as during heavy rain. An embankment was constructed at the southern end of the golf course to store flood water, reducing the risk of flooding to the houses further downstream.

As well as reducing the risk of flooding, this work will greatly improve the habitat for local wildlife. The sides of the new, natural channel have been seeded and planted with vegetation to attract a wide range of wildlife.

6. Environmental impacts of the actions

A number of assessments have been undertaken to identify how the Strategy contributes to the achievement of wider environmental objectives. These assessments are available as appendices to the Strategy but they have been summarised in the sections below.

6.1 Strategic Environmental Assessment

6.1.1 Background

The European Directive 2001/42/ED (the 'SEA Directive') was adopted in 2001 and transposed into English legislation by the Environmental Assessment of Plans and Programmes Regulations in 2004. The Directive aims to increase the level of protection for the environment by integrating environmental considerations into the preparation and adoption of plans and programmes with the view of promoting sustainable development. An SEA is required for all plans and programmes which are 'subject to preparation and/or adoption by an authority at national, regional or local level'.

The SEA is broken down into five stages to ensure that all the requirements of the Directive are met, with stage A represented by the Scoping Report, and stages B to E covered in the Environmental Report. The Scoping Report was completed in December 2012 and sent out to the statutory consultees (Natural England, Environment Agency and English Heritage) for a 6 week consultation period.

6.1.2 The Assessment Results

In order to measure the likely environmental performance of the LFRMS, the SEA objectives have been assessed against the objectives from the LFRMS and the options for flood risk management contained within the Strategy. Following the assessment, it is clear that each of the eight LFRMS objectives will achieve positive impacts, with no damage either to the natural or built environment. The assessment results show that the Strategy is likely to provide benefits to all of the receptors listed under each SEA topic. Although some of the benefits achieved are likely to be indirect, the effects still remain positive.

The second assessment carried out was the assessment of the actions set out in the LFRMS. For this assessment each action was taken forward and assessed against the SEA objectives alongside three alternative options for the management of flood risk. This assessment returned a mixed outcome, from severely negative environmental impacts where a 'do nothing' option was put forward, to major positive outcomes with many multiple benefits achieved, for example through the implementation of Sustainable Urban Drainage Systems (SuDS) which allow for the control of runoff within a site, whilst providing additional benefits such as habitat creation and enhancement of the local environment. Only options where positive outcomes can be achieved have been recommended by the SEA for consideration in the Southampton Local Flood Risk Management Strategy.

6.1.3 Monitoring

Although it is unlikely that the Southampton LFRMS will have any adverse effects on the environment, it is a requirement of the SEA Directive for all impacts to be monitored. Monitoring of the LFRMS will enable the identification of any unforeseen adverse effects and allow Southampton City Council to undertake any appropriate remedial works required, as well as recording the success of any enhancement schemes implemented.

The Southampton LFRMS has been developed to manage flood risk over the next 5 years; therefore a review of the Strategy will provide a good opportunity to also review any changes to the baseline data. Should a review of the strategy be required sooner, the environmental baseline shall also be reviewed in order to keep it up-to-date. The suggested monitoring framework is set out in the SEA Environmental Report.

6.2 Habitats Regulations Assessment

6.2.1 Background

Under the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) it is necessary to undertake an appropriate assessment of a plan or project to determine whether it will have a “likely significant effect” (LSE) on sites designated for their nature conservation interest at an international level. This Directive has been transposed into national laws through the Conservation of Habitats and Species Regulations 2010 (Habitats Regulations 2010).

6.2.2 Screening conclusion

The conclusion of the screening assessment is that the actions from the LFRMS, either alone or in-combination with other existing plans/projects, are not likely to significantly impact the international sites. However, there are three actions (which will work towards delivering the objectives that were identified within the ‘depends on how the plan is implemented’ category) that will require further HRA screening at the project-level to assess the alone and in-combination effects on the international sites. These actions include:

- Implementation of existing flood risk management plans & strategies (flood risk management schemes)
- Improve existing drainage infrastructure
- Retrofitting SuDS schemes

6.3 Water Framework Directive Assessment

6.3.1 Background

The Water Framework Directive (WFD) was passed into UK law in 2003. The overall requirement of the Directive is that all river basins must achieve “good ecological status” by 2015 unless there are grounds for derogation. It also requires that Environmental Objectives be set for all waterbodies; the River Basin Management Plans (RBMPs) set out the objectives for the waterbodies within the study area.

The WFD contains five Environmental Objectives, which aim to prevent a negative change to the status of water bodies, which could be caused by a deterioration of any of the biological, physico-chemical or hydromorphological Quality Elements. Actions/measures which can physically affect waterbodies need to be assessed against WFD objectives to ensure that they a) achieve no deterioration of water body status, and b) do not prevent the water body from reaching Good Ecological Potential (GEP) or Good Ecological Status (GES).

6.3.2 Preliminary screening assessment conclusion

The preliminary screening assessment concluded that overall the actions are unlikely to have any significant adverse impacts on the waterbodies present in the LFRMS area and given the current level of detail on specific actions a detailed assessment is not required on any of the actions at this stage.

The assessment concluded that the River Itchen Flood Alleviation Scheme will not require a detailed assessment as it is unlikely that any significant adverse impacts will result from

implementation of the scheme because the works are proposed within or behind the existing structures along the frontage.

The assessment concluded that any future proposals identified to manage surface water within the Tanners Brook/Holly Brook catchment may require a WFD preliminary screening assessment to be completed at the scheme level as there is insufficient information available at present to determine the potential impacts.

Three of the actions were identified as not likely to have any potential impacts because they are policies which only encourage activities and as such there are no identified schemes to be assessed at this stage. These actions include:

- Increased use of Sustainable Drainage Systems (SuDS) in new developments
- Improve watercourses
- Retrofitting SuDS schemes

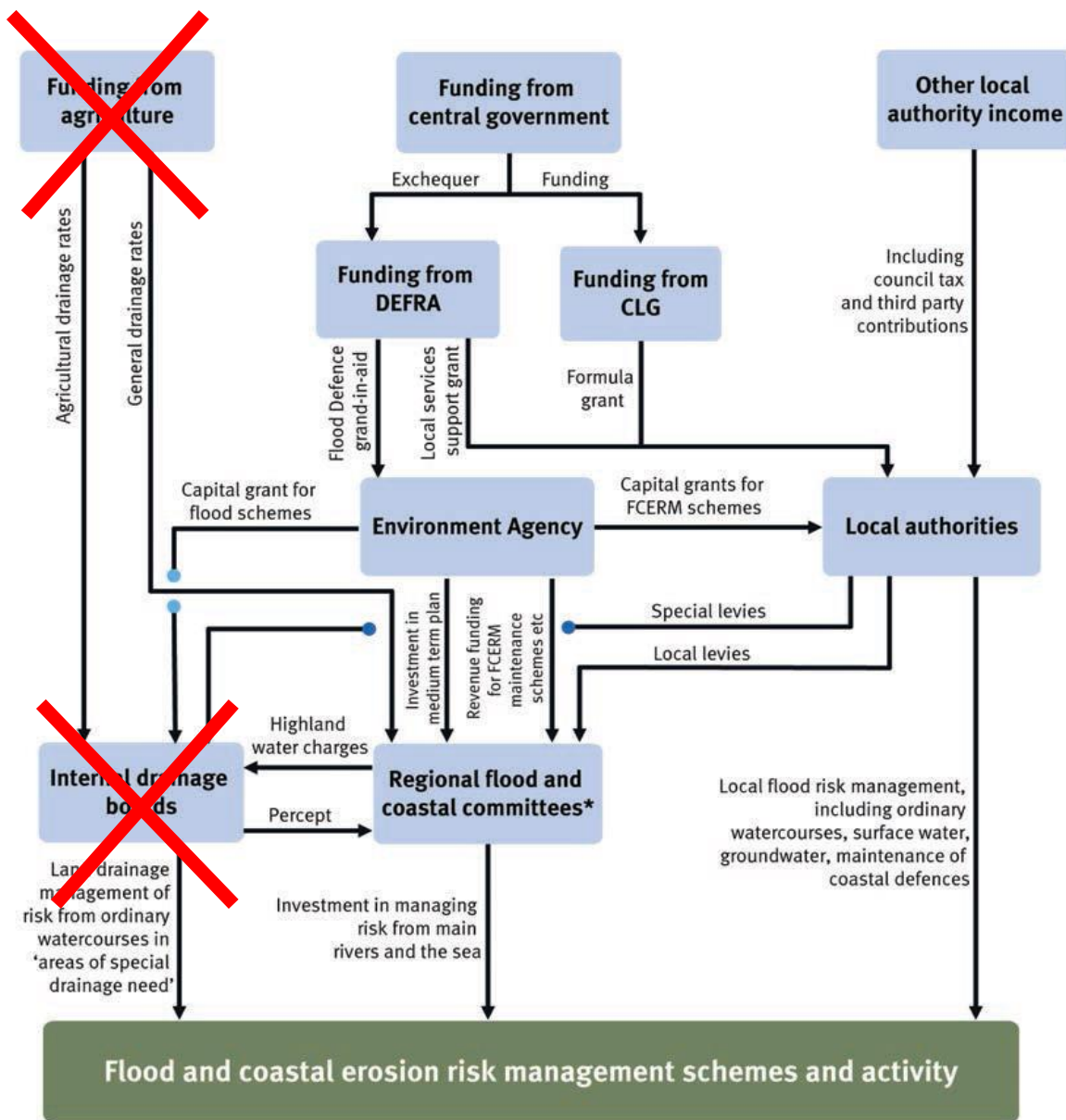
Any relevant schemes which are taken forward in the future to help deliver one (or more) of these actions may need to have a scheme level WFD preliminary screening assessment completed, dependent on the scheme location and proposed works.

7. Implementation

The implementation of the Strategy will require some form of resources, either as staff and/or direct financial resources. A number of the identified actions in Section 5 will be capable of being delivered within existing available resources but others will require additional financial resources.

7.1 Sources of funding

Since not all the actions will be able to be delivered within existing resources, SCC will have to seek additional funding. The current main sources of funding available are illustrated in Figure 7-1 (please note that there are no Internal Drainage Boards within the Strategy area so this avenue is not applicable to Southampton and has been crossed out in the diagram).



* Note the Environment Agency delivers flood risk management schemes and maintenance as approved by RFCCs

Figure 7-1: Funding streams (Adapted from the National Strategy, 2011)

It is likely that a number of different sources of funding will have to be explored, although this will be largely dependent on the cost of implementing the action. The various funding sources are summarised in the sections below.

7.1.1 Central government funding

Allocation of central government funding has recently changed to encourage communities to invest in local flood risk management projects from which they will benefit. This approach was developed to enable the national pot of money to go further and to enable greater input from local communities in the development and implementation of flood risk management schemes. Instead of providing the full cost towards a limited number of projects each year, the new approach makes funding available to any scheme that will deliver worthwhile benefits. The amount of funding made available for each scheme relates directly to the number of households protected, the damages being avoided plus environmental benefits, such as habitat creation or protection of designated habitats. If a proposed scheme does not qualify for full central government funding, local contributions are required to meet the shortfall and/or the cost of the scheme will need to be reduced. If local contributions are required these could be sought from those who are likely to benefit from the proposed scheme.

7.1.2 Regional funding

SCC is represented on the Southern Regional Flood & Coastal Committee (RFCC). Funding is raised by the RFCC through a levy which is placed on each LLFA in their region with payments supported by grants from central government. The RFCC is responsible for deciding how the levy is spent within the region each year. The levy can be used to support locally important flood risk management projects that do not attract full central government funding.

7.1.3 Local funding

Local sources of funding can include direct contributions from the council budgets or through Community Infrastructure Levy (CIL) funds (once the CIL is in place within Southampton). The CIL is a levy on new development which can be charged by the council to support the cost of delivering required infrastructure to support the development. CIL funds could be used to contribute to flood risk management schemes which have strategic and/or multiple benefits to the wider community.

7.1.4 Other sources

Other sources of funding and/or assistance that could be considered include:

- Local Enterprise Partnership
- National lottery grants
- European Union funding streams
- Private beneficiaries (e.g. utility companies, landowners etc.)
- Business rate supplements
- Local fundraising
- Involvement from the voluntary sector

7.2 Delivery plan

A summary of the actions (and associated objective they contribute to delivering), how and when they are expected to be implemented, the lead and supporting risk management authorities associated with each action, the estimated cost banding and benefits to be achieved and potential sources of funding required for delivery are provided in the delivery plan in Table 7-1.

The objective to 'identify all available funding mechanisms to enable delivery of flood risk management interventions' has not been specifically identified in the delivery plan but it will be delivered through a number of different actions under the other objectives which will require a form of funding to enable implementation.

Table 7-1: Strategy delivery plan

Objective	Action	How?	Lead risk management authority	Supporting partner(s)	Cost	Benefits	Potential funding source(s)	When?
Improve the knowledge and understanding of all sources of flood risk across the City.	Investigate flooding incidents	Follow the established procedure and guidelines to investigate relevant flooding incidents.	SCC		Within existing staff resources	Identify source of flooding; Identify & notify relevant risk management authorities.	N/A	Ongoing
	Develop & maintain a register of flood risk assets	Populate asset register with information on existing infrastructure and who owns and/or is responsible for maintaining it.	SCC	EA	Within existing staff resources	Greater understanding of location, ownership & status of the flood risk assets within the City.	N/A	Ongoing
		Identify where further survey/site investigation is required.	SCC		Within existing staff resources		N/A	
Improve knowledge & understanding of flood risk	Identify opportunities to monitor groundwater through other projects.	SCC		Within existing staff resources	Develop a better understanding of groundwater & the risk it poses.	National, local, other	Ongoing	
Work in partnership with other authorities who have a role in flood risk management, including across administrative boundaries.	Joint working	Continued co-ordination of the internal approach across SCC departments.	SCC		Within existing staff resources	Internal co-ordination of flood risk management activities.	N/A	Ongoing
		Continued co-ordination and partner involvement with Southampton Flood Board.	SCC	ALL	Within existing staff resources	Develop & continue partnership working within the City.	N/A	Ongoing
		Continued involvement with the Hampshire Strategic Flood Group.	SCC		Within existing staff resources	Develop & continue partnership working across political boundaries.	N/A	Ongoing
		Identify opportunities to work in partnership with other authorities and organisations.	ALL		Within existing staff resources	Develop partnership working to provide efficiencies in managing flood risk.	N/A	Ongoing
Identify ways to increase public awareness of the flood risk across the City.	Raise awareness of flood risk	Improve communication & involvement through a number of measures.	ALL		Within existing staff resources	Best available information is provided for the public to take appropriate action to protect themselves; Assist in getting political acceptance & buy in & that political influence is used positively to support & fund flood risk actions; Local flood risk can be given due consideration during undertaking of other council functions.	N/A	Commence 2014
Identify ways of improving support for people at direct risk to promote appropriate individual and community level planning and action.	Property level protection schemes	Identify other areas within Southampton which might require & benefit from development of a PLP scheme.	SCC	EA, SW	Within existing staff resources	Evidence will be gathered which can support future grant applications; Develop increased awareness of flood risk.	N/A	Ongoing
		Explore & secure funding opportunities to pursue any identified schemes.	SCC	EA, SW	Within existing staff resources		National, local, other	As required
	Support establishment of local flood groups	Facilitate setting up local flood groups.	SCC	EA, SW	Within existing staff resources		N/A	As required
Ensure that planning decisions are properly informed by flooding issues so future development assists with reducing and mitigating flood risk.	Increased use of Sustainable Drainage Systems (SuDS) in new developments	Implement the targets for the use of Sustainable Drainage Systems (SuDS) in new developments to reduce runoff volume and peak discharge where possible.	SCC	ALL	Within existing staff resources	Reduce surface water flood risk; Improve quality of runoff from sites; Increased amenity & biodiversity within developments.	N/A	Ongoing
Identify appropriate measures which reduce the likelihood of harm to people and damage to the economy and the environment.	Implementation of Southampton Coastal Strategy priority schemes	Explore & secure funding opportunities to pursue schemes.	SCC	EA, SW	Within existing staff resources	Reduce flood risk; Develop increased awareness of flood risk.	N/A	2013 - 2016
		Develop preliminary study.			Low-Medium			
		Develop detailed scheme design.			Medium			
		Scheme implementation			High			
	Identification of priority surface water management schemes within hotspot catchments	Identify feasible options for managing surface water.	SCC	EA, SW	Within existing staff resources	Reduce flood risk; Increased amenity value; Potential to deliver WFD objectives; Develop increased awareness of flood risk.	N/A	2014 - 2019
		Explore & secure funding opportunities to pursue feasible schemes.			Low-Medium			
	Develop detailed scheme design & implementation.			High		National, local, other	2014 - 2019	
							As funding becomes available	
	Improve existing drainage infrastructure	Partners to develop maintenance schedules to target areas at higher flood risk locations.	ALL		Low (within existing resources)	Reduce flood risk; Improve traffic management through reduced flooding disruptions.	N/A	Ongoing

Objective	Action	How?	Lead risk management authority	Supporting partner(s)	Cost	Benefits	Potential funding source(s)	When?
Maintain, and improve where necessary, flood risk management infrastructure and systems to reduce flood risk.		Prioritise highway drainage works (cleansing, maintenance & improvement) at hotspot flood risk locations.	SCC	SW	Low (within existing resources)		N/A	Ongoing
	Maintenance activities on main rivers	Implementation of required maintenance schedules for EA FRM assets and routine inspection of relevant infrastructure.	EA		Within existing staff resources	Reduce flood risk	N/A	Ongoing
	Improve rivers/watercourses	Identify & pursue opportunities to secure funding to make improvements to the rivers & watercourses.	EA, SCC	ALL	Low-Medium	Reduce flood risk; Improvement to habitats; Increased amenity value; Opportunities for integrated water management and multiple benefits will be discovered; Potential to deliver WFD objectives.	National, local, other	Ongoing
	Regulation of works on rivers	Implementation of consenting & enforcement activities for regulating works on main rivers and ordinary watercourses.	EA, SCC		Within existing staff resources	Reduce flood risk; Compliance with WFD objectives.	N/A	Ongoing
	Designation of features/structures	Apply a risk-based approach to designate features/structures which affect flood & coastal erosion within the City.	SCC, EA		Within existing staff resources	Reduce flood risk; Develop increased awareness of flood risk.	N/A	Ongoing
	Retrofitting SuDS schemes	Identify opportunities to retrofit SuDS schemes to areas for multiple benefits to include reducing surface water flood risk.	ALL		Low – medium	Reduce surface water flood risk; Improve quality of runoff from sites; Increased amenity & biodiversity within existing developments.	National, local, other	As opportunities & funding become available

8. Preparing for & during a flood event

Since it is not possible to prevent all flooding, it is important to be prepared for a flood event, particularly if you live in an area identified at risk of flooding. Please note that it is the responsibility of the property owner to take appropriate action to protect their property and possessions from flooding.

8.1 How do I prepare for a flood event?

There are a number of things which you can do to prepare for a flood event, including:

- Understand the potential flood risk which faces your property and the local community.
- Secure suitable insurance to cover your building and contents.
- Where the flood risk is associated with tidal and/or main river sources sign up to the Environment Agency's flood warning service to receive free flood warnings direct via telephone, mobile, email, text message or fax. Familiarise yourself with the flood warning codes (see Table 8-1) and flood warning zones (see Figure 8-1).

Environment Agency Flood Warning Service

Sign up to receive flood warnings online via the **Floodline Warnings Direct service** or phone **Floodline** on **0345 988 1188** to speak to someone. You can also download the free 'Flood Alert' app from the app store.



Flood Alert






Flooding Warning



Severe Flood Warning

Table 8-1: Environment Agency Flood Warning Codes

Code	What it means	When it's used	What to do
	Flooding is possible. Be prepared.	2 hours to 2 days in advance of flooding.	<ul style="list-style-type: none"> • Be prepared to act on your flood plan. • Prepare a flood kit of essential items. • Monitor local water levels, weather reports and the flood forecast on Environment Agency's website.
	Flooding is expected. Immediate action required.	Half an hour to 1 day in advance of flooding.	<ul style="list-style-type: none"> • Move family, pets and valuables to a safe place. • Turn off gas, electricity and water supplies if safe to do so. • Put flood protection equipment in place. • Protect yourself and help others.
	Severe flooding. Danger to life.	When flooding poses a significant threat to life.	<ul style="list-style-type: none"> • Stay in a safe place with a means of escape. • Be ready should you need to evacuate from your home. • Co-operate with the emergency services. • Call 999 if you are in immediate danger.
Warning no longer in force	No further flooding is currently expected for your area.	When river or sea conditions begin to return to normal.	<ul style="list-style-type: none"> • Be careful. Flood water may still be around for several days. • If you've been flooded, ring your insurance company as soon as possible.

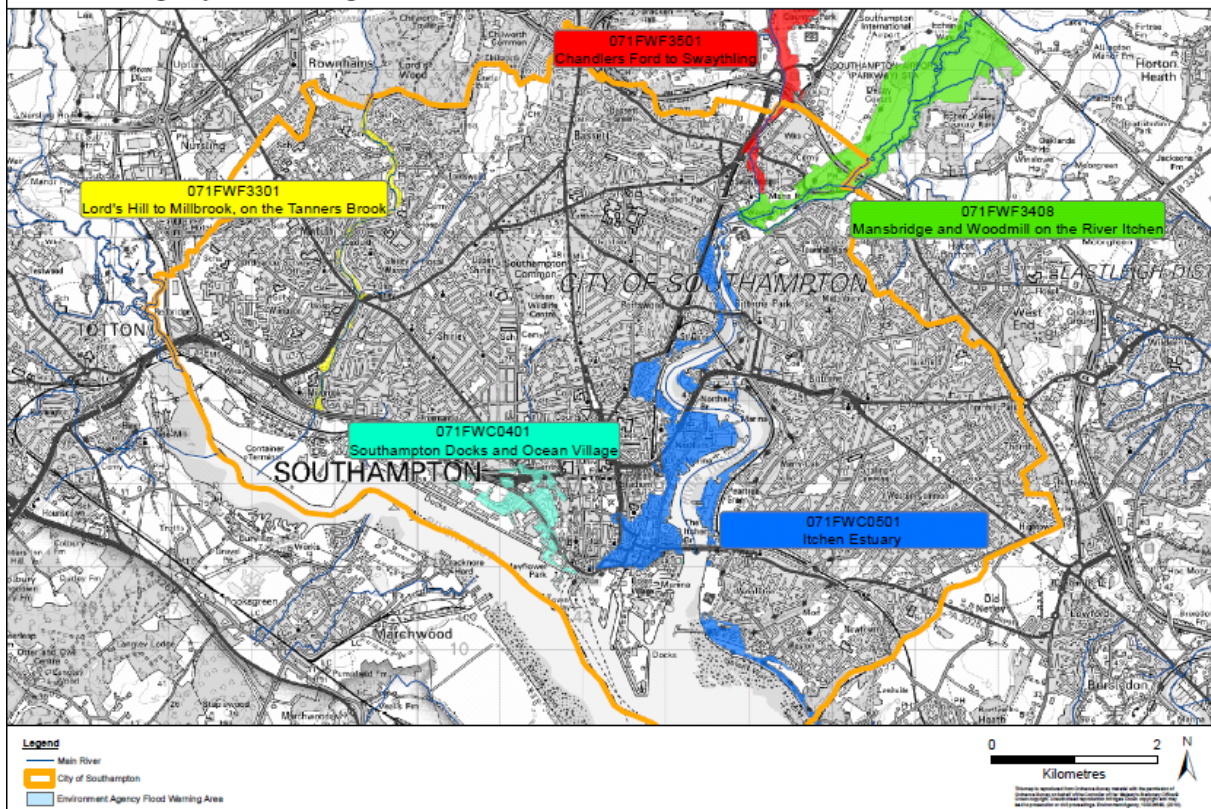


Figure 8-1: Environment Agency Flood Warning Zones

- For other sources of flood risk (surface water, groundwater & ordinary watercourses) keep up-to-date with weather reports and alerts/warnings issued by the [Met Office](#) and be aware of the state of the tides for potential tide locking scenarios when heavy downpours coincide with high tides. Familiarise yourself with the Met Office weather warning states (see Figure 8-2).

Met Office Warnings

Through the National Severe Weather Warning Service (NSWWS), the Met Office is responsible for issuing alerts and warnings of severe weather which has the potential to cause disruption.

- Alerts** which indicate the risk of severe weather over the next 2 to 5 days.
- Warnings** which indicate the risk of severe weather during the next 24 hours.

Both Alerts and Warnings aim to give an indication of both the **impact** the expected weather might have and the **likelihood** of its occurrence. Before issuing a warning, the Met Office will make an assessment of the likelihood of severe weather, classifying it as **Very Low, Low, Medium** or **High**. An assessment of the expected impact will also be made and the potential impact will also be classified as **Very Low, Low, Medium** or **High**.

	<p>NO SEVERE WEATHER EXPECTED <i>N.B. This does not preclude some minor impacts.</i></p>
	<p>BE AWARE <i>Remain alert and ensure you access the latest weather forecast.</i></p>
	<p>BE PREPARED <i>Remain vigilant and ensure you access the latest weather forecast. Take precautions where possible.</i></p>
	<p>TAKE ACTION <i>Remain extra vigilant and ensure you access the latest weather forecast. Follow orders and any advice given by authorities under all circumstances and be prepared for extraordinary measures.</i></p>

Figure 8-2: Met Office weather warning/alert codes

- Know how to turn off your gas, electricity and water mains supply.
- Prepare a flood kit of essential items and keep it in a place which is easily accessible should you need it.
- Regularly clear gutters/drains of any debris provided it is safe to do so.

For further advice on preparing for a flood event read the Environment Agency's ['What to do before, during and after a flood'](#) publication.

8.2 What should I do during a flood event?

During a flood event, you should focus on the safety of yourself and your family.

Upon hearing of a flood warning/weather warning:

- Move your valuable possessions to a higher level.
- Protect doorways and air vents with sandbags to reduce water entry.
- Monitor weather reports and Environment Agency's website or call their Floodline on 0345 911 1188.

Flood warnings are broadcast on many local TV and radio stations during weather and traffic bulletins. In Southampton the following are used to broadcast warnings:

BBC Radio Solent: 96.1 FM
 Wave: 105.2 FM
 Heart FM: 96.7 FM / 97.5 FM
 Capital South Coast: 103.2 FM
 Breeze Radio: 107.8 FM

Should water enter your property:

- Be prepared to act quickly.
- Move possessions upstairs and stay upstairs (if possible).
- Turn off the gas, electricity and water supplies.
- If trapped in deep flooding stay by a window and call for help.
- Dial 999 if you or someone else is in danger.
- Cooperate with the emergency services and evacuate if told to do so.

On returning to your home:

- Do NOT turn gas or electricity back on until systems have been professionally inspected.
- Throw away food which has been in contact with flood water, along with all fridge and freezer food.

Flood water is dangerous:

- Just six inches (15 cms) of fast flowing water can knock you over.
- Two feet (61 cms) of water is enough to float a car.
- Flooding can cause manhole covers to come off, leaving hidden dangers.
- Culverts are dangerous when flooded.
- Look out for other hazards such as fallen power lines and trees.
- Be aware that bridges may be dangerous to walk or drive over when water levels are high.
- Do not let children play in flood water.
- Do not walk or drive through flood water.
- Do not walk on sea defences or riverbanks.
- Avoid contact with flood water as it may be contaminated but if this is unavoidable remember to wash your hands thoroughly afterwards.

8.3 What do the authorities do during a flood event?

During a flood event the relevant authorities and emergency services will work together to try to minimise the impact to people, with the welfare and safety of people being their number one priority. The level of response will depend on the severity and potential impact of the flooding incident.

The co-ordinated approach for the response by the relevant authorities prior to and during a flood event is set out within the Southampton Multi-Agency Flood Plan (2011) which has been developed by the SCC Emergency Planning Unit. An overview of the various levels of response is illustrated in Figure 8-3.

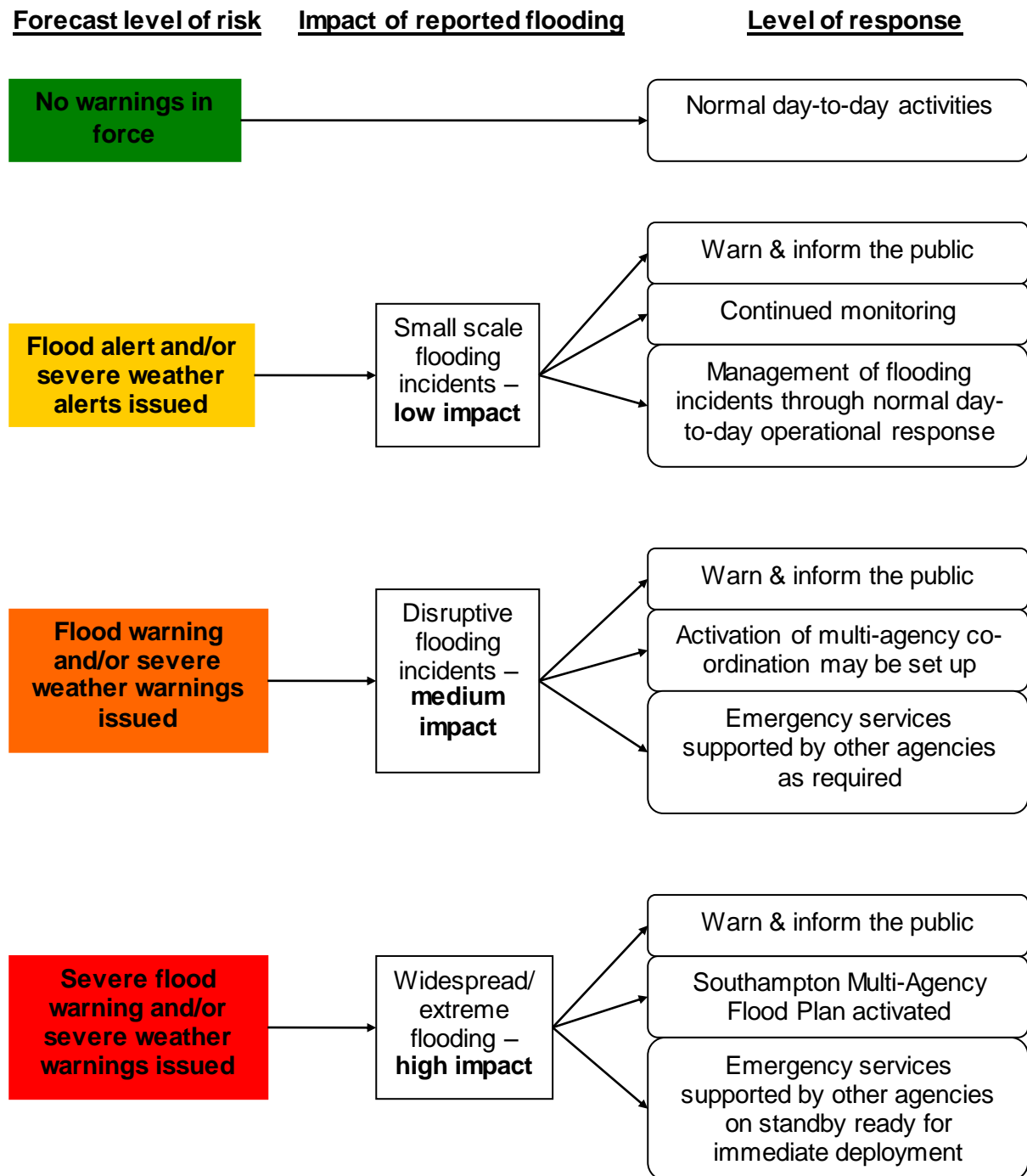


Figure 8-3: Levels of response to flood warnings and/or flooding incidents

During any flood event where the resources of the emergency services and supporting agencies are put under pressure it will be necessary to prioritise the resources depending on what is flooded or at risk of being flooded. Five receptor⁵ categories have been identified and prioritised within the Southampton Multi-Agency Flood Plan as outlined in Table 8-2.

Table 8-2: Prioritisation of receptor categories

Priority	Receptor	Response
1	People	Action to protect life
2	Houses	Action to protect life & property
3	Roads	Action to protect life & property
4	Commercial property	Possible action to protect property
5`	Gardens/other private land	No action

There are other factors that may influence the level of a response. Priority is likely to be given to the old, infirm, disabled and vulnerable when assisting people and to occupied residential property when protecting property. The classification of roads may be used in prioritising responses to road flooding and the protection of commercial property may depend on the risk of environmental pollution from stored chemicals etc.

The full unrestricted version of the Southampton Multi-Agency Flood Plan is available to view/download from the [Emergency Plans webpage](#).

⁵ A receptor is anything that can be impacted upon by flooding, such as people, buildings and the natural environment.

9. Monitoring and Review

Delivery of the Strategy will be managed by the Southampton Flood Board and progress will be reported to the board on a six-monthly basis for regular monitoring.

The delivery plan will be reviewed annually, and the Strategy as a whole will be subject to a five-yearly review process, including full public involvement, to ensure it is kept up-to-date, takes account of objectives achieved, and continues to maintain a focused forward programme at strategic and operational levels across all risk management authorities within the City.

SCC, as the LLFA will be responsible for ensuring that monitoring and reviews are undertaken accordingly, but the partnership as a whole will contribute to the review and refresh of the Strategy.