

## **Preliminary flood risk assessment: North Somerset District Council**

This addendum by North Somerset District Council (2017) updates the council's preliminary flood risk assessment report published in 2011. Read the addendum in conjunction with the [preliminary assessment report](#).

### **Addendum**

The preliminary flood risk assessment (PFRA) and flood risk areas (FRAs) for North Somerset District Council were reviewed during 2017, using all relevant current flood risk data and information.

North Somerset Council (NSC) is located in the southwest of England and borders the local authority areas of Bristol, Sedgemoor, Mendip and Bath and North East Somerset. NSC is a unitary authority which is approximately 375km<sup>2</sup> in size. More than two thirds of the district is rural. The majority of residents live in Weston-super-Mare, Portishead, Clevedon and Nailsea. The population within the entire district is around 210,000 based on the office of statistics 2015 mid-year estimate.

### **Past flood risk**

*Our understanding of flood risk within North Somerset has improved as a result of flooding that has occurred since 2011, however the priority order of communities at risk has not changed. Flooding that has occurred since 2011 has verified and confirmed our understanding of areas at risk of flooding*

*The level of risk within North Somerset does not meet the criteria of 'significant' risk for the purposes of identifying PFRA Flood Risk Areas.*

Flood event data is recorded through the Council's CONFIRM system, which provides a thorough and consistent approach. Flood event data is also collected from and shared with other risk management authorities through the Strategic Flood Management Board and Flood Operational Group.

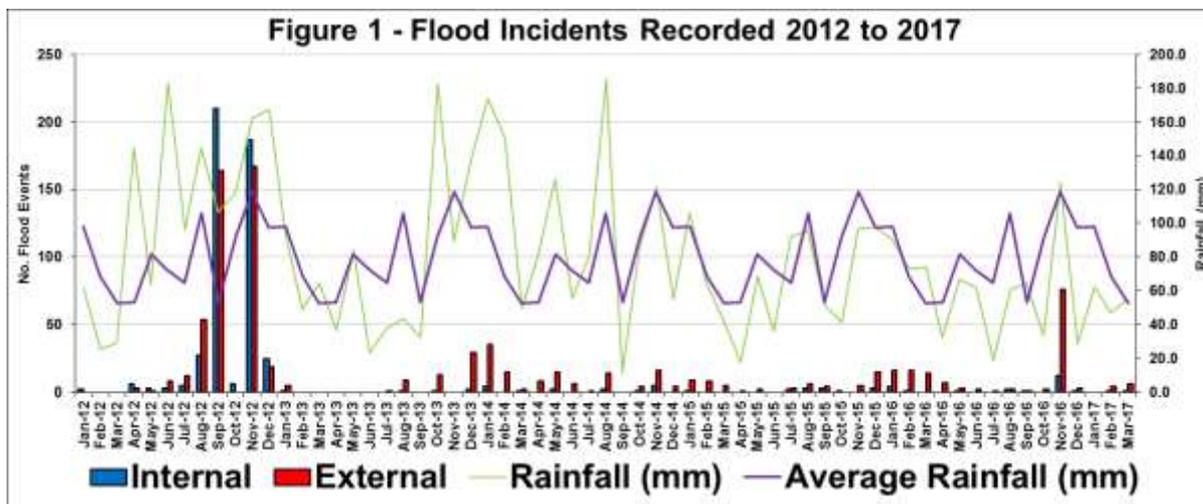
Data from significant flood events during 2012 and 2016 are included in the CONFIRM system and Flood Investigation Reports have been carried out for the 2012 flood events.

The Local Flood Risk Management Strategy has been published following a period of public consultation and includes a prioritised action plan for managing flood risk from local sources throughout North Somerset.

The Weston-super-Mare Surface Water Management Plan was published in 2015 and the latest datasets including the Environment Agency's Risk of Flooding from Surface Water map and latest Flood Zone maps have been uploaded to our GIS mapping system and are used to help inform our plans, policies and decision making.

Information on floods since 2011 has been compiled and significant recorded flood events are listed and described in detail in Annex 1.

Figure 1 (overleaf) shows the monthly number of reports of internal and external property flooding received by the Council between January 2012 and March 2017 along with average and total monthly rainfall depths.

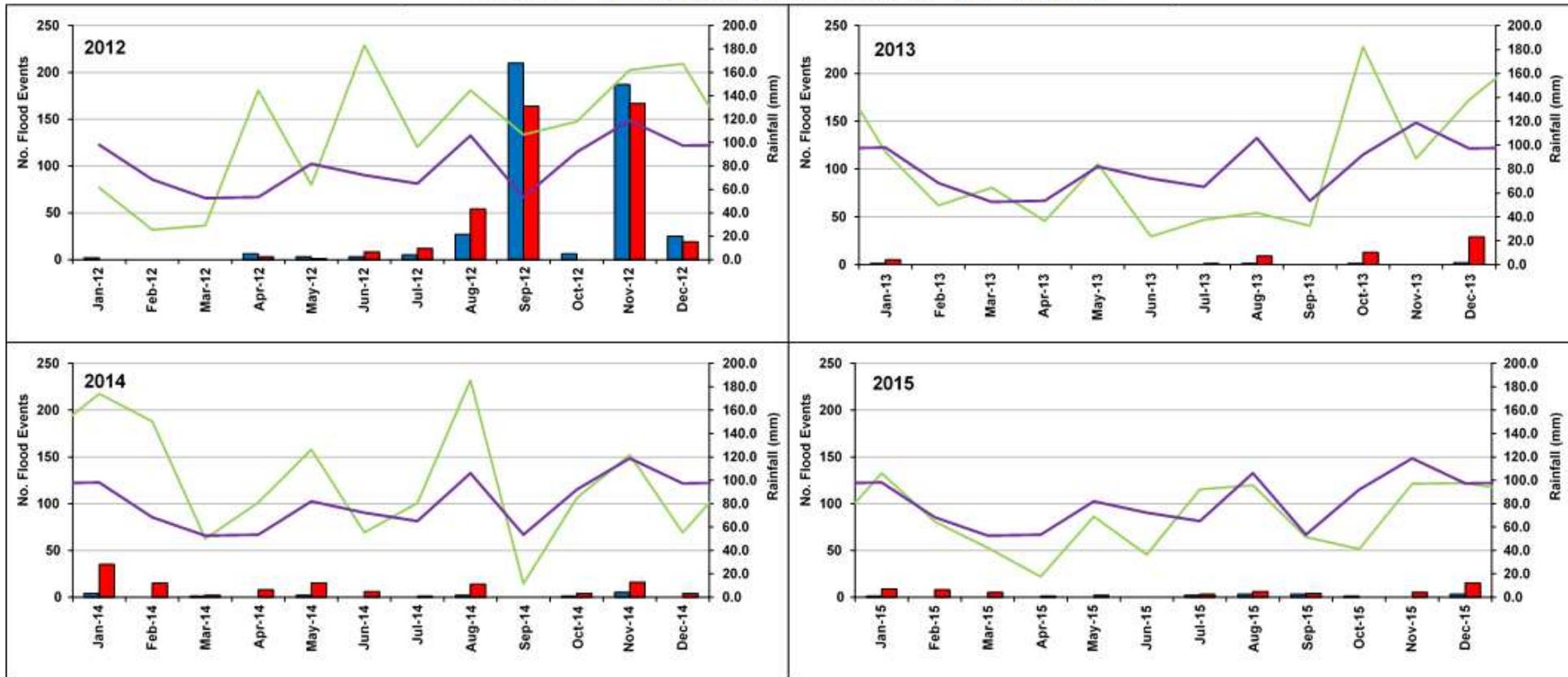


Figures 2 and 3 (Overleaf) show the data for each year from 2012 to 2016 in more detail and Table 1 summarises the number of internal and external property flood reports received by the Council each year from 2012 to 2016.

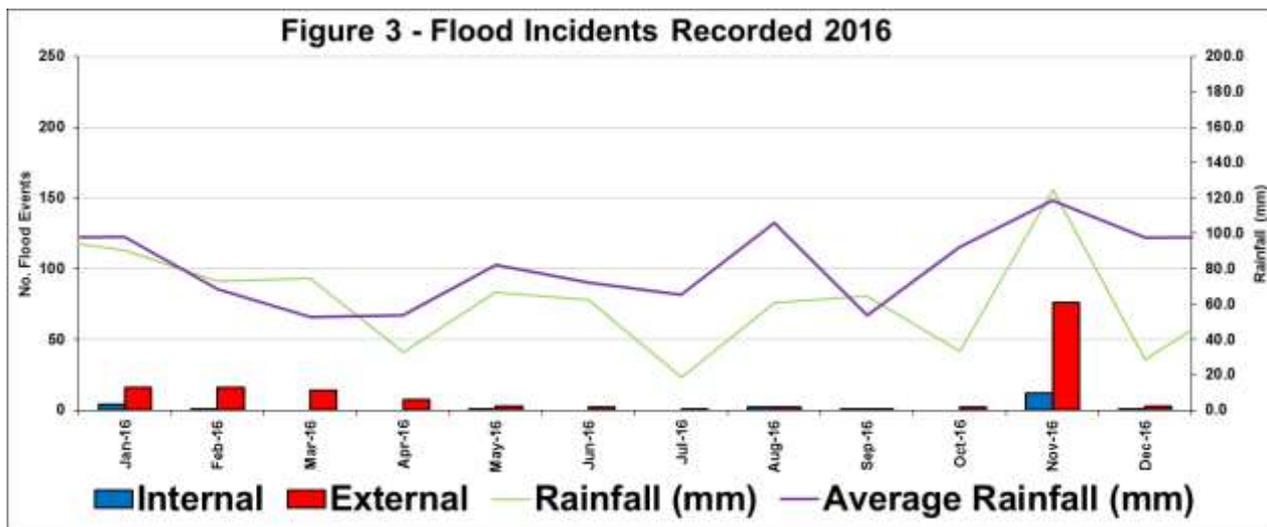
**Table 1 – Flood Incidents Reported to NSC**

Flood Incidents Reported to NSC		
Year	Internal Incidents	External Incidents
2012	474	428
2013	5	57
2014	15	120
2015	13	57
2016	22	143

Figure 2 – Flood Incidents Recorded 2012 to 2015



■ Internal 
 ■ External 
 — Rainfall (mm) 
 — Average Rainfall (mm)



Significant peaks in the number of reports of property flooding were experienced in August, September and November 2012 and in November 2016. In 2012, a combination of high rainfall totals and saturated ground brought widespread flooding to in many parts of the UK. The Met Office reported that 2012 was the wettest year on record in England and the second wettest in the UK since records began.

North Somerset experienced more rainfall than the national average. Rainfall totals were also significantly higher than average during winter 2013-14 and August 2014, however the 2013-14 rainfall totals did not result in the same level of property flooding reports as 2012.

During 2012, 474 properties were reported to have flooded internally with 428 flooded externally across North Somerset and a total of 25 communities being affected, the distribution of flood reports across North Somerset during 2012 is shown in Figure 4. Flood Investigations were carried out for each of the 25 communities affected.

During Storm Angus in November 2016, 22 properties were reported to have flooded internally with 143 flooded externally, the distribution of flood reports across North Somerset during 2016 is shown in Figure 5.

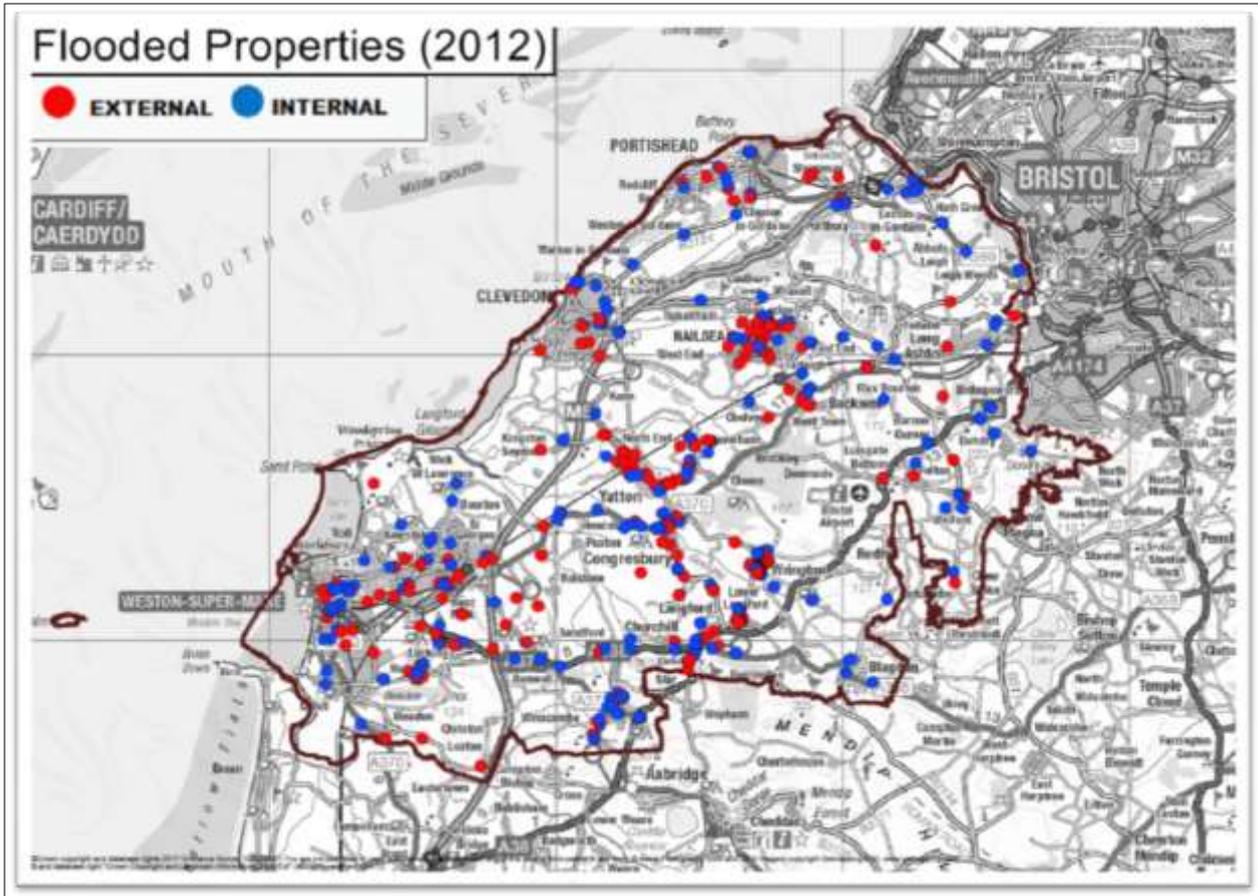


Figure 4 – Flood Report Map 2012

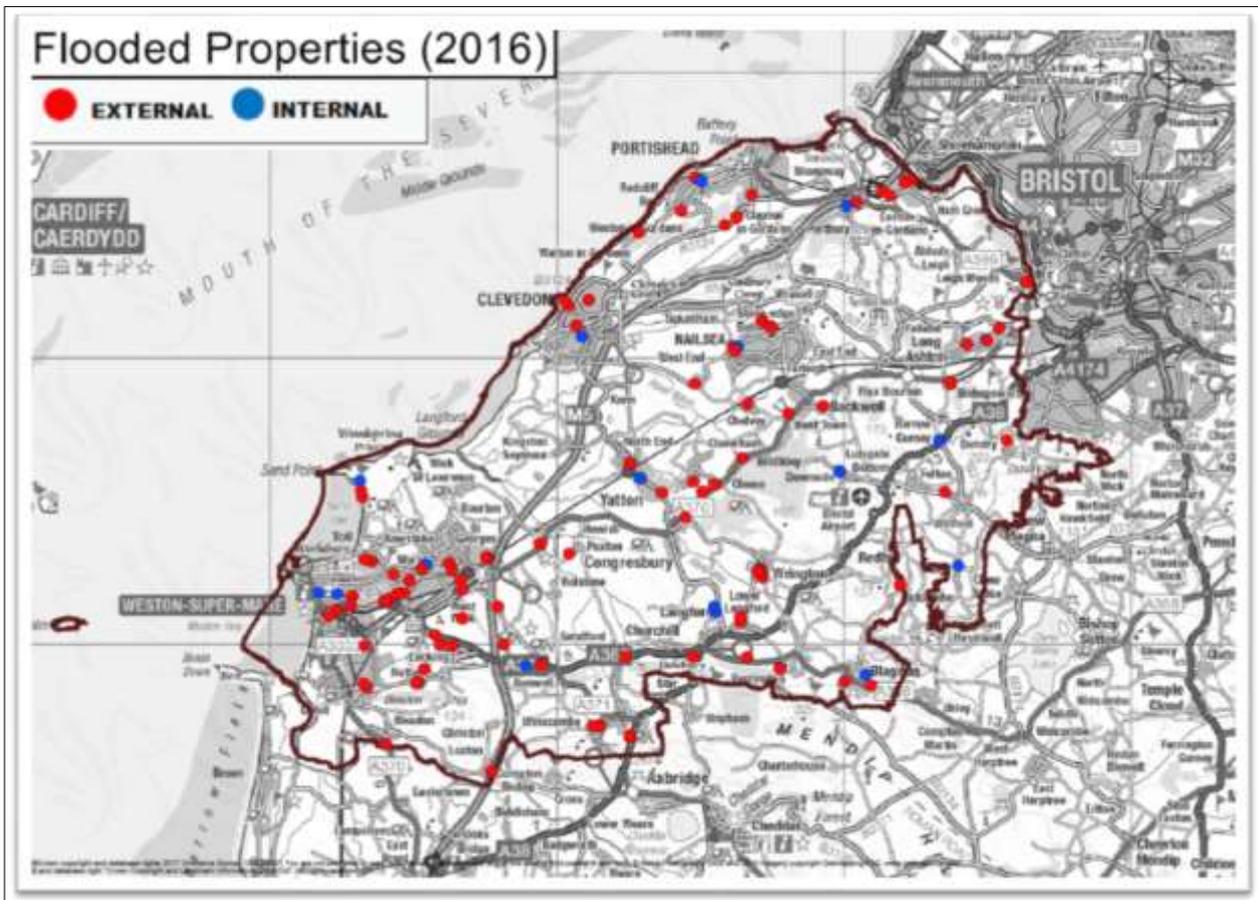


Figure 5 – Flood Report Map 2016

Local flood risk sources in North Somerset include surface water runoff, flooding from Ordinary Watercourses, flooding from drainage networks (highway and sewerage systems) and groundwater.

The topography of the area is varied, with steep hills in the upper catchments draining to an extensive flat lowland area before draining to the sea. These topographical characteristics cause waterlogging and or tide locked conditions in the low lying areas and this represents another significant flood mechanism which can affect a large proportion of the area.

There is also a significant risk from tidal and fluvial flooding within North Somerset.

A number of local Flood Risk Management schemes have been put in place to reduce flood risk within North Somerset during the last PFRA cycle, these include:

- Superpond – Flood storage area in Hutton (Weston-super-Mare) to manage surface water runoff and provide floodplain compensation for development on the old Weston Airfield site.
- River Banwell Scheme - Flood storage area in St Georges (Weston-super-Mare) to manage surface water runoff and provide floodplain compensation for development on the old Weston Airfield site and surrounding area.
- Milton Hill and Upper Bristol Road – Surface water drainage scheme in partnership with Wessex Water, construction of surface water storage tank and improvements to surface water capture to mitigate flooding to properties (this scheme was part of the Weston super Mare SWMP actions);
- Wrington culvert upgrade and property level resilience forming phase 1 of an overall strategy to reduce flood risk to the village from ordinary watercourse flooding.

## Future flood risk

*Updates to the following datasets have been incorporated into the flood risk management Earthlight mapping system:*

- a) Updated Flood Map for Surface Water (uFMfSW) - 1 in 30, 1 in 100 and 1 in 1000;*
- b) Areas Susceptible to Groundwater Flooding (AStGWF);*
- c) Flood Map (for rivers and sea) - Flood Zone 2 and 3;*
- d) North Somerset Council Strategic Flood Risk Assessment: Level 1 and 2.*

*The Local Flood Risk Management Strategy was based on the 2010/11 Flood Map for Surface Water which was the best available data at the time. The Updated Flood Map for Surface Water was released in 2013 and was considered improved data. North Somerset Council therefore ran an assessment to determine how the new data would impact on our Local Flood Risk Management Strategy and the prioritisation of communities at risk. The conclusion of this analysis was that the priority order of communities at risk remained broadly similar, particularly in identifying the most vulnerable communities, but there are some additional communities added using the new data.*

*The top four communities on the priority list remain the same and this is where flood risk management activities will be focused in the short- to medium-term. We will consider whether we will review our communities at risk priority list as part of any future LFRMS updates. Updates to the Flooded Properties database have also verified some areas predicted to be at risk of flooding and therefore provide confidence that the EA mapping is reflecting the correct flood mechanisms and potential impacts of flooding in these areas.*

Current guidance<sup>1</sup> on climate change allowances for flood risk assessments recommends using a 20 – 40% increase to predicted 1% AEP rainfall depths to represent the effects of climate change. Surface water flood modelling including an allowance for climate change has not been carried out in North Somerset so the 0.1% AEP rainfall event modelling results are being used as a surrogate for climate change modelling.

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<sup>1</sup> Flooding and Coastal Change, Environment Agency, 19 February 2016; <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> last updated 3 February 2017.

There are limitations to the approach. A recent hydrological study carried out as part of a flood mitigation scheme within North Somerset estimated 1%, 1% plus climate change and 0.1% AEP rainfall depths. The results of this analysis showed that 0.1% AEP rainfall depths estimated using FEH were significantly more than 40% greater than the 1% AEP rainfall depths.

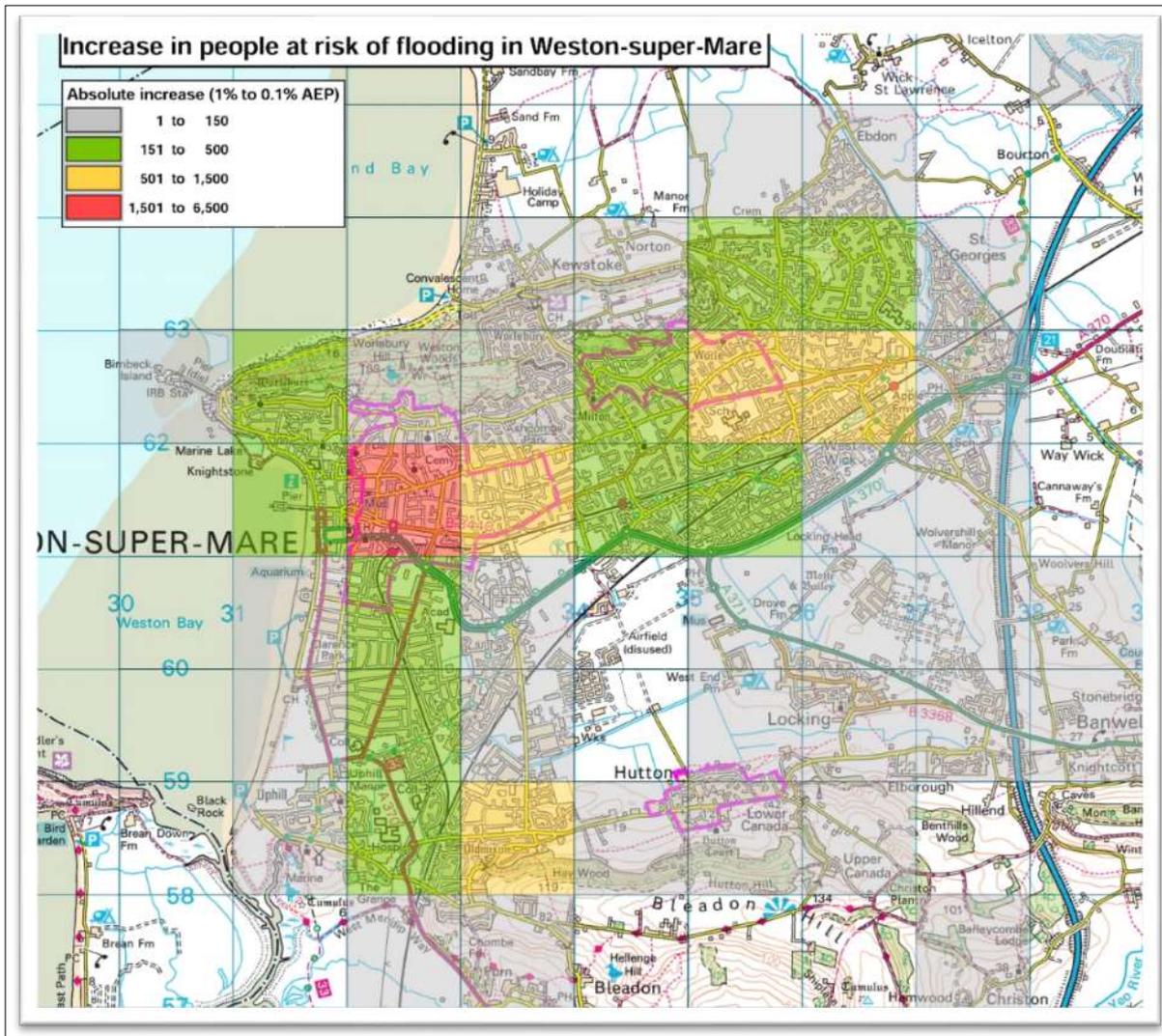
Although this study only looked at rainfall in one location within North Somerset, it suggests that the use of the 0.1% AEP rainfall event as a proxy for climate change overestimates the increase in flood risk as a result of climate change, however the 0.1% AEP proxy is currently the best available area wide information to represent the potential impacts of climate change.

The EA maps titled “Increase in people at risk of flooding in 1km grid from the 0.1% AEP rainfall event compared with the 1% AEP event” and “Percentage increase in people at risk of flooding in LLFAs for the 0.1% AEP rainfall event compared with the 1% AEP event” use the 0.1% AEP rainfall event surface water flood map to represent what future 1% AEP surface water flood risk might look like taking account of climate change.

The “Increase in people at risk of flooding in 1km grid from the 0.1% AEP rainfall event compared with the 1% AEP event” map shows a high (501-1500) and significant (1501 – 6500) increase in people at risk of flooding in Weston Super Mare (see figure 6).

The “Percentage increase in people at risk of flooding in LLFAs for the 0.1% AEP rainfall event compared with the 1% AEP event” shows a high (472%) overall percentage increase. North Somerset is ranked the 25<sup>th</sup> highest LLFA area in terms of percentage increase. This indicates that climate change is likely to have a relatively large impact on future flood risk within North Somerset.

Using the “Risk of flooding from Surface Water Property Points Dataset for PRFA” data provided by the Environment Agency, the “Increase in people at risk of flooding in 1km grid from the 0.1% AEP rainfall event compared with the 1% AEP event” map has been reproduced at a smaller scale to allow the results within North Somerset to be scrutinised in more detail. Figure 6 shows the increase in people at risk of flooding in each 1km grid from the 0.1% AEP rainfall event compared with the 1% AEP event for Weston-super-Mare.



**Figure 6 – Increase in people at risk of flooding in 1km grid from the 0.1% AEP rainfall event compared with the 1% AEP event – Weston-super-Mare**

The difference between the 1% AEP and 0.1%AEP Risk of Flooding from Surface Water outlines are significant within some parts of North Somerset. This could be due to the large areas of low lying land with very gentle slopes where an increase in flood depth can spread a long way when a threshold is passed, leading to a significant increase in flood extent. Weston-super-Mare is situated within a large low lying area bounded by steep hills, runoff from the hills rapidly reaches the low lying areas where, under saturated catchment or tide locked conditions, it is difficult to drain away to the sea.

The population density within Weston-Super-Mare is relatively high, it is therefore logical that an increase in flood extent in this area will lead to the highest category of increase in number of people at risk of flooding when climate change is taken into account in comparison to other areas of North Somerset which are more rural in general and towns are smaller.

The Weston-super-Mare Surface Water Management Plan used broad scale direct rainfall modelling to assess the impact of climate change on surface water flood risk. Surface water modelling was undertaken for a 1%AEP event using 3 different antecedent conditions for the drainage system: drainage system operating as designed; drainage system tide locked; and saturated catchment to represent the worst case scenario. The same scenarios were then also modelled with a 30% increase in rainfall depths to represent climate change. The results are summarised in Table 2 and show that within Weston-super-Mare, climate change is predicted to significantly increase the numbers of properties at risk. The number of properties at risk is sensitive to antecedent conditions with a saturated catchment prior to heavy rainfall presenting the worst case scenario. This analysis further supports the evidence that the number of people

at risk from surface water flooding in Weston-super-Mare is likely to increase significantly in the future if mitigation measures are not put in place.

**Table 2 – Weston-super-Mare SWMP<sup>2</sup> residential properties at risk from surface water flooding**

AEP	No. of residential properties at risk		
	As designed	Tide locked	Saturated
1%	302	503	1255
1% +CC	589	1195	2318
Increase	287	692	1063

It is recognised that due to its topography, flood mechanisms and population density, Weston-super-Mare is particularly sensitive to increases in surface water flood risk as a result of climate change. Although the increases may not be quite as severe as indicated by the 0.1% AEP proxy, the SWMP indicates that climate change does pose a significant future risk.

Measures are being taken to mitigate future flood risk in Weston-super-Mare through the Town Centre regeneration project, the development management process and the promotion of retrofit sustainable drainage systems.

**Flood risk areas (FRAs)**

No FRAs have been identified in the North Somerset lead local flood authority area for the purposes of the second planning cycle.

**Note on first cycle**

For the 2011 PFRA the Environment Agency identified indicative Flood Risk Areas across England and Wales. Ten indicative Flood Risk Areas were identified in England but none were fully located within North Somerset Council’s administrative area.

The north east corner of North Somerset borders a part of Bristol City Council’s administrative area that did contain a Flood Risk Area in the 2011 PFRA. Parts of the community of Long Ashton in North Somerset, were included within the Greater Bristol FRA. The recommendations of the North Somerset 2011 PFRA therefore included engagement in detailed discussions with Bristol City Council about the potential risk of flooding across the boundary and in Long Ashton.

The North Somerset Local Flood Risk Management Strategy (2014) further assessed flood risk across the whole North Somerset area and identified Long Ashton as one of the key vulnerable communities at risk from surface water flooding. The LFRMS produced a prioritised Action Plan for the management of flood risk throughout North Somerset and includes recommended actions for Long Ashton.

During the last iteration of the Floods Directive cycle, the Environment Agency also prepared a Flood Risk Management Plan (FRMP) for the whole area, North Somerset Council contributed significant information to the FRMP based on the Local Flood Risk Management Strategy which includes actions for Long Ashton as well as the other communities at risk of flooding from local sources across North Somerset.

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<sup>2</sup> Weston super Mare Surface Water Management Plan Final Report (Royal Haskoning DHV), North Somerset Council, June 2014

Long Ashton remains one of the vulnerable communities that we are continuing to work with through the Local Flood Risk Management Strategy, with actions in the medium to longer term. The designation of a PFRA Flood Risk Area would therefore not lead to any changes in the approach to managing Flood Risk in this area.

### **Other changes**

The 2011 PFRA used historic local flooding data, local knowledge and the Environment Agency Flood Map for Surface Water to agree the local flood risk in the study area. This exercise identified the three highest local flood risk areas within North Somerset as:

1. Weston-super-Mare;
2. Wrington;
3. Nailsea

and set out actions for the Council to take to manage the risks identified.

The LFRMS was completed in 2014 and used flood data gathered during 2012 along with the Environment Agency's Flood Map for Surface Water, to further the PFRA and identify communities considered to be most vulnerable to local flood risk. The strategy prioritises the communities at risk and identifies measures that are proposed to be taken in these communities to reduce flood risk.

The three highest priority communities identified by this assessment were:

1. Wrington;
2. Weston-super-Mare; and
3. Nailsea

The same three communities as identified in the PFRA, albeit in a different order.

The flooding in Wrington is more frequent and within a small cluster, whereas Weston-super-Mare has multiple flooding issues spread across a wider area.

Consultation on the LFRMS with organisations and the public took place from December 2013 to February 2014. During this time, the Environment Agency made a number of technical changes to the development and modelling approach used to produce the Flood Map for Surface Water and published the updated Flood Map for Surface Water.

As this was a key dataset in the LFRMS assessment of flood risk, the implications of the change were identified and quantified to establish whether changes were required to the LFRMS.

As a result of the updated Flood Map for Surface Water, the overall number of properties identified at risk from surface water flooding reduces quite significantly in most of the hotspot areas. The net result of this is that there are some potential changes in the overall LFRMS risk assessment. Twelve of the original fifteen areas identified remain un-changed in terms of being a priority area, however the overall priority order is changed. The top four locations in the risk assessment remain the same, with a change in the order of the first two locations:

1. Weston-super-Mare;
2. Wrington;
3. Nailsea;
4. Winscombe

It was recommended that the LFRMS progresses using the existing risk assessment and that changes to the flood map data are incorporated as part of future iterations and updates of the strategy.

**North Somerset Council  
December 2017**