



Norfolk County Council

Investigation Report into the flooding in South Norfolk District in 2014-2018

Report Reference: FIR_029

Report prepared by John Mellows on 26 March 2019



Executive Summary

(a) Flooding incidents and causes

Flooding occurred in numerous events in 2014, 2016, 2017 and 2018. Internal flooding of 19 properties occurred in the following locations:

- Grenville Close, Hethersett.
- Beccles Road and Kittens Lane, Loddon.
- Green Fall, Poringland.
- Five Acres, Stoke Holy Cross.
- Broad Street, Redenhall with Harleston.
- Sycamore Avenue, Wymondham.
- Church Lane, Welborne.
- Old Street, Newton Flotman.
- West End, Costessey.
- Hackford, Wicklewood.
- High Road, Roydon (Bressingham).
- Hall Road, Toft Monks.
- The Heywood, Market Place and Denmark Street, Diss.

Flooding was caused by:

- Surface run-off flowing onto roads and directed towards properties.
- Surface run-off directed down to properties at a lower elevation than the surrounding area.
- Entry of flood water into properties via low thresholds
- Overloading and surcharging of drainage systems
- Lack of maintenance, blockage or obstruction to drainage systems
- Increased run-off due to the development of impermeable surfaces or saturation of soils.

(b) Key recommendations

The recommendations set out in the report have been summarised below. Specific recommendations for each individual catchment are set out within the report. Please note a number of these recommendations have already been followed up by the respective organisations identified. Progress against these recommendations will be assessed as part of an addendum to this report to be undertaken a year from the date of publication of this report.

Risk Management Authorities should;

- Communicate with affected residents where their assets have given rise to the flooding of properties.
- Review the appropriateness of their response to flooding.
- Determine the integrity and/or capacity of their assets and their maintenance where they have contributed to the flooding of properties to understand the systems role in accommodating rainfall events as well as mitigating flooding.

Property owners of affected properties should;

- Confirm the integrity, capacity and appropriateness of their property drainage
- Determine if works are needed to remove the risk posed by structures that form obstructions to flows.
- Determine if it is appropriate for them to protect their buildings through flood protection measures.
- Seek their own legal advice if they are concerned about the responsibilities and liabilities of themselves and/or others.
- All property owners should remove any inappropriate surface water connections to the foul sewer system and direct flows to alternative points of discharge where it doesn't increase flood risk.

Norfolk County Council should;

- Work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures, reduce run-off and increase the attenuation of flood water to reduce the impacts of flooding.
- Work with property owners to consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.
- Seek to remind riparian owners of their responsibility to undertake appropriate levels of maintenance to sustain the efficiency of the drainage systems.
- Communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders
- Determine if works are needed to remove the risk posed by structures that form obstructions to watercourse flows and communicate with affected parties and riparian owners
- Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.
- Work with partner organisations to identify the potential for managing the amount of surface water entering their drainage system in flood events.

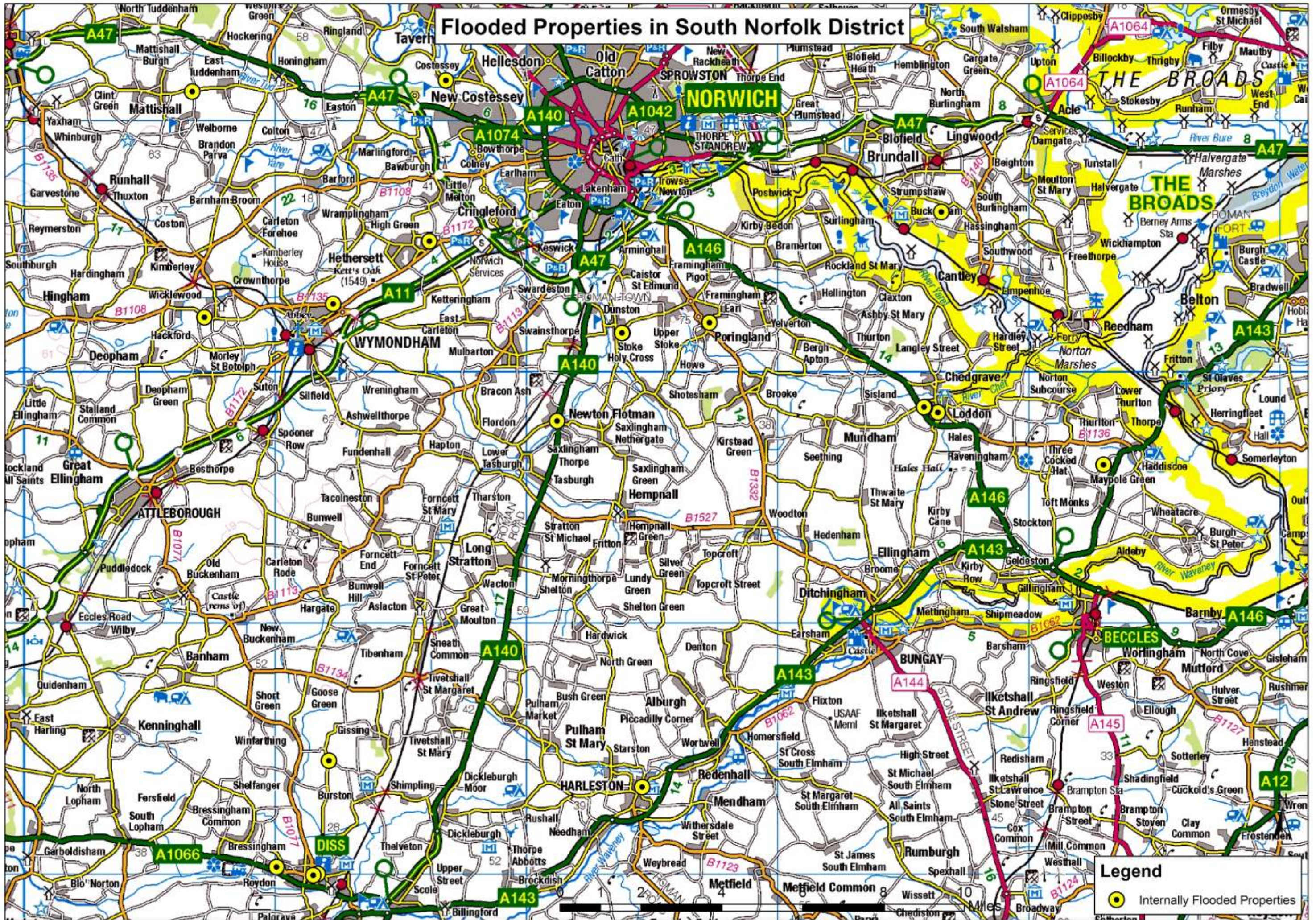
Anglian Water should;

- Work with partner organisations the amount of surface water entering their drainage system in flood events.

The Environment Agency should;

- Work with riparian owners to review the maintenance of main rivers to manage the risk of surcharging during flood events.

Overview of flooding in South Norfolk



Justification for Flood Investigation

The purpose of this report relates to Section 19 of the Flood and Water Management Act 2010. This legislation sets out that the County Council, in its role as Lead Local Flood Authority for Norfolk, should investigate the role and response of organisations to significant flooding incidents. Significant flooding is deemed to be those incidents that impact upon people, property and infrastructure.

The Norfolk Local Flood Risk Management Strategy Policy UC2 (Flood Investigation) sets out the thresholds the Lead Local Flood Authority will apply to its formal flood investigation role. This states an investigation will be undertaken where it is determined that;

- (a) There is ambiguity surrounding the source or responsibility for a flood incident, and/or;
- (b) There is cause to investigate the flood incident, due to either its impact, or consequence

In judging the impact or consequence of a flood event Norfolk County Council uses the criteria set out below;

- Any risk to loss of life or serious injury.
- One or more residential or business property flooded internally.
- One or more critical services/installations and vulnerable person's properties flooded internally; and/or rendered inoperable or their functions severely compromised due to the access to the premises being impassable; and/or resulting in a loss of service impacting on the local community.
- Any section of a national category 3 road or above made impassable due to flooding; and/or flooding to priority 1 and 2 gritting routes.
- Flooding adversely impacting a rail link by making it impassable.

It was deemed necessary to complete a formal Investigation Report into the flooding in South Norfolk in 2014-2018 as:

- Multiple residential properties were internally flooded.
- Multiple commercial properties were internally flooded.

This impact met Norfolk County Council's threshold for triggering the undertaking of a formal flood investigation.

The flood investigation report aims to:

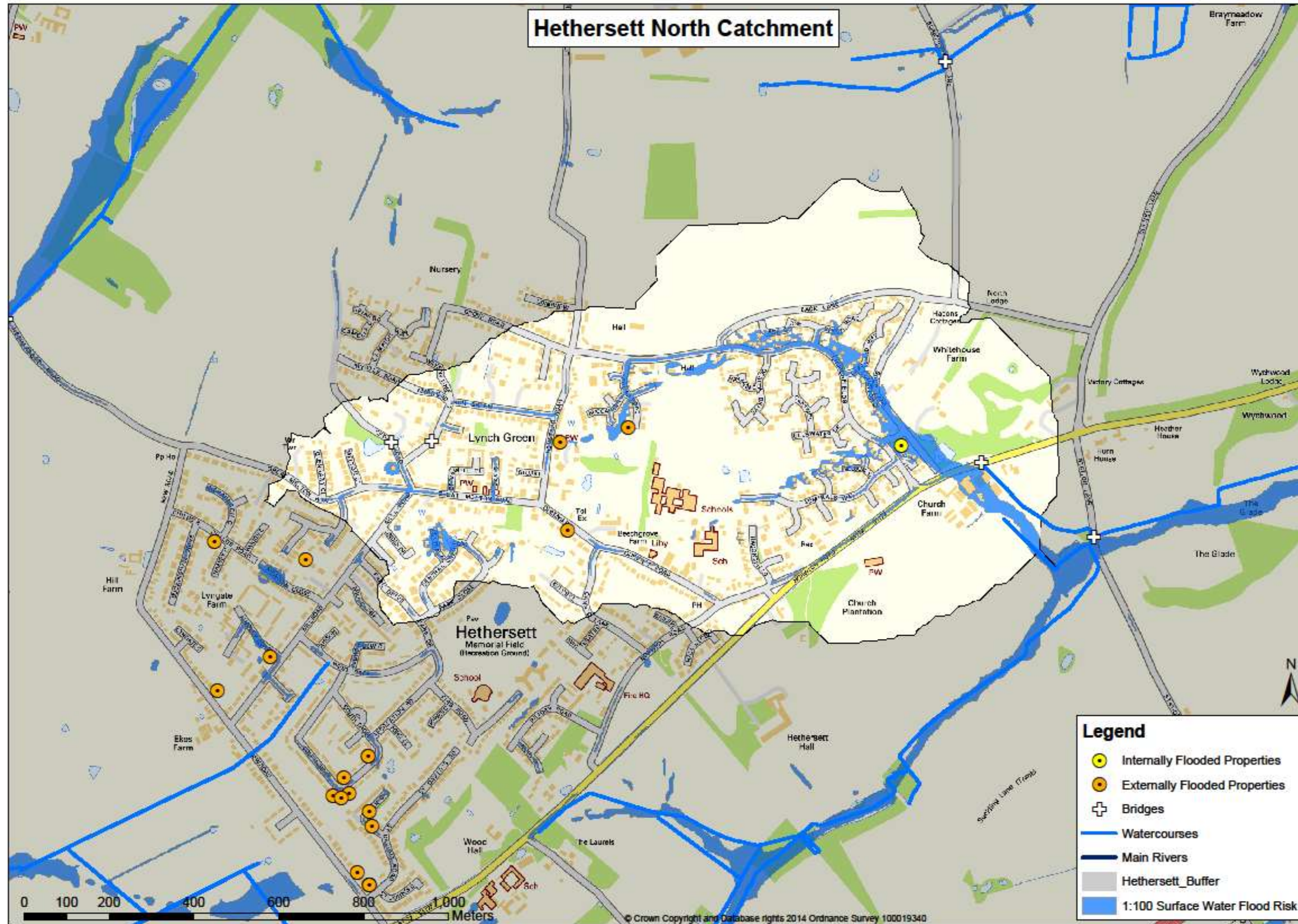
- Provide a transparent and consistent review of recent flooding.
- Identify those organisations and individuals who have responsibility to manage the causes of the flooding.
- Identify what their response has been or will be to the flooding.
- Make recommendations as to how the flood risk could be mitigated or reduced.
- Provide new evidence of the level of risk faced by communities in Norfolk that can be used in current funding bids in support of flood mitigation schemes.

Mitigation measures include property level protection: reinstating lost drainage features: reviewing or increasing maintenance regimes and increasing the capacity of the drainage network.

The flood investigation report cannot:

- Resolve the flooding issues or provide designed solutions.
- Force authorities to undertake any of the recommended actions.

Flooding and flood risk within the Hethersett North catchment



What are catchments?

To aid the investigation process and, for ease of presentation, the incidents of flooding have been grouped within this document based on hydrological catchments. The purpose of viewing flooding incidents based on catchments reflects the reality that flooding does not respect the administrative boundaries of water management organisations. Hydrological catchments catch water and discharge it at locations known as outlets. Individual hydrological catchment boundaries are usually formed by ridges of surrounding higher ground, which separate the lower lying areas at a line known as a watershed.

Description of catchment

Mixture of urban development, agricultural land and parkland. Surface water flowpath across the catchment and draining into a watercourse.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not take into account flood risk from groundwater or reservoir failure.

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] No. of properties subject to surface water flood risk at 1 in 30 year event:	0	73	5
[b] No. of properties subject to surface water flood risk at 1 in 100 year event:	0	154	6
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event:	0	0	0
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

Flood incidents within this catchment

Within this catchment 1 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
06/07/2017	On the 06/07/2017 - 1 property was internally flooded on Grenville Close, Hethersett. This incident was reported by Anglian Water Services Ltd via an electronic report on the 6 July 2017, (FWF/18/7/6438)	Anglian Water Services Ltd carried out measures to minimise the impact of flooding after the incident.

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

1 of the incidents (100%) of internal flooding in this catchment are within 2.5km of a rain gauge. The rainfall events recorded by gauges for this catchment are;

06 July 2017 – 28.2mm rainfall was recorded as falling in 2 hours 45 minutes at the Hethersett rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1:5.3 rainfall event. In the 6 days prior to the rainfall event no rainfall is recorded as having fell. This combined with the warm, dry weather likely caused the ground to become impermeable.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

Following flooding to people, property and infrastructure;

- Risk Management Authorities should
 - Communicate with affected residents where their assets have given rise to the flooding of properties.
 - Review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.
- Property owners of affected properties should seek their own legal advice.
- NCC should
 - Incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment (“PFRA”).

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Grenville Close, Hethersett, 06/07/2017	Rainfall was directed into the combined system. The loss of function of a hydraulic pump caused the system to surcharge elsewhere. This surcharging contributed to the flooding at the affected property.	Anglian Water Services Ltd

Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
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Grenville Close, Hethersett, 06/07/2017	Anglian Water Services Ltd should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.	Anglian Water Services Ltd	12 Months
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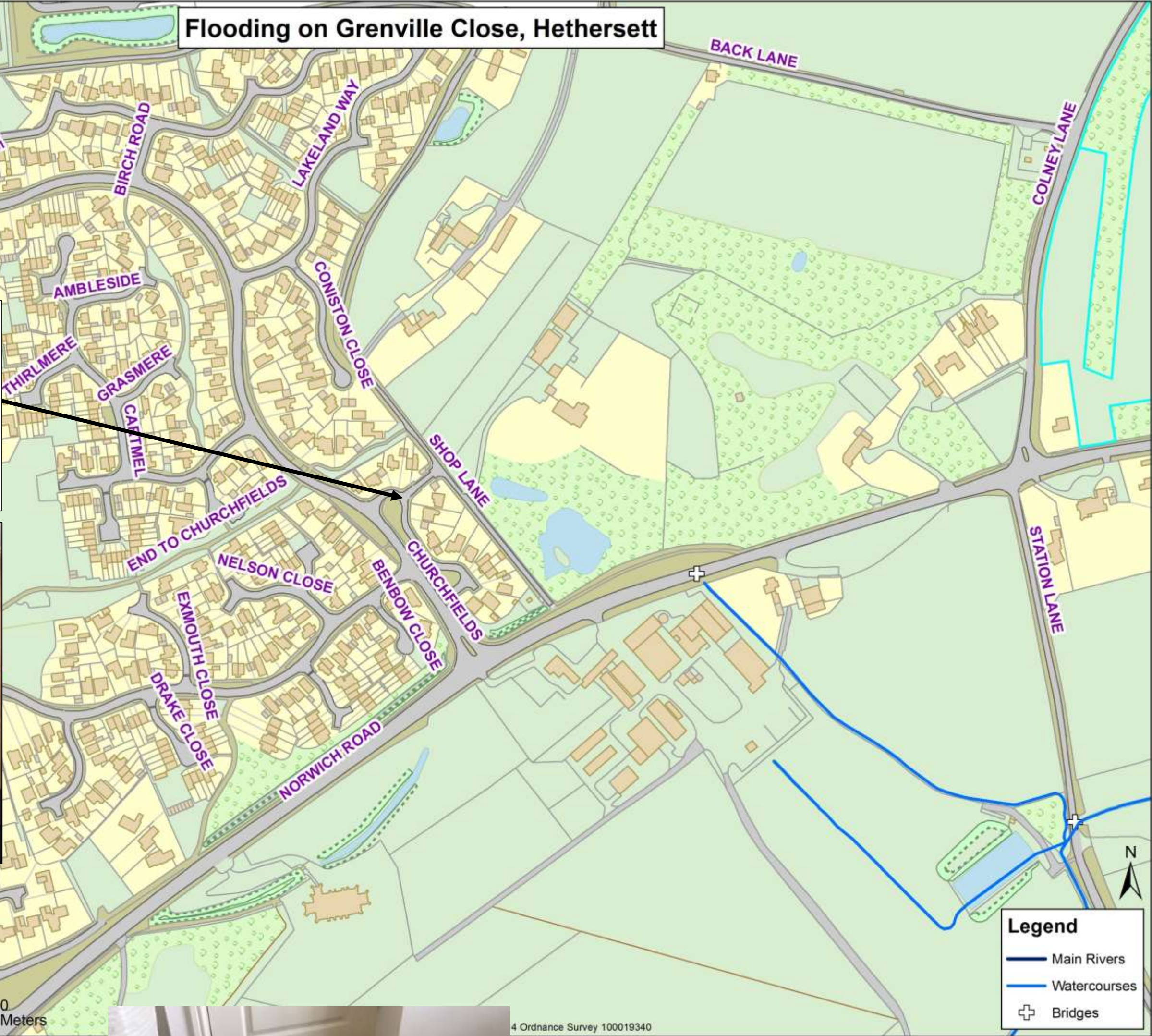
- Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Flooding on Grenville Close, Hethersett

Grenville Close – Internal and external flooding experienced on 06/07/2017

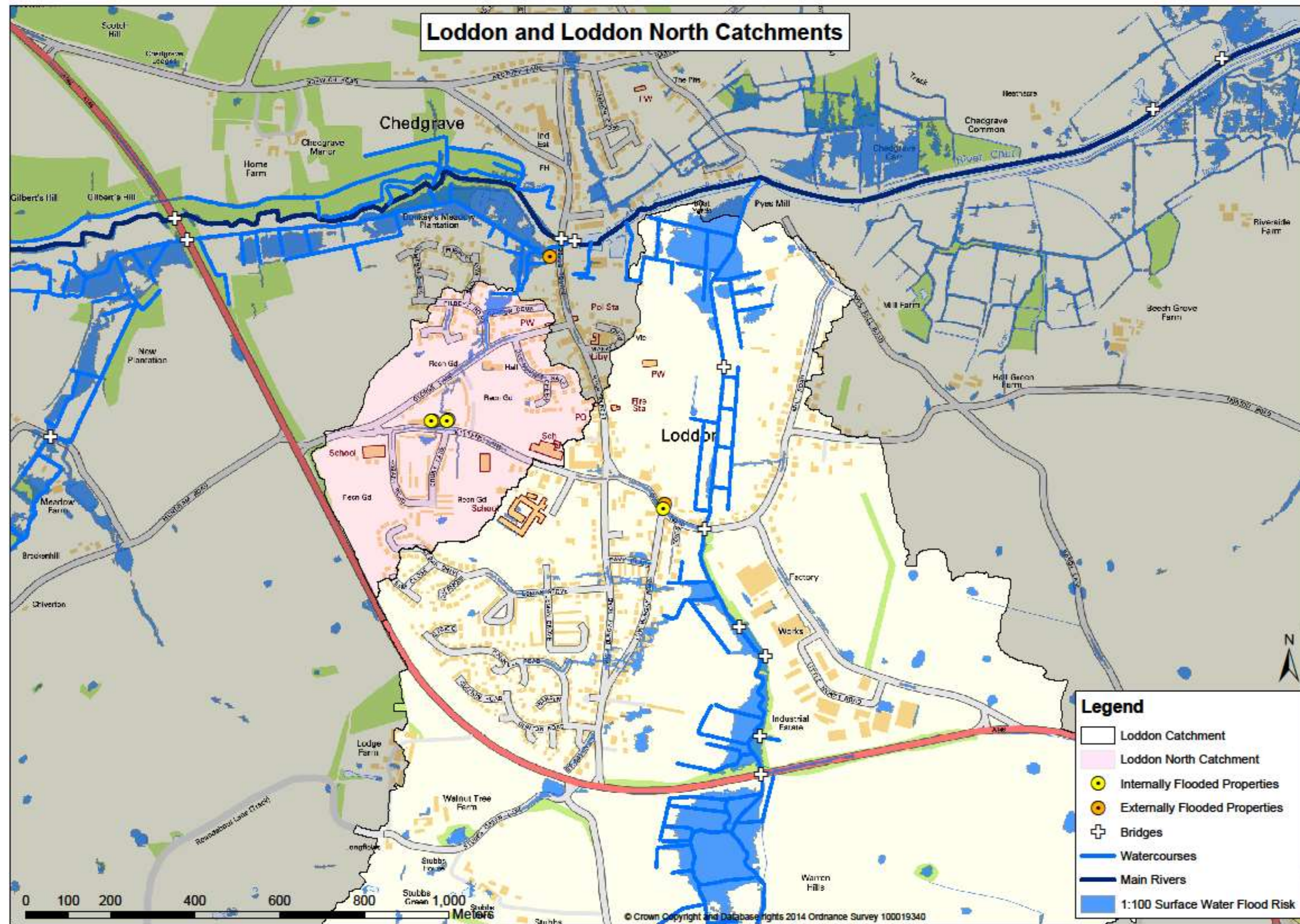
Causes - Rainfall was directed into the combined system. Failure of a hydraulic pump caused the system to surcharge in the vicinity of the affected property

Recommendations - Anglian Water Services Ltd should work with partner organisations to manage the surface water entering their drainage system in flood events.



Legend

- Main Rivers
- Watercourses
- Bridges



What are catchments?

To aid the investigation process and, for ease of presentation, the incidents of flooding have been grouped within this document based on hydrological catchments. The purpose of viewing flooding incidents based on catchments reflects the reality that flooding does not respect the administrative boundaries of water management organisations. Hydrological catchments catch water and discharge it at locations known as outlets. Individual hydrological catchment boundaries are usually formed by ridges of surrounding higher ground, which separate the lower lying areas at a line known as a watershed.

Description of catchments

Loddon and Loddon North:

Mixture of urban area and farmland with watercourse running through centre of the catchments.

Flood Risk within the catchments

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within these catchments has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not take into account flood risk from groundwater or reservoir failure.

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] No. of properties subject to surface water flood risk at 1 in 30 year event:	1	36	3
[b] No. of properties subject to surface water flood risk at 1 in 100 year event:	1	106	7
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	1	0
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event:	0	0	0
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

Flood incidents within these catchments

Within these catchments 4 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
08/08/2017	On the 08/08/2017 - 2 properties were internally flooded on Kittens Lane, Loddon. These incidents were reported by: South Norfolk District Council via email correspondence on the 10 August 2017, (FWF/17/7/5160, FWF/17/7/5162)	The Fire and Rescue Service responded during the incident.
03/08/2017	On the 03/08/2017 - 1 property was internally flooded on Beccles Road, Loddon. This incident was reported by Norfolk County Council via an electronic report on the 15 August 2017, (FWF/17/7/5265)	Norfolk County Council identified the need to renew the existing drainage in the area and extend it to the affected side of the road. Norfolk County Council carried out maintenance work to the highway drainage system after the incident.

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

There were no rain gauges within 2.5km of the incidents of flooding within this catchment

Causes of flooding within the catchments and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchments as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within these catchments.

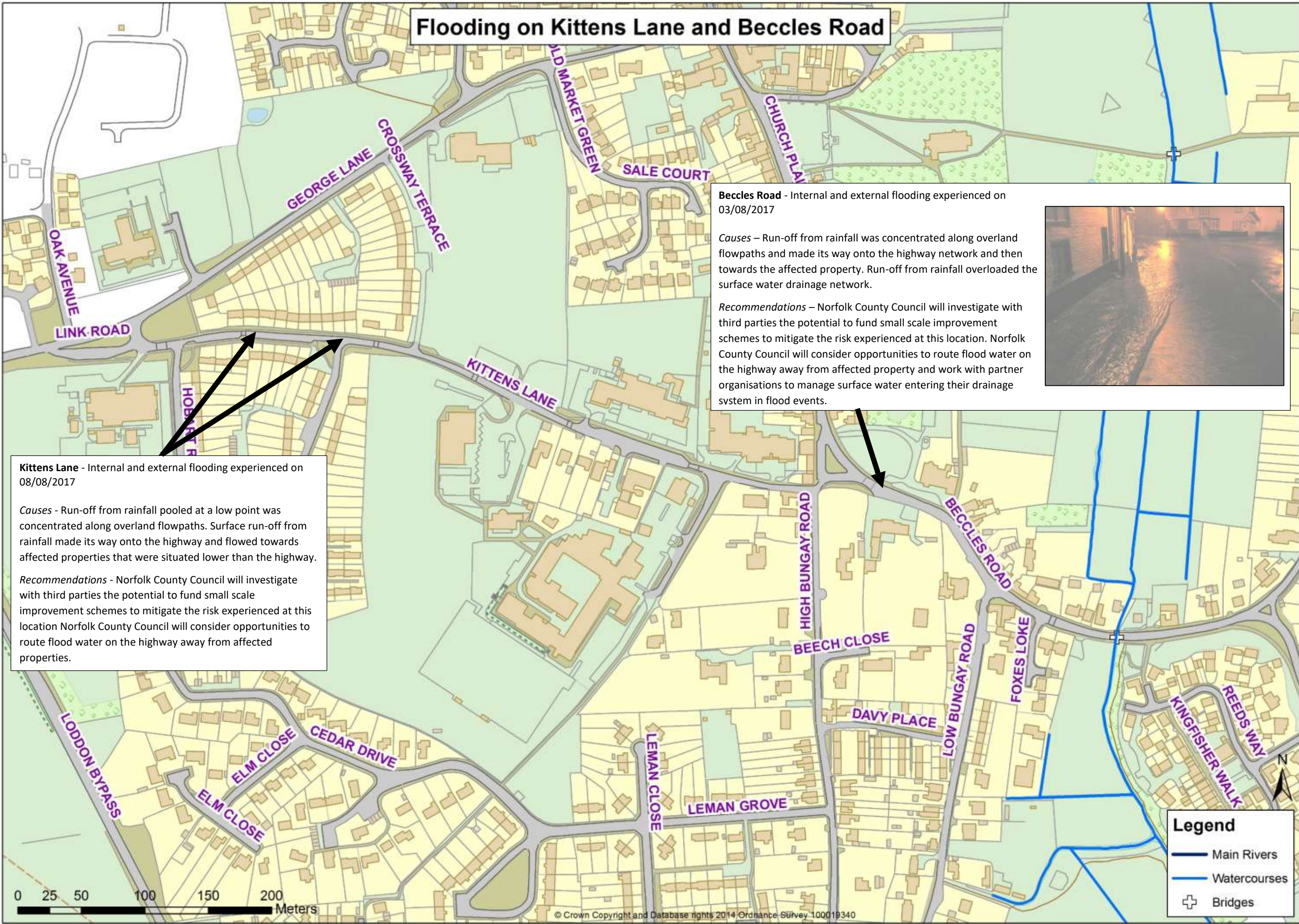
Following flooding to people, property and infrastructure;

- Risk Management Authorities should
 - Communicate with affected residents where their assets have given rise to the flooding of properties.
 - Review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.
- Property owners of affected properties should seek their own legal advice.
- NCC should
 - Incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment ("PFRA").
 - Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Kittens Lane, Loddon, 08/08/2017	Run-off from rainfall pooled at a low point within the catchment affecting properties.	Property owners
Kittens Lane, Loddon, 08/08/2017 Beccles Road, Loddon, 03/08/2017	Run-off from rainfall was concentrated along overland flowpaths on which the affected properties are positioned.	Property owners
Kittens Lane, Loddon, 08/08/2017 Beccles Road, Loddon, 03/08/2017	Surface run-off from rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than the highway.	NCC, Property owners
Beccles Road, Loddon, 03/08/2017	Run-off from Rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected property. This was due to the infiltration of surface water into existing drainage networks.	NCC

Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Kittens Lane, Loddon, 08/08/2017 Beccles Road, Loddon, 03/08/2017	Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.	NCC	12 Months
Kittens Lane, Loddon, 08/08/2017 Beccles Road, Loddon, 03/08/2017	Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.	NCC	12 Months
Beccles Road, Loddon, 03/08/2017	Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.	NCC	12 Months

Flooding on Kittens Lane and Beccles Road



Kittens Lane - Internal and external flooding experienced on 08/08/2017

Causes - Run-off from rainfall pooled at a low point was concentrated along overland flowpaths. Surface run-off from rainfall made its way onto the highway and flowed towards affected properties that were situated lower than the highway.

Recommendations - Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties.

Beccles Road - Internal and external flooding experienced on 03/08/2017

Causes - Run-off from rainfall was concentrated along overland flowpaths and made its way onto the highway network and then towards the affected property. Run-off from rainfall overloaded the surface water drainage network.

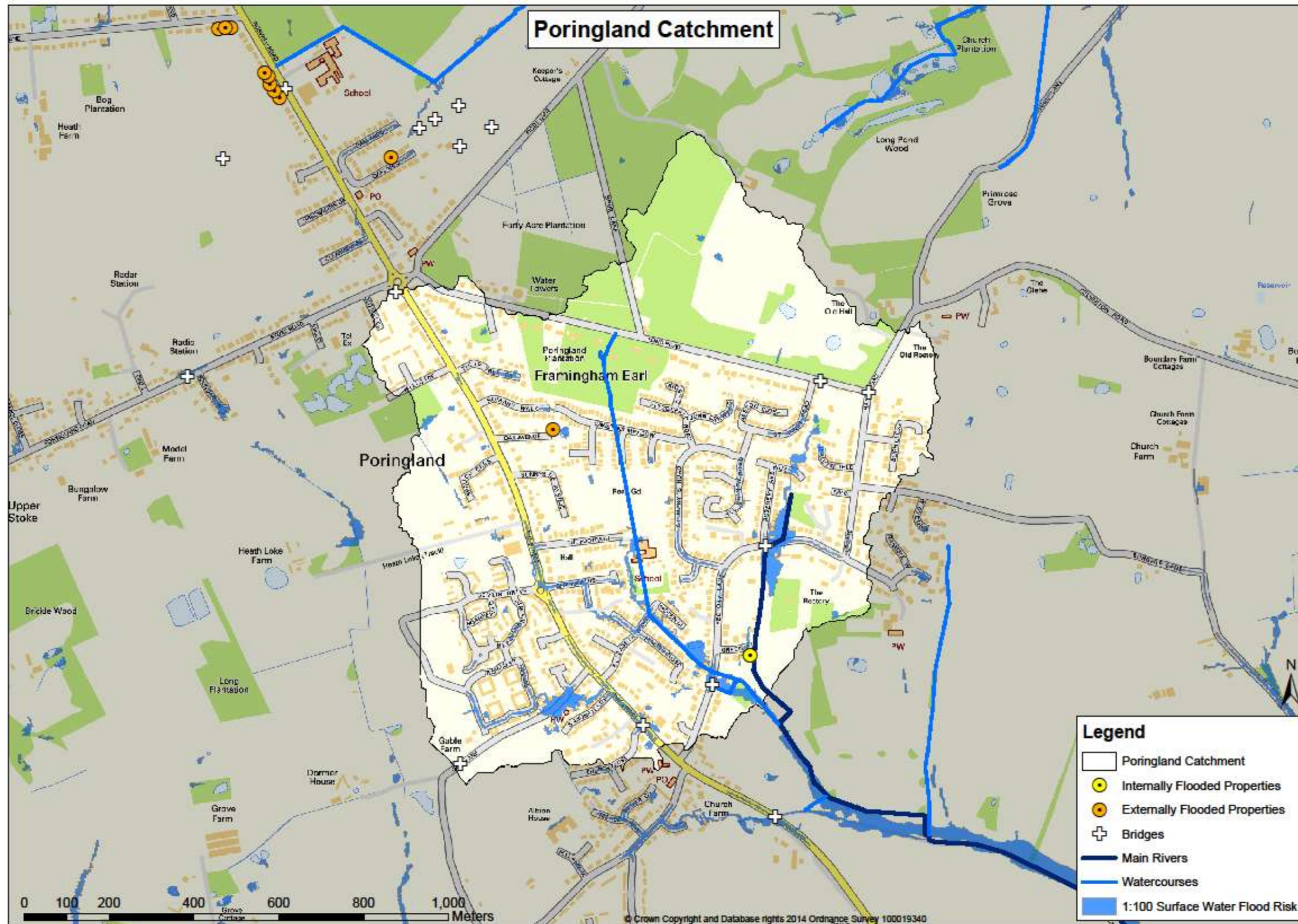
Recommendations - Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. Norfolk County Council will consider opportunities to route flood water on the highway away from affected property and work with partner organisations to manage surface water entering their drainage system in flood events.



Legend

- Main Rivers
- Watercourses
- Bridges

Flooding and flood risk within the Poringland catchment



What are catchments?

To aid the investigation process and, for ease of presentation, the incidents of flooding have been grouped within this document based on hydrological catchments. The purpose of viewing flooding incidents based on catchments reflects the reality that flooding does not respect the administrative boundaries of water management organisations. Hydrological catchments catch water and discharge it at locations known as outlets. Individual hydrological catchment boundaries are usually formed by ridges of surrounding higher ground, which separate the lower lying areas at a line known as a watershed.

Description of catchment

The Poringland catchment is urban, being dominated by residential land. The North West of the catchment is the highest and slopes towards the South West, this causes water to flow predominately in a south westerly direction through the catchment.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not take into account flood risk from groundwater or reservoir failure.

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] No. of properties subject to surface water flood risk at 1 in 30 year event:	1	23	0
[b] No. of properties subject to surface water flood risk at 1 in 100 year event:	1	95	9
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event:	0	0	0
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

Flood incidents within this catchment

Within this catchment 4 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
24/06/2016	On the 24/06/2016 - 1 property was internally flooded on Green Fall, Poringland. This incident was reported by Norfolk County Council via an electronic report on the 24 June 2016, (FWF/16/7/3898)	Norfolk County Council identified the need to renew the existing drainage scheme that serves the flooding location after the incident. Norfolk County Council carried out maintenance work to the highway drainage system after the incident.
09/08/2017	On the 09/08/2017 - 1 property was internally flooded on Green Fall, Poringland. This incident was reported by a resident via a telephone call on the 11 August 2017, (FWF/17/7/5165)	Norfolk County Council visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

2 of the incidents (100%) of internal flooding in this catchment are within 2.5km of a rain gauge. The rainfall events recorded by gauges for this catchment are;

24 June 2016 – 14.6mm rainfall was recorded as falling in 45 minutes at the Poringland rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1:3 rainfall event.

09 August 2017 – 28mm rainfall was recorded as falling in 11 hours and 45 minutes at the Poringland rainfall monitoring station.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

Following flooding to people, property and infrastructure;

- Risk Management Authorities should
 - Communicate with affected residents where their assets have given rise to the flooding of properties.
 - Review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.
- Property owners of affected properties should seek their own legal advice.
- NCC should
 - Incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment (“PFRA”).
 - Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Green Fall, Poringland, 24/06/2016	Run-off from rainfall pooled at a low point within the catchment affecting property.	Property owners
Green Fall, Poringland, 24/06/2016	Run-off from rainfall was concentrated along overland flowpaths on which the affected property is adjacent to.	Property owners
Green Fall, Poringland, 24/06/2016	The surface water drainage system network was partially obstructed by debris or silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	NCC

Green Fall, Poringland, 24/06/2016, 09/08/2017	Surface run-off from rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected property situated lower than the highway.	NCC, property owners
Green Fall, Poringland, 24/06/2016, 09/08/2017	Run-off from rainfall was directed into the main river channel causing it to surcharge elsewhere. This surcharging contributed to the flooding at the affected property.	Environment Agency
Green Fall, Poringland, 24/06/2016, 09/08/2017	Due to the development of impermeable surfaces localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding.	NCC

Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Green Fall, Poringland, 24/06/2016	Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.	Norfolk County Council	12 Months
Green Fall, Poringland, 24/06/2016	Norfolk County Council will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified.	Norfolk County Council	12 Months
Green Fall, Poringland, 24/06/2016, 09/08/2017	Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.	Norfolk County Council	12 months
Green Fall, Poringland, 24/06/2016, 09/08/2017	Norfolk County Council will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems	Norfolk County Council	12 months
Green Fall, Poringland, 24/06/2016, 09/08/2017	The Environment Agency will determine an appropriate maintenance regime in line with the risk identified and communicate with affected parties and riparian owners.	Environment agency	12 months

Flooding on Green Fall, Poringland

Green Fall, Poringland - Internal and external flooding experienced on 24/06/2016, 09/08/2017

Causes - Run-off from rainfall pooled at a low point within the catchment and was concentrated along overland flowpaths on which the affected property is adjacent to. The surface water drainage system network was partially obstructed by debris or silt, reducing the efficiency of the upstream drainage system. Surface run-off from rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected property situated lower than the highway.

Recommendations - Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. NCC will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified. NCC will consider opportunities to route flood water on the highway away from the affected property.



Flooding and flood risk in Stoke Holy Cross

Flood incidents within this area

In this area 2 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
09/08/2017	On the 09/08/2017 - 2 properties were internally flooded on Five Acres, Stoke Holy Cross. These incidents were reported by: a resident via an online flood report form on the 19 August 2017 (FWF/17/7/5231, FWF/17/7/5235).	Norfolk County Council contacted affected residents, to offer advice and gather information to confirm the flood report.

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

There were no rain gauges within 2.5km of the incidents of flooding within this catchment

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

Following flooding to people, property and infrastructure;

- Risk Management Authorities should
 - Communicate with affected residents where their assets have given rise to the flooding of properties.
 - Review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.
- Property owners of affected properties should seek their own legal advice.
- NCC should
 - Incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment ("PFRA").
 - Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Five Acres, Stoke Holy Cross, 09/08/2017	Run-off from rainfall pooled at a low point within the catchment affecting properties.	Property owners
Five Acres, Stoke Holy Cross, 09/08/2017	Surface run-off from rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than the highway	NCC
Five Acres, Stoke Holy Cross, 09/08/2017	Due to the saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding.	Land owners

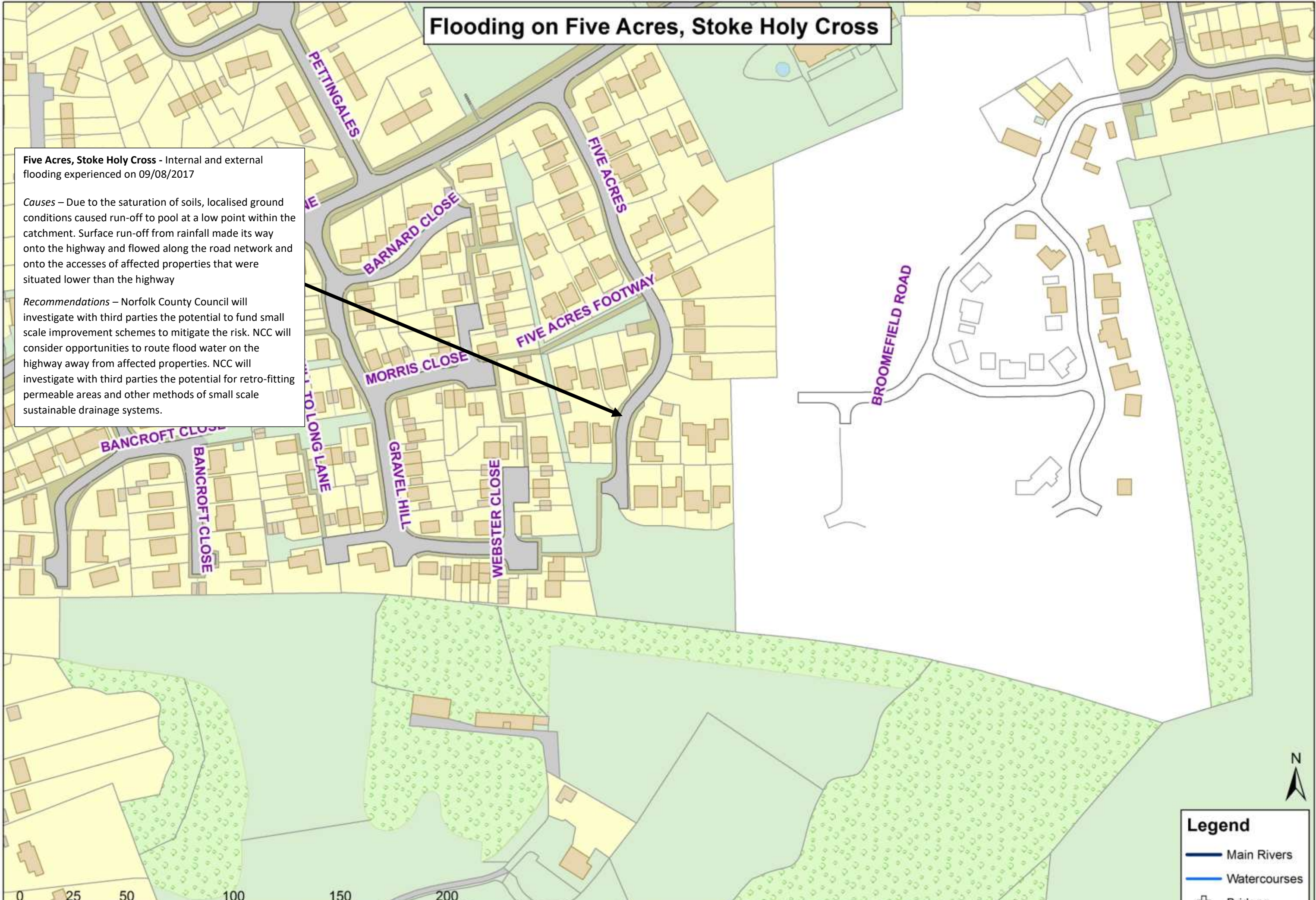
Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Five Acres, Stoke Holy Cross, 09/08/2017	Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.	Norfolk County Council	12 Months
Five Acres, Stoke Holy Cross, 09/08/2017	Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.	Norfolk County Council	12 Months
Five Acres, Stoke Holy Cross, 09/08/2017	Norfolk County Council will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems	Norfolk County Council	12 Months

Flooding on Five Acres, Stoke Holy Cross

Five Acres, Stoke Holy Cross - Internal and external flooding experienced on 09/08/2017

Causes – Due to the saturation of soils, localised ground conditions caused run-off to pool at a low point within the catchment. Surface run-off from rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than the highway

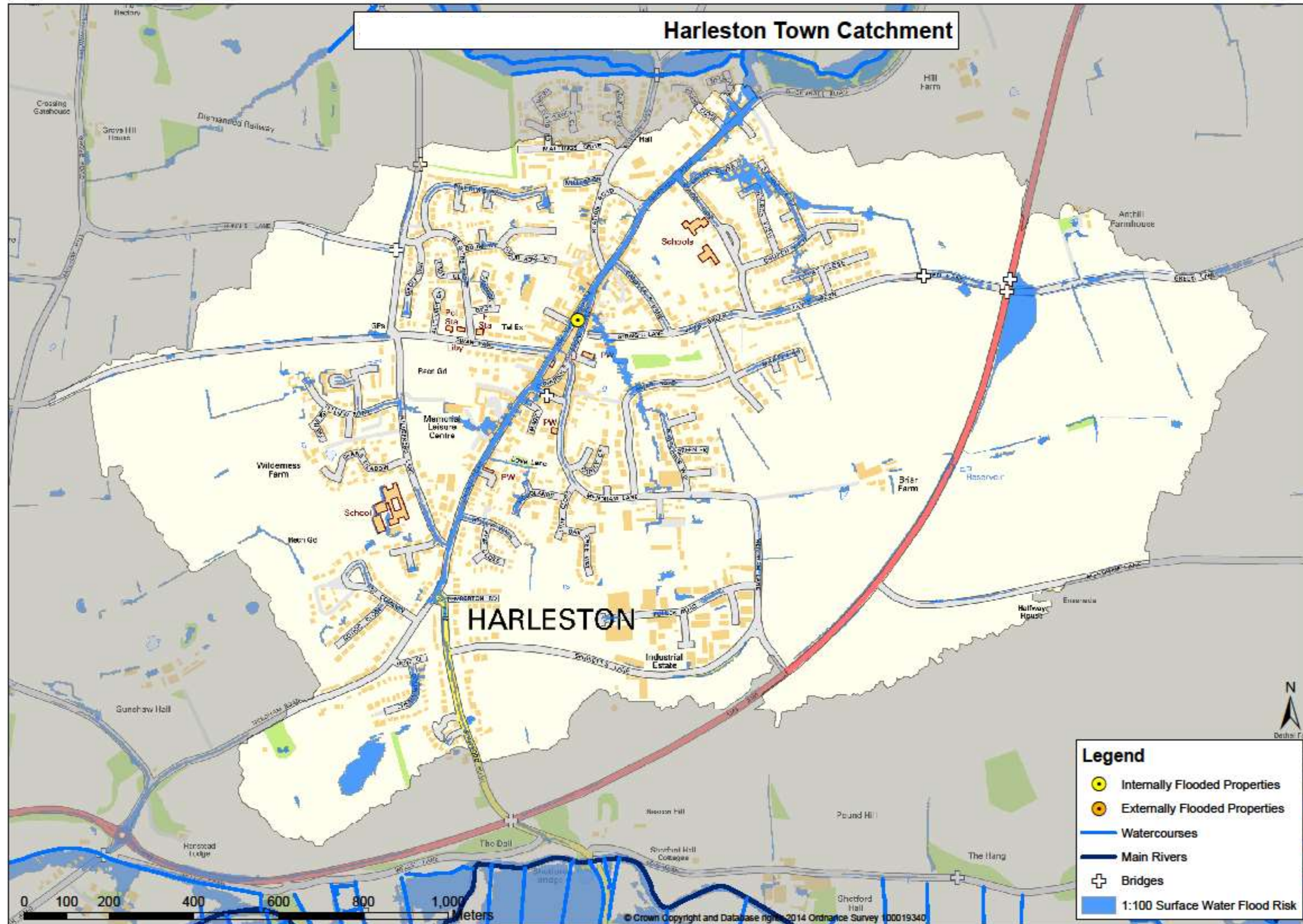
Recommendations – Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk. NCC will consider opportunities to route flood water on the highway away from affected properties. NCC will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems.



Legend

- Main Rivers
- Watercourses

Flooding and flood risk within the Harleston Town catchment



What are catchments?

To aid the investigation process and, for ease of presentation, the incidents of flooding have been grouped within this document based on hydrological catchments. The purpose of viewing flooding incidents based on catchments reflects the reality that flooding does not respect the administrative boundaries of water management organisations. Hydrological catchments catch water and discharge it at locations known as outlets. Individual hydrological catchment boundaries are usually formed by ridges of surrounding higher ground, which separate the lower lying areas at a line known as a watershed.

Description of catchment

The Harleston Catchment is residential in the centre with agricultural land to the East and West. Run-off flows from the East and West towards the centre of Harleston where it converges and flows in a Northerly direction.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not take into account flood risk from groundwater or reservoir failure.

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] No. of properties subject to surface water flood risk at 1 in 30 year event:	1	130	55
[b] No. of properties subject to surface water flood risk at 1 in 100 year event:	2	269	85
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	16	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	16	0
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event:	0	9	0
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	12	0

Flood incidents within this catchment

Within this catchment 1 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
28/06/2014	On the 28/06/2014 - 1 property was internally flooded on Broad Street, Redenhall with Harleston. This incident was reported by a resident via a flood questionnaire on the 9 July 2014, (FWF/14/7/0674)	Norfolk County Council contacted affected residents, to offer advice and gather information to confirm the flood report.

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

1 of the incidents (100%) of internal flooding in this catchment are within 2.5km of a rain gauge. The rainfall events recorded by gauges for this catchment are;

28 June 2014 – 21.4mm rainfall was recorded as falling in 2 hours 30 at the Harleston rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1:3.2 rainfall event.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

Following flooding to people, property and infrastructure;

- Risk Management Authorities should
 - Communicate with affected residents where their assets have given rise to the flooding of properties.
 - Review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.
- Property owners of affected properties should seek their own legal advice.
- NCC should
 - Incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment (“PFRA”).
 - Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Broad Street, Redenhall with Harleston, 28/06/2014	Run-off from rainfall pooled at a low point within the catchment affecting property.	Property owners
Broad Street, Redenhall with Harleston, 28/06/2014	Surface run-off from rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than the highway	NCC, Property owners
Broad Street, Redenhall with Harleston, 28/06/2014	Rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected property.	NCC
Broad Street, Redenhall with Harleston, 28/06/2014	Run-off from Rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected property. This was due to the infiltration of surface water into existing drainage networks.	NCC
Broad Street, Redenhall with Harleston, 28/06/2014	Rainfall was directed into the surface water system causing it to surcharge elsewhere. This surcharging contributed to the flooding at the affected property	NCC
Broad Street, Redenhall with Harleston, 28/06/2014	The flood water entered the property through low thresholds at entrances.	Property owners, NCC

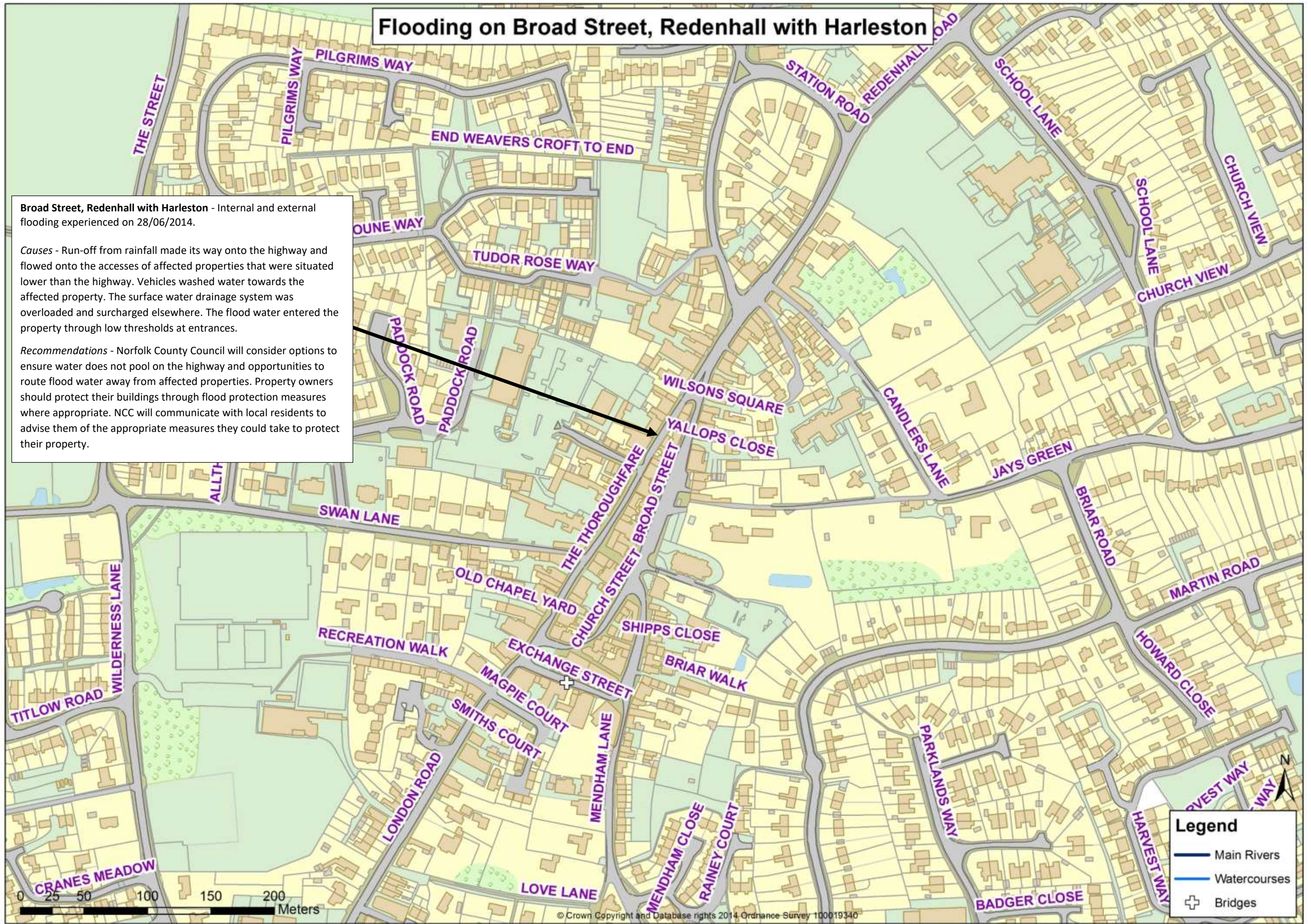
Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Broad Street, Redenhall with Harleston, 28/06/2014	Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.	Norfolk County Council	12 Months
Broad Street, Redenhall with Harleston, 28/06/2014	Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.	Norfolk County Council	12 Months
Broad Street, Redenhall with Harleston, 28/06/2014	Norfolk County Council will consider options that would ensure water does not pool on the highway.	Norfolk County Council	12 Months
Broad Street, Redenhall with Harleston, 28/06/2014	Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.	Norfolk County Council	12 Months
Broad Street, Redenhall with Harleston, 28/06/2014	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders.	Property owners	12 Months

Flooding on Broad Street, Redenhall with Harleston

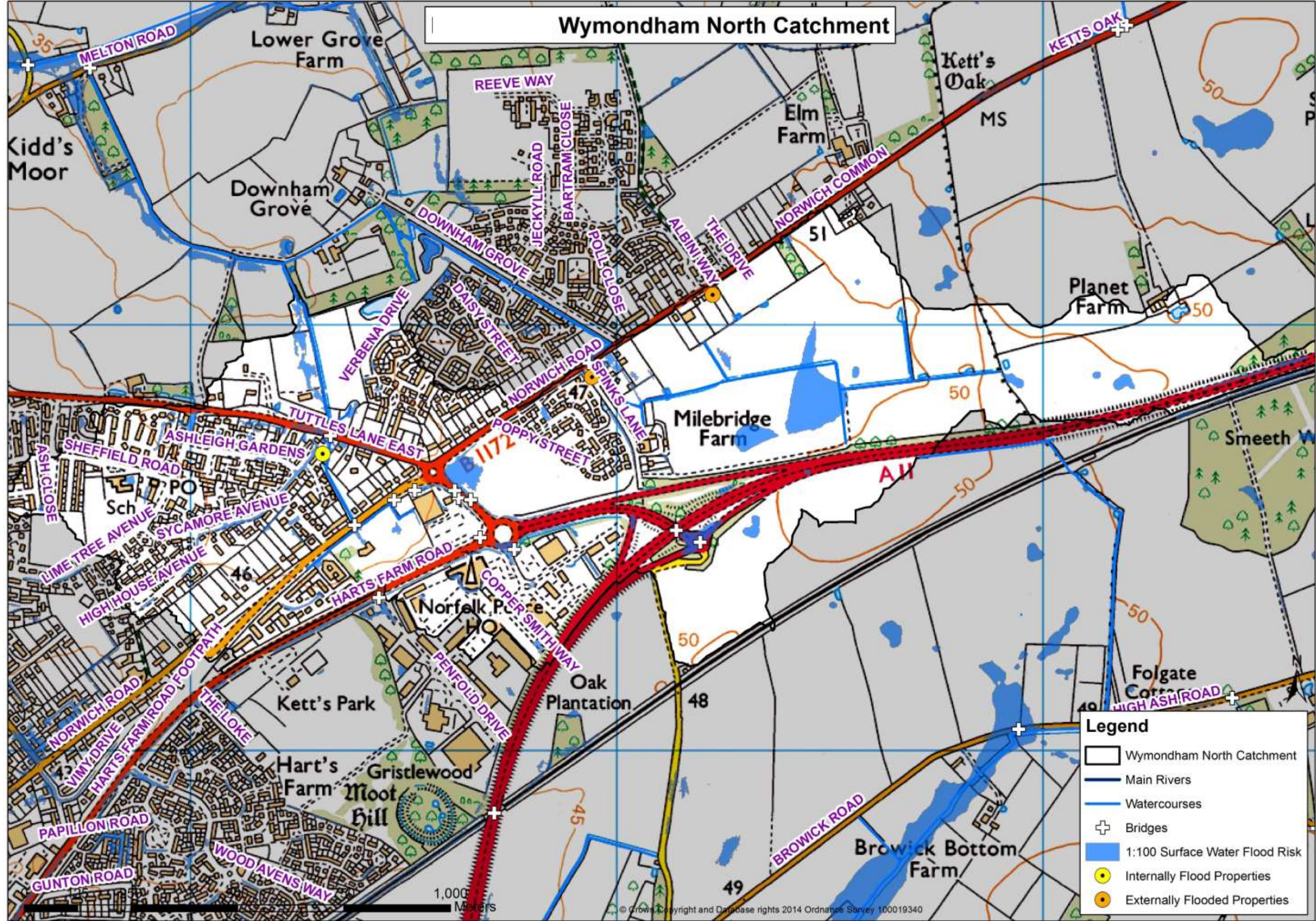
Broad Street, Redenhall with Harleston - Internal and external flooding experienced on 28/06/2014.

Causes - Run-off from rainfall made its way onto the highway and flowed onto the accesses of affected properties that were situated lower than the highway. Vehicles washed water towards the affected property. The surface water drainage system was overloaded and surcharged elsewhere. The flood water entered the property through low thresholds at entrances.

Recommendations - Norfolk County Council will consider options to ensure water does not pool on the highway and opportunities to route flood water away from affected properties. Property owners should protect their buildings through flood protection measures where appropriate. NCC will communicate with local residents to advise them of the appropriate measures they could take to protect their property.



Wymondham North Catchment



Legend

- Wymondham North Catchment
- Main Rivers
- Watercourses
- Bridges
- 1:100 Surface Water Flood Risk
- Internally Flooded Properties
- Externally Flooded Properties

What are catchments?

To aid the investigation process and, for ease of presentation, the incidents of flooding have been grouped within this document based on hydrological catchments. The purpose of viewing flooding incidents based on catchments reflects the reality that flooding does not respect the administrative boundaries of water management organisations. Hydrological catchments catch water and discharge it at locations known as outlets. Individual hydrological catchment boundaries are usually formed by ridges of surrounding higher ground, which separate the lower lying areas at a line known as a watershed.

Description of catchment

Flow paths originate in the East of this catchment in a rural area and flow towards Wymondham in a westerly direction.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not take into account flood risk from groundwater or reservoir failure.

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] No. of properties subject to surface water flood risk at 1 in 30 year event:	1	11	0
[b] No. of properties subject to surface water flood risk at 1 in 100 year event:	3	26	1
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event:	0	0	0
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

Flood incidents within this catchment

Within this catchment 1 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
10/08/2017	On the 10/08/2017 - 1 property was internally flooded on Sycamore Avenue, Wymondham. This incident was reported by a resident via an online flood report form on the 10 August 2017, (FWF/17/7/5196)	Norfolk County Council contacted affected residents, to offer advice and gather information to confirm the flood report.

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

There were no rain gauges within 2.5km of the incidents of flooding within this catchment

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

There were no rain gauges within 2.5km of the incidents of flooding within this catchment

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

Following flooding to people, property and infrastructure;

- Risk Management Authorities should
 - Communicate with affected residents where their assets have given rise to the flooding of properties.
 - Review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.
- Property owners of affected properties should seek their own legal advice.
- NCC should
 - Incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment ("PFRA").
 - Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Sycamore Avenue, Wymondham, 10/08/2017	Run-off from Rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected property. This was due to the infiltration of surface water into existing drainage networks.	Norfolk County Council
Sycamore Avenue, Wymondham, 10/08/2017	Rainfall was directed into the surface water system causing it to surcharge elsewhere. This surcharging contributed to the flooding at the affected property.	Norfolk County Council

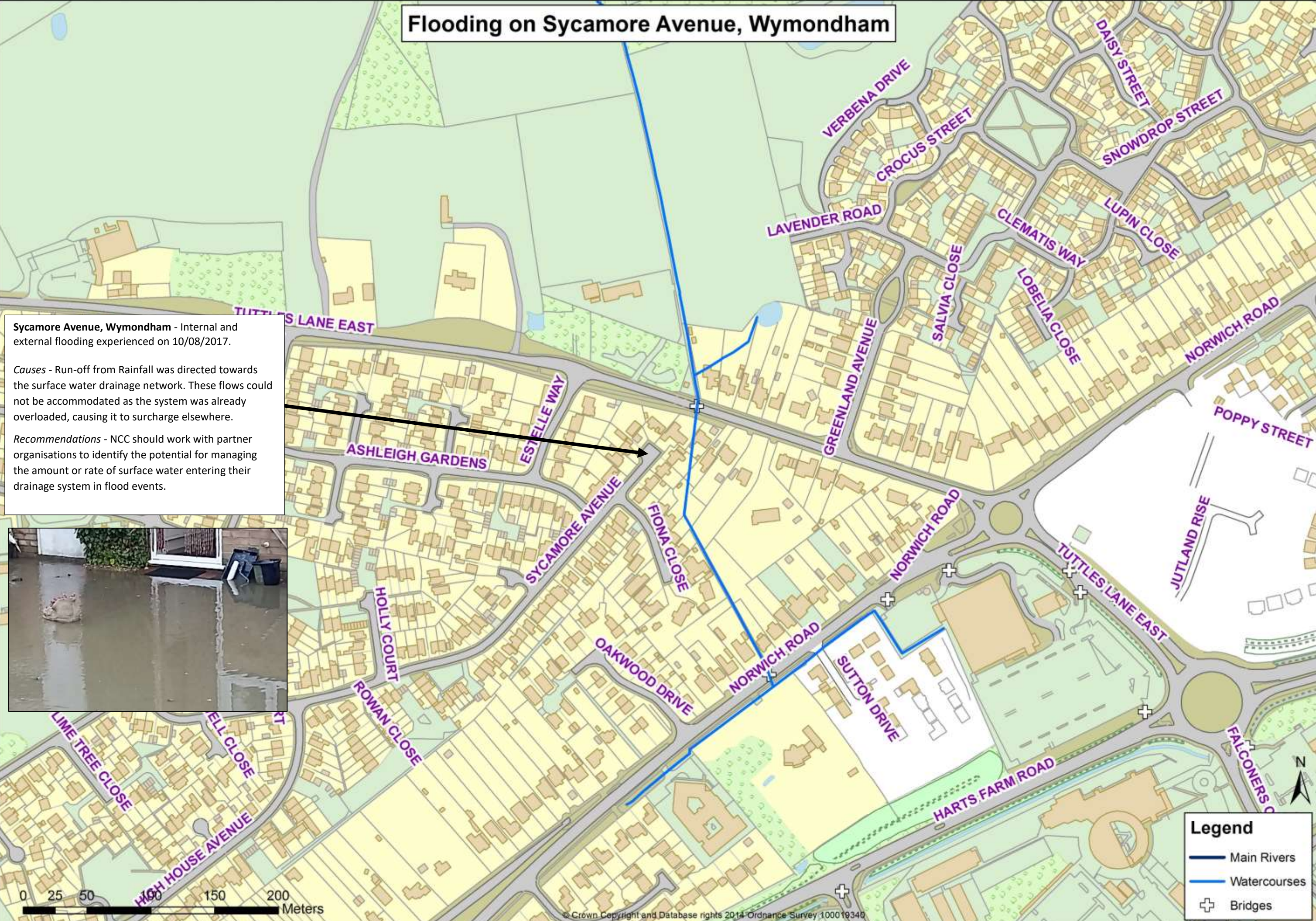
Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Sycamore Avenue, Wymondham, 10/08/2017	NCC should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.	Norfolk County Council	12 Months

Flooding on Sycamore Avenue, Wymondham

Sycamore Avenue, Wymondham - Internal and external flooding experienced on 10/08/2017.

Causes - Run-off from Rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded, causing it to surcharge elsewhere.

Recommendations - NCC should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.



Flooding and flood risk in Welborne

Flood incidents in this area.

Date of Incident	Incident as reported	What was the response to the flood incident
27/12/2017	On the 27/12/2017 - 1 property was internally flooded on Church Lane, Welborne. This incident was reported by Norfolk County Council via an electronic report on the 2 January 2018, (FWF/17/7/5862)	Norfolk County Council contacted affected residents, to offer advice and gather information to confirm the flood report. Following the incident Norfolk County Council had the drainage system pumped and the resident installed flood protection measures.

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

There were no rain gauges within 2.5km of the incidents of flooding within this catchment

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

Following flooding to people, property and infrastructure;

- Risk Management Authorities should
 - Communicate with affected residents where their assets have given rise to the flooding of properties.
 - Review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.
- Property owners of affected properties should seek their own legal advice.
- NCC should
 - Incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment ("PFRA").
 - Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Church Lane, Welborne , 27/12/2017	Run-off from rainfall pooled at a low point within the catchment affecting property.	Property owners
Church Lane, Welborne , 27/12/2017	The surface water drainage system network was partially obstructed by debris or silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	Norfolk County Council
Church Lane, Welborne , 27/12/2017	Rainfall was directed into the surface water system causing it to surcharge elsewhere. This surcharging contributed to the flooding at the affected property.	Norfolk County Council
Church Lane, Welborne , 27/12/2017	The flood water entered the property through low thresholds at entrances.	Property owners, Norfolk County Council

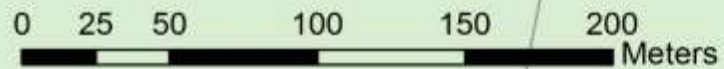
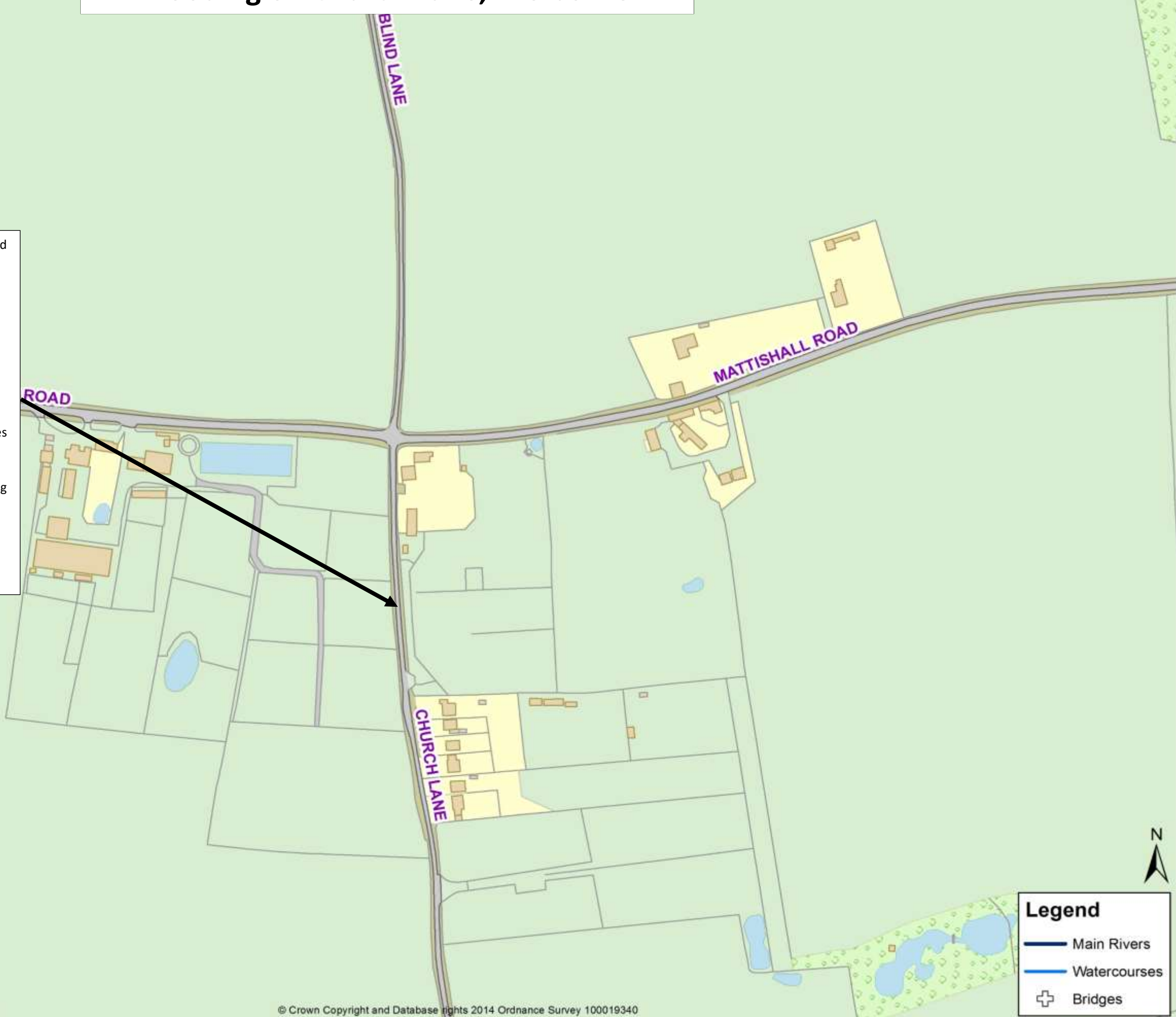
Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Church Lane, Welborne, 27/12/2017	Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.	Norfolk County Council	12 Months
Church Lane, Welborne, 27/12/2017	Norfolk County Council will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified.	Norfolk County Council	12 Months
Church Lane, Welborne, 27/12/2017	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders.	Property owners, Norfolk County Council	12 Months

Flooding on Church Lane, Welborne

Church Lane, Welborne - Internal and external flooding experienced on 27/12/2017.

Causes - Run-off from rainfall pooled at a low point within the catchment and was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded, causing it to surcharge elsewhere. The flood water entered the property through low thresholds at entrances.

Recommendations - Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them of the appropriate measures they could take to protect their property.



Legend

- Main Rivers
- Watercourses
- Bridges



Flooding and flood risk in various locations

Flood incidents in these locations

8 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
11/08/2018	On the 11/08/2018 - 1 property was internally flooded on Old Street, Newton Flotman. This incident was reported by a resident via an online flood report form on the 6 September 2018, (FWF/18/7/7149)	Norfolk County Council contacted affected residents, to offer advice and gather information to confirm the flood report.
02/04/2018	On the 02/04/2018 - 1 property was internally flooded on West End, Costessey. This incident was reported by a resident via email correspondence on the 10 April 2018, (FWF/18/7/6403)	Norfolk County Council cleansed and assessed the drainage system and found there was no faults.
05/03/2018	On the 05/03/2018 - 1 property was internally flooded on Hackford, Wicklewood. This incident was reported by a resident via an online flood report form on the 8 March 2018, (FWF/18/7/6238)	The Fire and Rescue Service responded and pumped out during the incident. Norfolk County Council visited affected residents to offer advice and to gather information after the incident.
14/02/2018	On the 14/02/2018 - 1 property was internally flooded on High Road, Roydon (Bressingham). This incident was reported by a resident via an online flood report form on the 19 February 2018, (FWF/18/7/6122)	The Fire and Rescue Service responded and pumped out during the incident.
01/01/2018	On the 01/01/2018 - 1 property was internally flooded on Hall Road, Toft Monks. This incident was reported by South Norfolk District Council via email correspondence on the 9 January 2018, (FWF/18/7/5986)	Norfolk County Council visited affected residents to offer advice and to gather information after the incident. Norfolk County Council carried out maintenance work to the highway drainage system after the incident.
17/11/2017	On the 17/11/2017 - 1 property was internally flooded on Denmark Street, Diss. This incident was reported by Norfolk County Council via an electronic report on the 21 November 2017, (FWF/17/7/5686)	Norfolk County Council carried out maintenance work to the highway drainage system after the incident. Norfolk County Council visited affected residents to offer advice and to gather information after the incident.
30/06/2017	On the 30/06/2017 - 1 property was internally flooded on Market Place, Diss. This incident was reported by Norfolk County Council via an electronic report on the 11 July 2017, (FWF/17/7/4942)	Norfolk County Council contacted affected residents, to offer advice and gather information to confirm the flood report.
06/07/2016	On the 06/07/2016 - 1 property was internally flooded on The Heywood, Diss. This incident was reported by the Fire and Rescue Service via an electronic report on the 10 July 2016, (FWF/16/7/3363)	The Fire and Rescue Service responded and pumped out during the incident.

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

There were no rain gauges within 2.5km of the incidents of flooding within this catchment

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

Following flooding to people, property and infrastructure;

- Risk Management Authorities should
 - Communicate with affected residents where their assets have given rise to the flooding of properties.
 - Review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.
- Property owners of affected properties should seek their own legal advice.
- NCC should
 - Incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment ("PFRA").
 - Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Old Street, Newton Flotman, 11/08/2018 Hackford, Wicklewood, 05/03/2018 High Road, Roydon (Bressingham), 14/02/2018 Hall Road, Toft Monks, 01/01/2018 The Heywood, Diss, 06/07/2016	Run-off from rainfall pooled at a low point within the catchment affecting properties.	Property Owners
Old Street, Newton Flotman, 11/08/2018 West End, Costessey, 02/04/2018 High Road, Roydon (Bressingham), 14/02/2018 Hall Road, Toft Monks, 01/01/2018 Denmark Street, Diss, 17/11/2017 Market Place, Diss, 30/06/2017	Surface run-off from rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than the highway	Norfolk County Council
West End, Costessey, 02/04/2018 Hall Road, Toft Monks, 01/01/2018 Denmark Street, Diss, 17/11/2017	The surface water drainage system network was partially obstructed by debris or silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	Norfolk County Council
West End, Costessey, 02/04/2018 Hackford, Wicklewood, 05/03/2018 High Road, Roydon (Bressingham), 14/02/2018 Hall Road, Toft Monks, 01/01/2018 The Heywood, Diss, 06/07/2016	Run-off from Rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected properties. This was due to the infiltration of surface water into existing drainage networks.	Norfolk County Council
Hackford, Wicklewood, 05/03/2018 High Road, Roydon (Bressingham), 14/02/2018 Hall Road, Toft Monks, 01/01/2018	Rainfall was directed into the surface water system causing it to surcharge elsewhere. This surcharging contributed to the flooding at the affected properties.	Norfolk County Council
Old Street, Newton Flotman, 11/08/2018 Denmark Street, Diss, 17/11/2017 Market Place, Diss, 30/06/2017	The flood water entered the properties through low thresholds at entrances.	Property Owners, Norfolk County Council
The Heywood, Diss, 06/07/2016	Run-off from rainfall was directed into the ditch system. The system upstream from the property was unmaintained and partially obstructed by vegetation, causing the water to back up towards the affected property and overtop the ditch system.	Riparian Owners

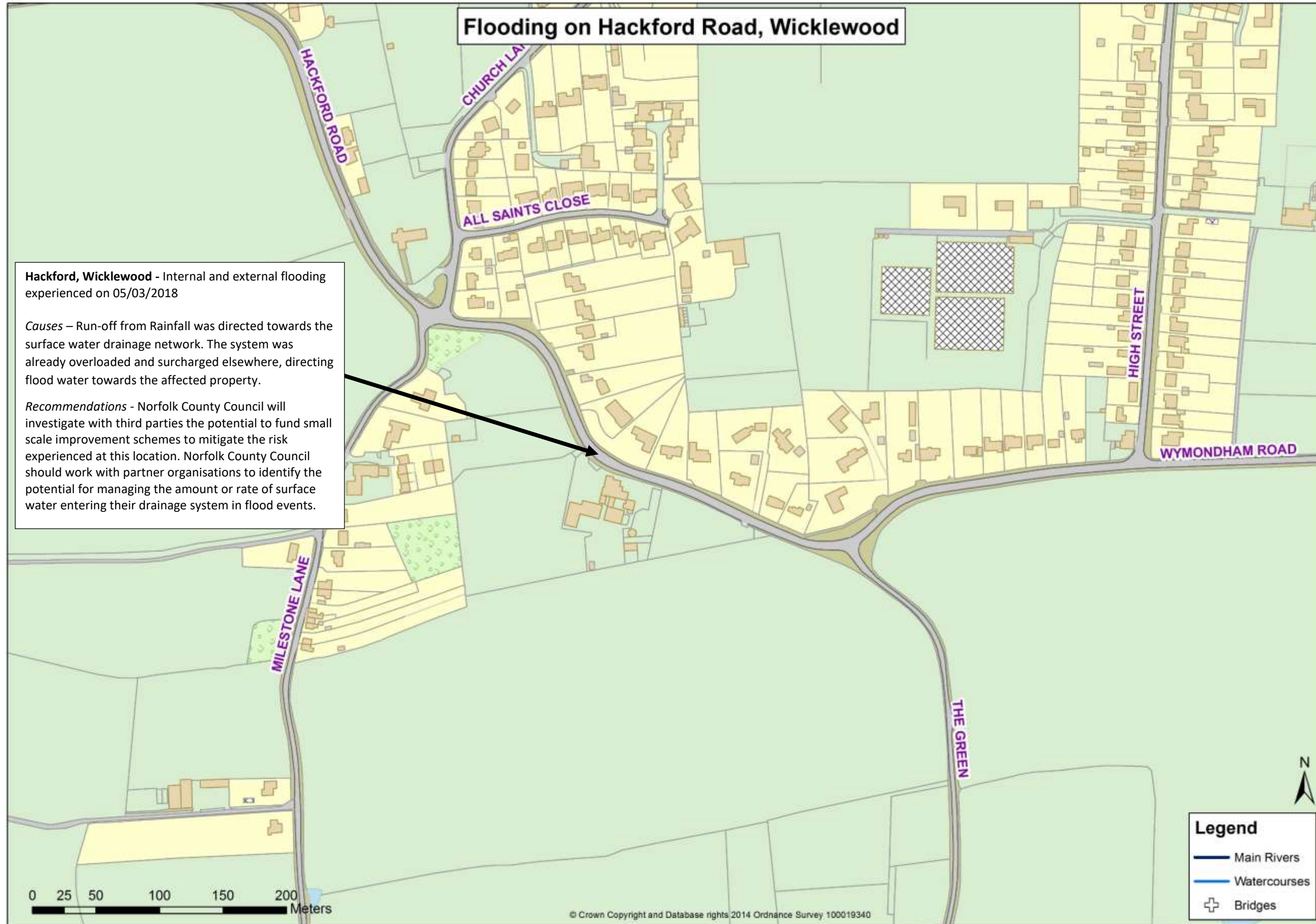
Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
<p>Old Street, Newton Flotman, 11/08/2018 Hackford, Wicklewood, 05/03/2018 High Road, Roydon (Bressingham), 14/02/2018 Hall Road, Toft Monks, 01/01/2018 The Heywood, Diss, 06/07/2016</p>	<p>Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.</p>	<p>Norfolk County Council</p>	<p>12 Months</p>
<p>Old Street, Newton Flotman, 11/08/2018 West End, Costessey, 02/04/2018 High Road, Roydon 14/02/2018 Hall Road, Toft Monks, 01/01/2018 Denmark Street, Diss, 17/11/2017 Market Place, Diss, 30/06/2017</p>	<p>Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.</p>	<p>Norfolk County Council</p>	<p>12 Months</p>
<p>West End, Costessey, 02/04/2018 Hall Road, Toft Monks, 01/01/2018 Denmark Street, Diss, 17/11/2017</p>	<p>Norfolk County Council will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified.</p>	<p>Norfolk County Council</p>	<p>12 Months</p>
<p>West End, Costessey, 02/04/2018 Hackford, Wicklewood, 05/03/2018 High Road, Roydon 14/02/2018 Hall Road, Toft Monks, 01/01/2018 The Heywood, Diss, 06/07/2016</p>	<p>Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.</p>	<p>Norfolk County Council</p>	<p>12 Months</p>
<p>Old Street, Newton Flotman, 11/08/2018 Denmark Street, Diss, 17/11/2017 Market Place, Diss, 30/06/2017</p>	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders.</p>	<p>Property owners, Norfolk County Council</p>	<p>12 Months</p>
<p>The Heywood, Diss, 06/07/2016</p>	<p>Norfolk County Council will determine an appropriate maintenance regime in line with the risk identified and communicate with affected parties and riparian owners.</p>	<p>Norfolk County Council Riparian Owners</p>	<p>12 Months</p>

Flooding on Hackford Road, Wicklewood

Hackford, Wicklewood - Internal and external flooding experienced on 05/03/2018

Causes – Run-off from Rainfall was directed towards the surface water drainage network. The system was already overloaded and surcharged elsewhere, directing flood water towards the affected property.

Recommendations - Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.



Flooding on West End, Costessey

West End, Costessey – Internal and external flooding experienced on 02/04/2018.

Causes - Run-off was directed towards the surface water drainage network and could not be accommodated as the system was already overloaded. The system was partially obstructed by debris or silt, reducing the efficiency of the upstream drainage system. Surface run-off from rainfall made its way onto the highway and onto the access of the affected property situated lower than the road.

Recommendations - Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties. NCC will review the level of maintenance required to sustain the design efficiency of their drainage systems. NCC should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.



0 25 50 100 150 200 Meters

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Legend

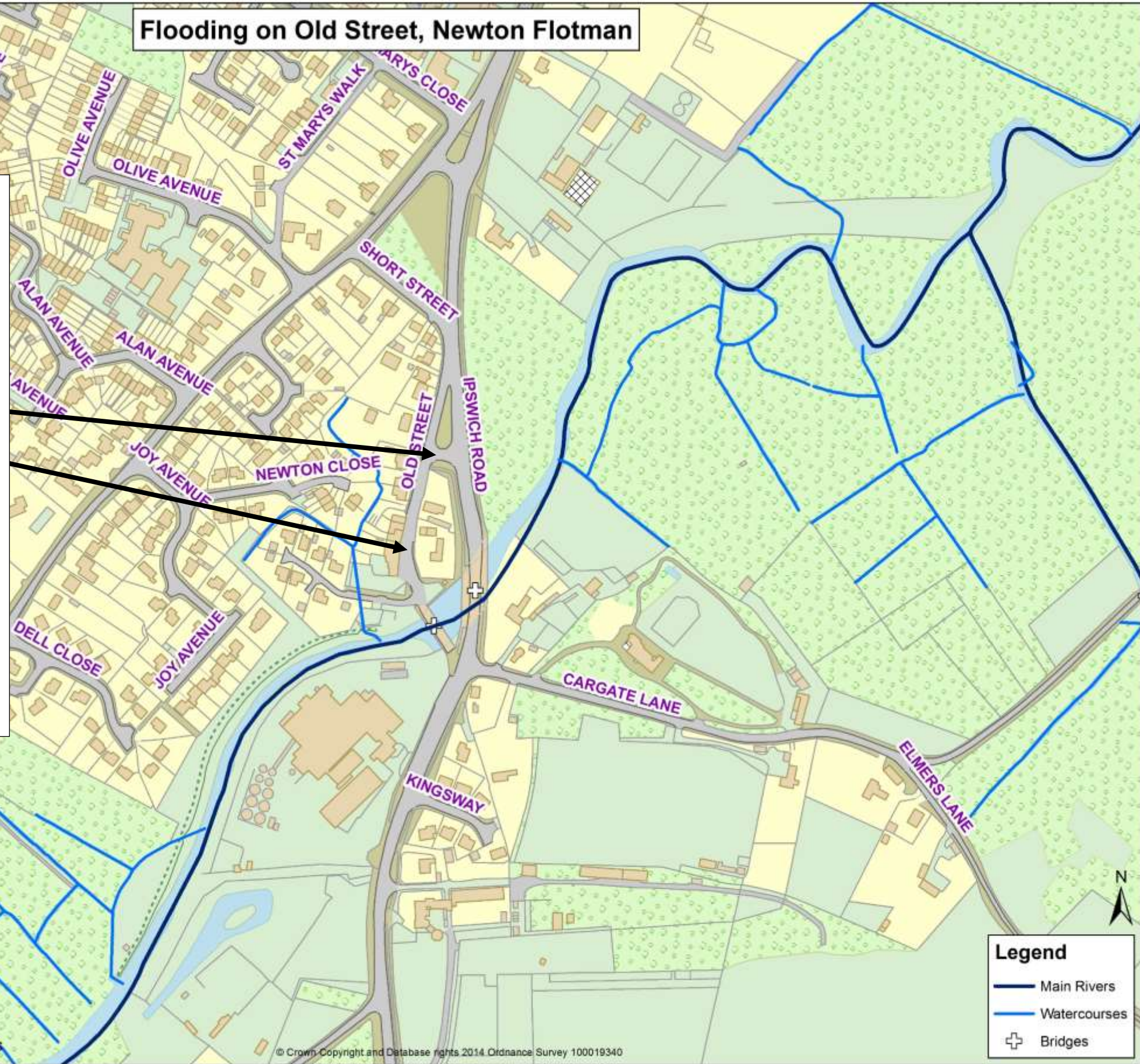
- Main Rivers
- Watercourses
- + Bridges

Flooding on Old Street, Newton Flotman

Old Street, Newton Flotman– Internal and external flooding experienced on 11/08/2018.

Causes - Run-off from rainfall pooled at a low point and made its way onto the highway. Run-off flowed along the road network and onto the access of the affected property situated lower than the highway, entering through the low threshold at the entrance.

Recommendations – Norfolk County Council will investigate with third parties the potential to fund small scale improvement scheme. NCC will consider opportunities to route flood water on the highway away from the affected property. Property owners should protect their buildings through flood protection measures where appropriate.

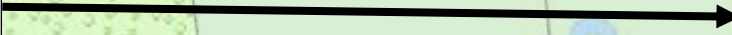


Flooding on The Heywood, Diss

The Heywood, Diss - Internal and external flooding experienced on 06/07/2016

Causes - Run-off from rainfall pooled at a low point within the catchment and was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. The ditch system upstream of the property was unmaintained, causing the system to back up and overflow near the property.

Recommendations - Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. NCC should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. NCC will communicate with riparian owners regarding their responsibilities and a maintenance regime.



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Legend

- Main Rivers
- Watercourses
- Bridges

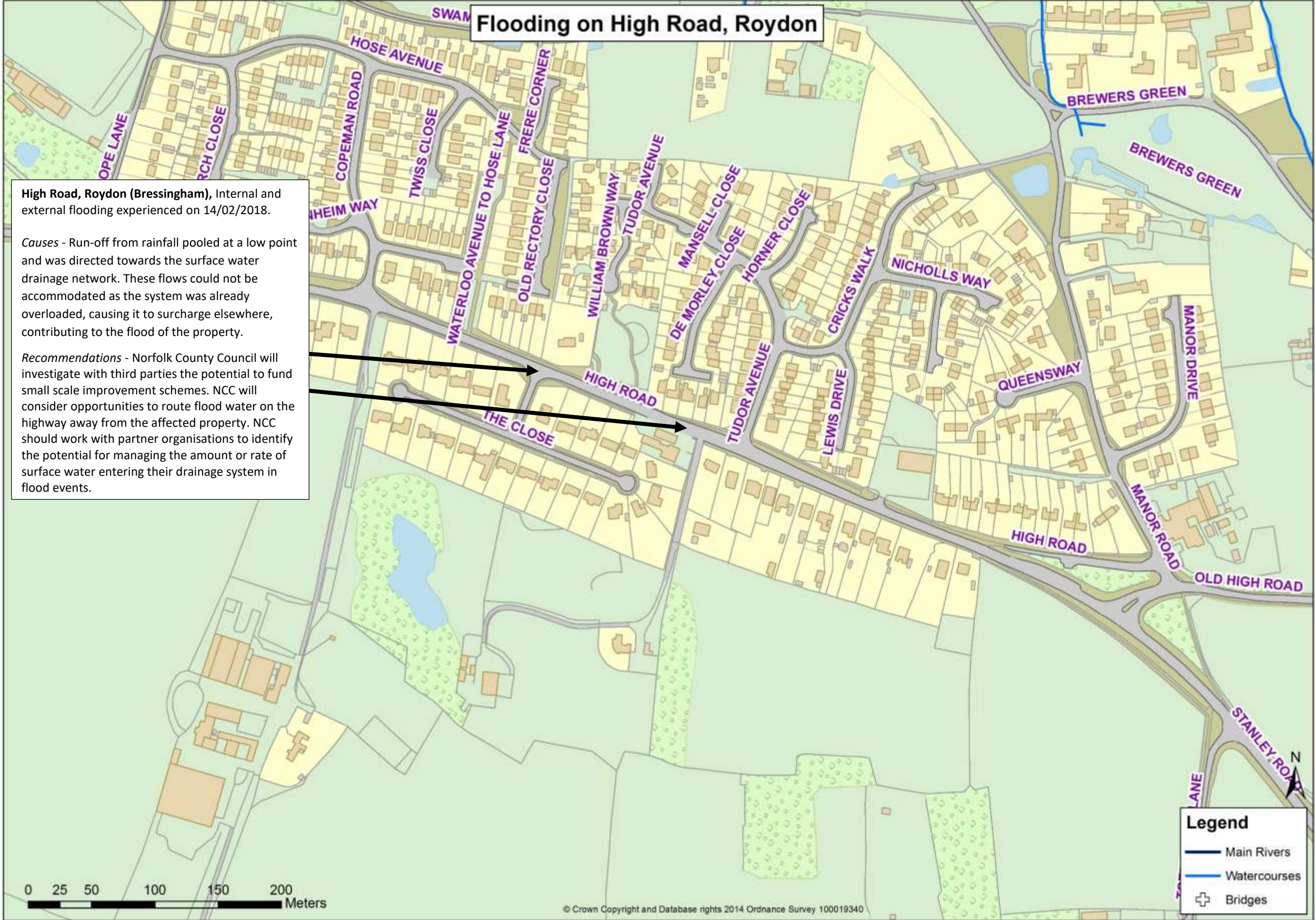


Flooding on High Road, Roydon

High Road, Roydon (Bressingham), Internal and external flooding experienced on 14/02/2018.

Causes - Run-off from rainfall pooled at a low point and was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded, causing it to surcharge elsewhere, contributing to the flood of the property.

Recommendations - Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes. NCC will consider opportunities to route flood water on the highway away from the affected property. NCC should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.



Flooding on Denmark Street and Market Place, Diss

Denmark Street, Diss - Internal and external flooding experienced on 17/11/2017.

Causes – Surface run-off from rainfall that had made its way onto the highway flowed along the road network and onto the accesses of the affected property situated lower than the highway. The surface water drainage system network was partially obstructed by debris or silt, reducing the efficiency of the upstream drainage system. The flood water entered the properties through low thresholds at entrances.

Recommendations - Norfolk County Council will consider opportunities to route flood water on the highway away from the affected property. Norfolk County Council will review the level of maintenance required to sustain the design efficiency of their drainage systems. Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them of the appropriate measures they could take to protect their property.



Market Place, Diss - Internal and external flooding experienced on 30/06/2017.

Causes – Surface run-off from rainfall made its way onto the highway and flowed onto the access of the affected property situated lower than the highway. The flood water entered the property through low thresholds at entrances.

Recommendations - Norfolk County Council will consider opportunities to route flood water on the highway away from the affected property. Property owners should protect their buildings through flood protection measures where appropriate. NCC will communicate with local residents to advise them of the appropriate measures they could take to protect their property.

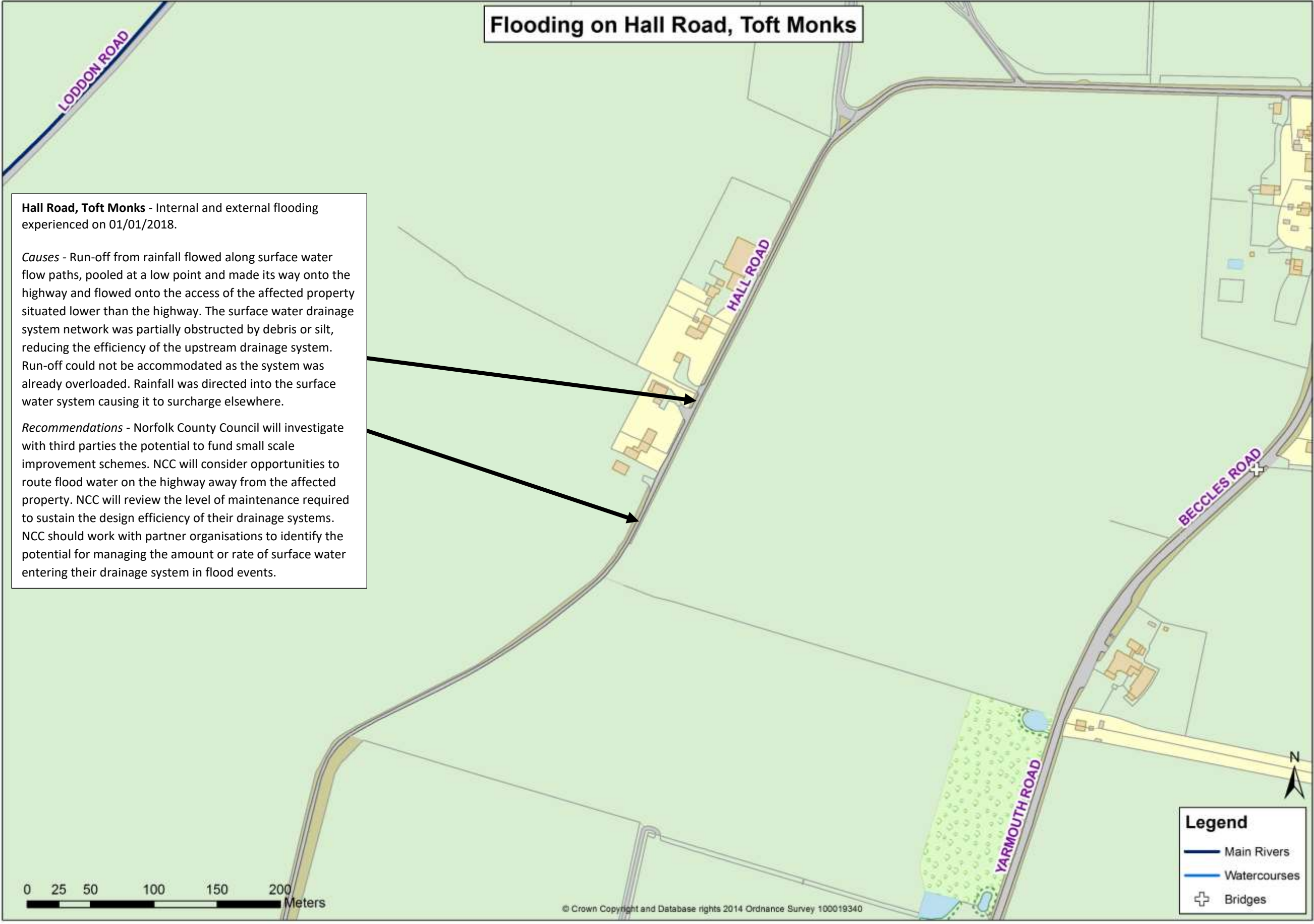


Flooding on Hall Road, Toft Monks

Hall Road, Toft Monks - Internal and external flooding experienced on 01/01/2018.

Causes - Run-off from rainfall flowed along surface water flow paths, pooled at a low point and made its way onto the highway and flowed onto the access of the affected property situated lower than the highway. The surface water drainage system network was partially obstructed by debris or silt, reducing the efficiency of the upstream drainage system. Run-off could not be accommodated as the system was already overloaded. Rainfall was directed into the surface water system causing it to surcharge elsewhere.

Recommendations - Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes. NCC will consider opportunities to route flood water on the highway away from the affected property. NCC will review the level of maintenance required to sustain the design efficiency of their drainage systems. NCC should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.



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Disclaimer

Although every effort has been taken to ensure the accuracy of the information contained within the pages of the report, we cannot guarantee that the contents will always be current, accurate or complete.

This report has been prepared as part of Norfolk County Council's responsibilities under the Flood and Water Management Act 2010. It is intended to provide context and information to support the delivery of the local flood risk management strategy and should not be used for any other purpose.

The findings of the report are based on a subjective assessment of the information available by those undertaking the investigation and therefore may not include all relevant information. As such it should not be considered as a definitive assessment of all factors that may have triggered or contributed to the flood event.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by Norfolk County Council when preparing this report, including, but not limited to those key assumptions noted in the Report, including reliance on information provided by third parties.

Norfolk County Council expressly disclaims responsibility for any error in, or omission from, this report arising from or in connection with any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the time of preparation and Norfolk County Council expressly disclaims responsibility for any error in, or omission from this report arising from or in connection with those opinions, conclusions and any recommendations.

The implications for producing Flood Investigation Reports and any consequences of blight have been considered. The process of gaining insurance for a property and/or purchasing/selling a property and any flooding issues identified are considered a separate and legally binding process placed upon property owners and this is independent of and does not relate to the County Council highlighting flooding to properties at a street level.

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Appendix A - Key definitions and responsibilities

What is flooding?

Section 1 of the Flood and Water Management Act 2010 states that: "Flood" includes any case where land not normally covered by water becomes covered by water. In addition, this section adds the caveat: "But "flood" does not include – (a) a flood from any part of the sewerage system, unless wholly or partly caused by an increase in the volume of rainwater (including snow and other precipitation) entering or otherwise affecting the system, or (b) a flood caused by a burst water main (within the meaning given by Section 219 of the Water Industry Act 1991)."

What is internal and external flooding?

For the purposes of this report, properties that have internally flooded are those where it is considered that water has entered the fabric of the building;

- Basements and below ground level floors are included.
- Garages are included if in the fabric of the building. Garages adjacent or separate from the main building are not included.
- Occupied caravans are included but not tents.

External flooding included those properties where water has entered gardens or surrounding areas which restricts access, affects the highway or where flooding has disrupted essential services to the property such as sewerage. For businesses this includes those where the flood waters are directly preventing them trading as usual.

What is Local Flood Risk?

Local Flood Risk is defined by the Flood and Water Management Act 2010 as being flood risk from surface runoff, groundwater and ordinary watercourses.

- 'Surface runoff' means rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving) and, has not entered a watercourse, drainage system or public sewer.
- 'Groundwater' means all water which is below the surface of the ground and in direct contact with the ground or subsoil.
- 'Ordinary Watercourse' means a watercourse that does not form part of a main river and includes a reference to a lake, pond or other area of water which flows into an ordinary watercourse.

Roles and Responsibilities of Risk Management Authorities

Below is a short summary of those groups and Risk Management Authorities ("RMAs") that have a role in managing flooding within Norfolk. The listing of responsibilities includes those duties or powers that directly relate to managing the flood incidents or consequence. All RMAs have a duty to cooperate with other RMAs.

1. Norfolk County Council (as Lead Local Flood Authority)

- Duty to investigate significant flooding from any source.
- Duty to maintain a register of structures or features which affect flood risk from all sources.
- Power to undertake works to manage flood risk from surface run-off and groundwater.
- Powers to regulate activities on ordinary watercourses outside of Internal Drainage Board areas.
- Duties as a Category 1 Responder for Emergency Planning and the Fire & Rescue Service.

2. District Councils

- Powers to undertake works on ordinary watercourses outside of IDB areas.
- The Local Planning Authority for their District area and determine the appropriateness of developments and their exposure and effect on flood risk.
- Duties as a Category 1 Responder for Emergency Planning.

3. Internal Drainage Boards ("IDBs")

- A duty to act in a manner consistent with the national and local strategies and guidance when exercising FCERM functions.

- Duty to act in a manner consistent with Local Flood Risk Management Strategies when exercising other functions that may affect flood risk.
- Powers to regulate activities on ordinary watercourses within IDB areas.
- Exercise a general power of supervision over all matters relating to the drainage of land within their district.
- Powers to undertake works on ordinary watercourses within IDB areas.

4. Highway Authorities (Norfolk County Council / Highways England)

- Powers to undertake works to manage water on the highway and to move water off the highway.
- Enforcement powers to unauthorised alterations, obstructions and interferences with highway drainage.
- Have responsibilities for culverts vested in the highway. Currently NCC discharges its responsibilities associated with bridges and culverts (whether as owner or highway authority) through the inspection of condition (undertaken by the Bridges team) and through maintenance activity (delivered on a as needs basis by the relevant Highways area team).

5. Water Companies

- Undertake cost beneficial capital schemes to alleviate or eliminate flooding where the flood event is associated with a failure of their assets.
- Duty to provide, improve, maintain and operate systems of public sewers and works for the purpose of effectually draining an area.
- Are responsible for flooding from their foul, combined and surface water sewers, and from burst water mains.
- Maintain 'At Risk Registers' for Ofwat that record properties that have flooded from public foul, combined and surface water sewers and that are at risk of flooding again.
- Water companies respond to reports from the public of flooding associated with their assets and determine an appropriate response in line with their standards or customer service.
- Duties as a Category 2 Responder for Emergency Planning.

6. Riparian Owners

- Duty of care towards neighbours upstream and downstream, avoiding any action likely to cause flooding.
- Entitled to protect their properties from flooding.
- May be required to maintain the condition of their watercourse to ensure that the proper flow of water is unimpeded.