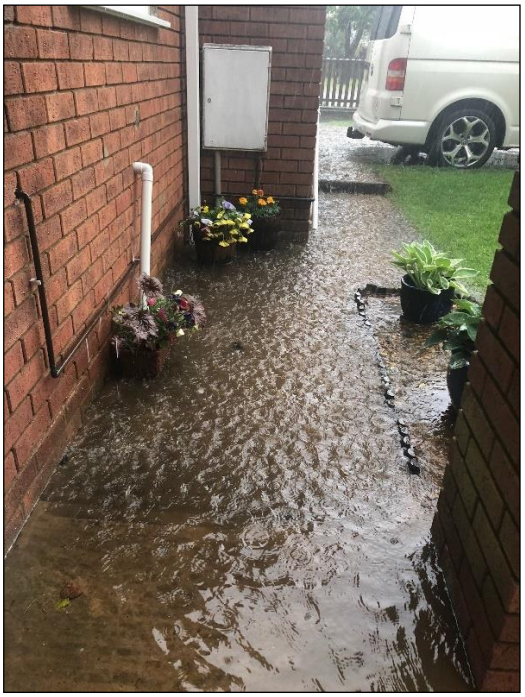
Investigation Report into the flooding in Breckland Various in 2017/18

Report Reference: 38

Draft Report prepared by Nathan Harris on 18 March 2019



Contents

Executive Summary

(a) Flooding incidents and causes

The flooding that occurred in Breckland in 2017/18 was located in five parishes; Swaffham, Attleborough, Rocklands, Dereham & Mundford and led to the internal flooding of 7 properties.

The incidents of internal flooding in Breckland and its environs occurred in the following parishes and at the locations listed below;

- Lynn Road, Swaffham – 1 Property
- Chapel Road, Attleborough - 1 Property
- The Street, Rocklands - 1 Property
- Nelson Place, Dereham - 1 Property
- Rashs Green, Dereham - 1 Property
- Crown Road, Mundford - 2 Properties

(b) Flooding causes

The flooding that occurred within Breckland 2017/18 can be attributed to several factors, as listed below

- Existing drainage systems had become obstructed with silt and other debris resulting in the pooling of water within the highway, this was subsequently washed towards affected properties by passing vehicles.

- Water that fell onto highway that was unable to enter a drainage system due to blockage or where a surface water drainage system did not exist flowed along the highway and subsequently onto property via drop kerbs.

- Loss of drainage features within the area (such as ditches) and the amendments of principal drains/watercourses and their connections through culverting, infilling and lack of maintenance caused a loss of integrity and capacity of the drainage network.

- Individual property drainage was either unmaintained or lacked sufficient capacity to cope with the event.

- The capacity of surface water drainage including land drains, highway drainage and private property drainage was exceeded due to the levels of rainfall that fell during the event.

- Flood water entered properties through the unprotected structure of the building. This included via features such as low thresholds at entrances and unprotected air bricks

(c) 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;

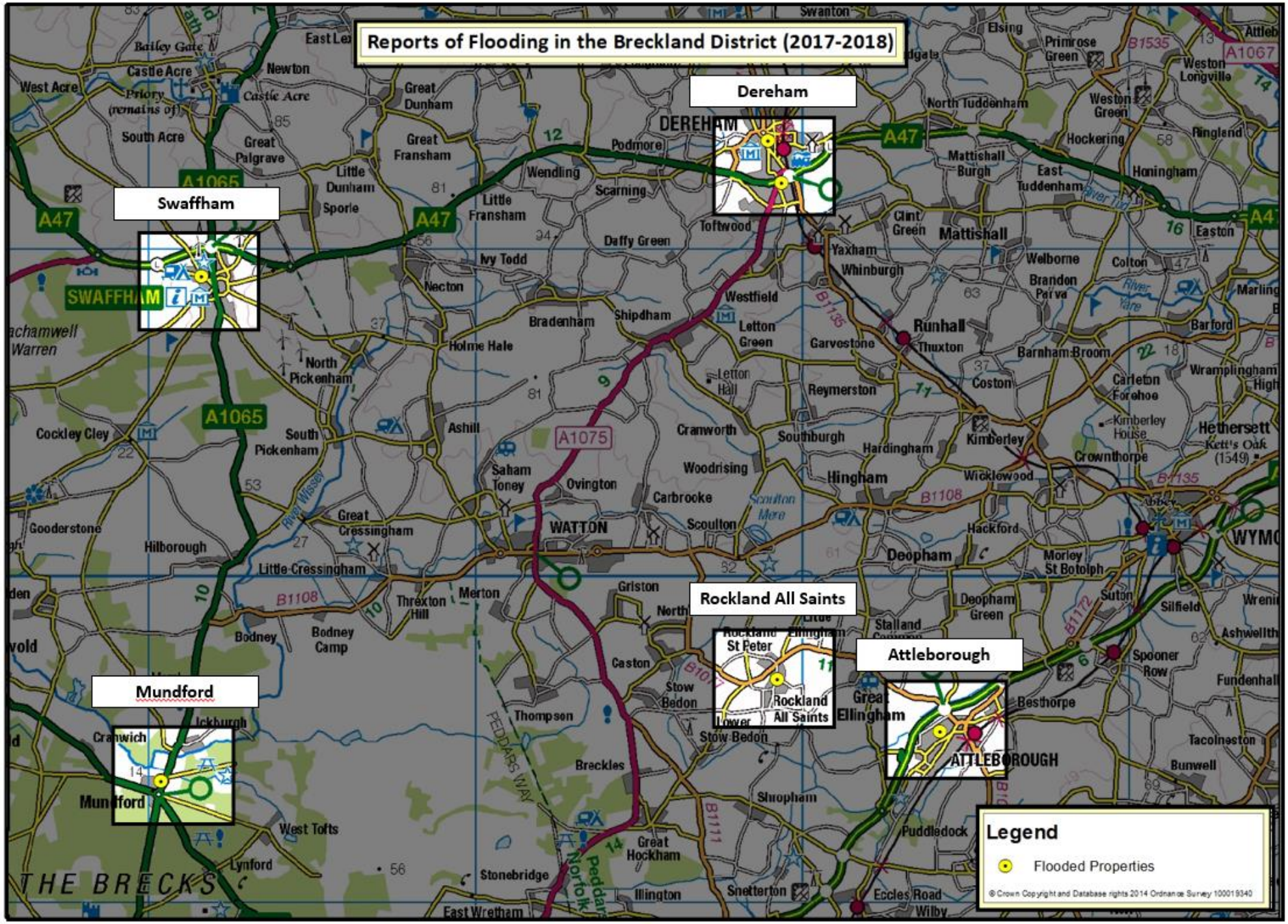
- Confirm the integrity, capacity and appropriateness of their property drainage
- Determine if works are needed to remove the risk posed by structures that form obstructions to flows.
- Determine if it is appropriate for them to protect their buildings through flood protection measures.
- Seek their 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 residents to advise them of the 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.

Anglian Water should;

- Work with partner organisations to identify the potential for managing the amount of surface water entering their drainage system in flood events.


Reports of Flooding in the Breckland District (2017-2018)
Dereham
Swaffham
Rockland All Saints
Attleborough
Mundford
Legend
Flooded Properties
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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 Breckland Various in Various 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 Swaffham Area

Description of Location
Location is North West of the centre of the market town of Swaffham.

Flood incidents within this location
Within this location one incident of internal flooding have been assessed as part of this investigation. This incident is detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
28/06/2017	On the 28/06/2017 - 1 property was internally flooded on Lynn Road, Swaffham. This incident was reported by Norfolk County Council (Highways) via an electronic report on the 11 July 2017, (FWF/17/3/4936)	Norfolk County Council assessed validity and impact of the flood report after the incident.

Recent rainfall within the area
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.

Historic flooding incidents within the area
The following table lists flooding incidents within the catchment that have been recorded:

Date of incident	Impact	Rainfall intensity
08/06/2017	Standing water present	Unknown
08/06/2016	Standing water present	Unknown
11/01/2016	Standing water present	Unknown
25/04/2014	Standing water present	Unknown
23/09/2013	Standing water present	Unknown

Causes of flooding within the area 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?
Lynn Road, Swaffham, 28/06/2017	Rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected property.	Norfolk County Council
Lynn Road, Swaffham, 28/06/2017	The surface water drainage system network was obstructed by debris or silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	Norfolk County Council Anglia Water
Lynn Road, Swaffham, 28/06/2017	Run-off from rainfall was directed towards the surface water drainage network. These flows could not be accommodated. This directed flood water towards the affected property.	Norfolk County Council Anglia Water
Lynn Road, Swaffham, 28/06/2017	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 Anglia Water
Lynn Road, Swaffham, 28/06/2017	The flood water entered the property through low threshold.	Property owner
Lynn Road, Swaffham, 28/06/2017	Individual property drainage was unmaintained and could not cope with heavy rainfall. Individual property drainage was obstructed by debris or silt. This reduced the efficiency of the drainage system contributing to the accumulation of surface water flood water at the affected property.	Property owner
Lynn Road, Swaffham, 28/06/2017	Run-off from rainfall was directed towards Individual property drainage. These flows could not be accommodated as the system is of insufficient capacity to deal with this amount of water. This directed flood water towards the affected property.	Property owner

Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Lynn Road, Swaffham, 28/06/2017	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
Lynn Road, Swaffham, 28/06/2017	Norfolk County Council will consider options that would ensure water does not pool on the highway.	Norfolk County Council	12 months
Lynn Road, Swaffham, 28/06/2017	Norfolk County Council & AW 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 Anglian Water	12 months
Lynn Road, Swaffham, 28/06/2017	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.	Norfolk County Council Anglian Water	12 months
Lynn Road, Swaffham, 28/06/2017	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with resident 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 Owner should consider the potential to retrofit permeable areas and other methods of small scale sustainable drainage systems. Property owners could also carry out their own measures where funding is not forthcoming or where resident is unwilling to wait for measures to be approved through national funding schemes.	Norfolk County Council Property owner	12 months
Lynn Road, Swaffham, 28/06/2017	The property owner should instigate a regular regime of maintenance to ensure the system is free from obstruction i.e. tree leaves, silt at all times.	Property owner	12 months
Lynn Road, Swaffham, 28/06/2017	The property owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency.	Property owner	12 months

Flooding on Lynn Road

Location: **Swaffham**

Lynn Road– Report of internal and external flooding on 28th July 2017.

Causes – The surface water drainage system network was obstructed by debris or silt This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties. Run-off from rainfall was directed towards the surface water drainage network, these flows could not be accommodated and this directed flood water towards the affected property. Individual property drainage was obstructed by debris or silt. This reduced the efficiency of the drainage system contributing to the accumulation of surface water flood water at the affected property. Run-off from rainfall was directed towards individual property drainage, these flows could not be accommodated due to insufficient capacity of the system directing flood water towards the affected property.

Recommendations – NCC will consider options that would ensure water does not pool on the highway. NCC & AW will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location. Property owners should protect their buildings through flood protection measures where appropriate. The property owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity & system efficiency.

Flooding and flood risk within the Attleborough Area

Description of location
Located in an urban residential area within the market town of Attleborough.

Flood incidents within this location
Within this 1 incidence of internal flooding have been assessed as part of this investigation. This incident is detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
15/07/2017	On the 15/07/2017 - 1 property was internally flooded on Chapel Road, Attleborough. This incident was reported by Norfolk County Council (Highways) via an electronic report on the 15 July 2017, (FWF/17/3/5073)	Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report after the incident.

Recent rainfall within the area
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 location were within 2.5km of a rain gauge.

15 July 2017 – 0.2mm rainfall was recorded as falling in 15 minutes at the Attleborough STW rainfall monitoring station. Following review, the data collected was insufficient to estimate a return period for the event.

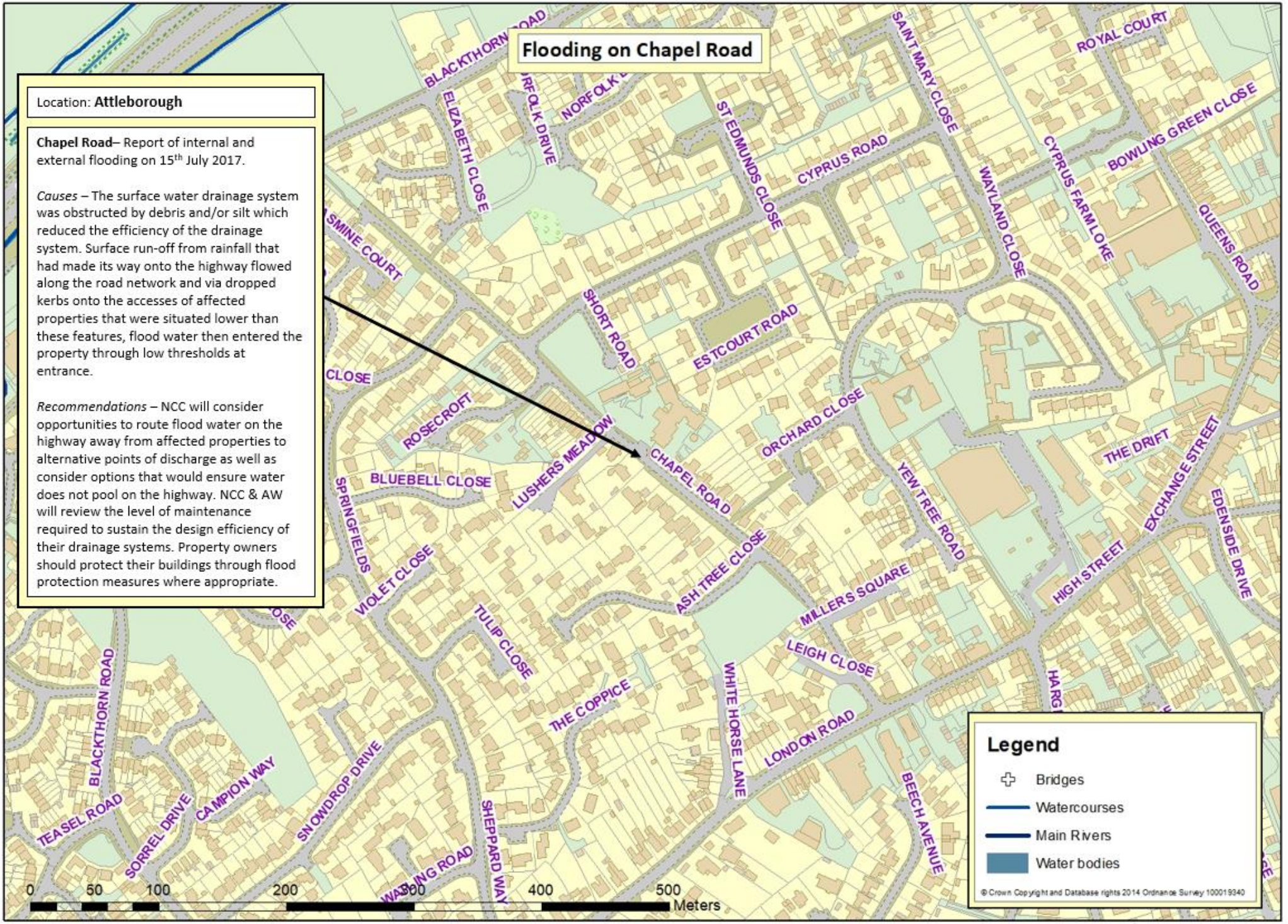
Causes of flooding within the area and recommendations

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.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Chapel Road, Attleborough, 15/07/2017	Surface run-off from rainfall that had made its way onto the highway flowed along the road network and via dropped kerbs onto the accesses of affected properties that were situated lower than these features.	Norfolk County Council
Chapel Road, Attleborough, 15/07/2017	Rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected property.	Norfolk County Council
Chapel Road, Attleborough, 15/07/2017	The surface water drainage system was obstructed by debris and/or silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	Norfolk County Council Anglian Water
Chapel Road, Attleborough, 15/07/2017	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.	Norfolk County Council Anglian Water
Chapel Road, Attleborough, 15/07/2017	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 Anglian Water
Chapel Road, Attleborough, 15/07/2017	The flood water entered the property through low thresholds at entrance.	Property Owners

Flooding experienced at / on	**Recommendation**	Who has responsibility to follow up the recommendation?	**Timescale**
Chapel Road, Attleborough, 15/07/2017	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
Chapel Road, Attleborough, 15/07/2017	Norfolk County Council will consider options that would ensure water does not pool on the highway.	Norfolk County Council	12 months
Chapel Road, Attleborough, 15/07/2017	Norfolk County Council & AW 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 Anglian Water	12 months
Chapel Road, Attleborough, 15/07/2017	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.	Norfolk County Council Anglian Water	12 months
Chapel Road, Attleborough, 15/07/2017	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with resident 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 should consider the potential to retrofit permeable areas and other methods of small scale sustainable drainage systems. Property owners could also carry out their own measures where funding is not forthcoming or where resident is unwilling to wait for measures to be approved through national funding schemes.	Property owner	12 months

Flooding on Chapel Road



Location: **Attleborough**

Chapel Road– Report of internal and external flooding on 15th July 2017.

Causes – The surface water drainage system was obstructed by debris and/or silt which reduced the efficiency of the drainage system. Surface run-off from rainfall that had made its way onto the highway flowed along the road network and via dropped kerbs onto the accesses of affected properties that were situated lower than these features, flood water then entered the property through low thresholds at entrance.

Recommendations – NCC will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge as well as consider options that would ensure water does not pool on the highway. NCC & AW 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.

Flooding and flood risk within the Rocklands Area

Description of location
A rural location beside the main road within the small village of Rockland.

Flood incidents within this location
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
27/12/2017	On the 27/12/2017 - 1 property was internally flooded on The Street, Rocklands. This incident was reported by a resident via email correspondence on the 30 December 2017, (FWF/17/3/5890)	• The Fire and Rescue Service responded and pumped out during the incident. • Breckland District Council provided sandbags, this helped to protect the property from internal flooding. • Norfolk County Council (Highways) visited affected residents to offer advice and to gather information after the incident. • Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the area
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.

Historic flooding incidents within the area
The following table lists flooding incidents within the catchment that have been recorded:

Date of incident	Impact	Rainfall intensity
30/12/2017	Causing overflow of storm drains	Unknown
14/04/2016	Flooding to a rear garden	Unknown

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.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
The Street, Rocklands, 27/12/2017	Run-off from rainfall pooled at a low point within the location affecting the property.	Property Owners
The Street, Rocklands, 27/12/2017	Surface run-off from rainfall that had made its way onto the highway flowed along the road network and via dropped kerbs onto the accesses of affected properties that were situated lower than these features.	NCC Highways
The Street, Rocklands, 27/12/2017	Rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected property.	NCC Highways
The Street, Rocklands, 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.	Riparian Owners
The Street, Rocklands, 27/12/2017	The flood water entered the property through low thresholds at entrances.	Property owners
The Street, Rocklands, 27/12/2017	The loss of pre-existing drainage features such as drains & ditches within the catchment exacerbated the flooding.	Riparian Owners

Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
The Street, Rocklands, 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 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
The Street, Rocklands, 27/12/2017	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
The Street, Rocklands, 27/12/2017	Norfolk County Council will consider options that would ensure water does not pool on the highway.	Norfolk County Council	12 months
The Street, Rocklands, 27/12/2017	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.	Norfolk County Council Land owners	12 months
The Street, Rocklands, 27/12/2017	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with 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 should consider the potential to retrofit permeable areas and other methods of small scale sustainable drainage systems. Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait for measures to be approved through national funding schemes.	Norfolk County Council Property owner	12 months
The Street, Rocklands, 27/12/2017	NCC and Property owners could confirm, where possible, the existence of any connections to a wider drainage network. This work should seek to confirm where the drainage network conveys flows to.	Norfolk County Council Property owner	12 months

Flooding on The Street

Location: **Rockland All Saints**

The Street– Report of internal and external flooding on 27th December 2017.

Causes – Surface run-off from rainfall that had made its way onto the highway flowed along the road network and overland flowpaths, on which the affected property is adjacent to, and onto the accesses of affected properties via dropped kerbs. Run-off from rainfall was concentrated Rainfall was directed into the surface water system causing it to surcharge elsewhere, the flood water entered the property through low thresholds at entrances.

Recommendations – NCC will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. NCC will consider opportunities to manage the amount or rate of surface water entering their drainage system as well as options to route flood water on the highway away from affected properties to alternative points of discharge . Property owners should protect their buildings through flood protection measures where appropriate.

BRAYES LANE

THE STREET

THE STREET

THE STREET

LOW LANE

MILL LA

0 50 100 200 300 400 500 Meters

Legend

- Bridges
- Watercourses
- Main Rivers
- Water bodies

Flooding and flood risk within the Dereham area

Description of location
Affected properties located in market town of Dereham.

Flood incidents within this location
Within this catchment 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
02/01/2018	On the 02/01/2018 - 1 property was internally flooded on Rashs Green, Dereham. This incident was reported by a resident via a flood questionnaire on the 4 January 2018, (FWF/18/3/5920)	Norfolk County Council visited affected residents to offer advice and to gather information after the incident.
26/12/2017	On the 26/12/2017 - 1 property was internally flooded on Nelson Place, Dereham. This incident was reported by the media via an article on the 27 December 2017, (FWF/17/3/5898)	Norfolk County Council assessed validity and impact of the flood report after the incident.

Recent rainfall within the area
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 (50%) of internal flooding in this location are within 2.5km of a rain gauge. The rainfall events recorded by gauges for this catchment are;

27 July 2017 – 30mm rainfall was recorded as falling in 13 hours minutes at the East Dereham STW rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 2 year rainfall event.

Historic flooding incidents within the area
The following table lists flooding incidents within the catchment that have been recorded:

Date of incident	Impact	Rainfall intensity
22/06/2016	Flooding inside the property, both in the office and warehouse space	Unknown
28/06/2016	Flooding inside the property, both in the office and warehouse space	Unknown

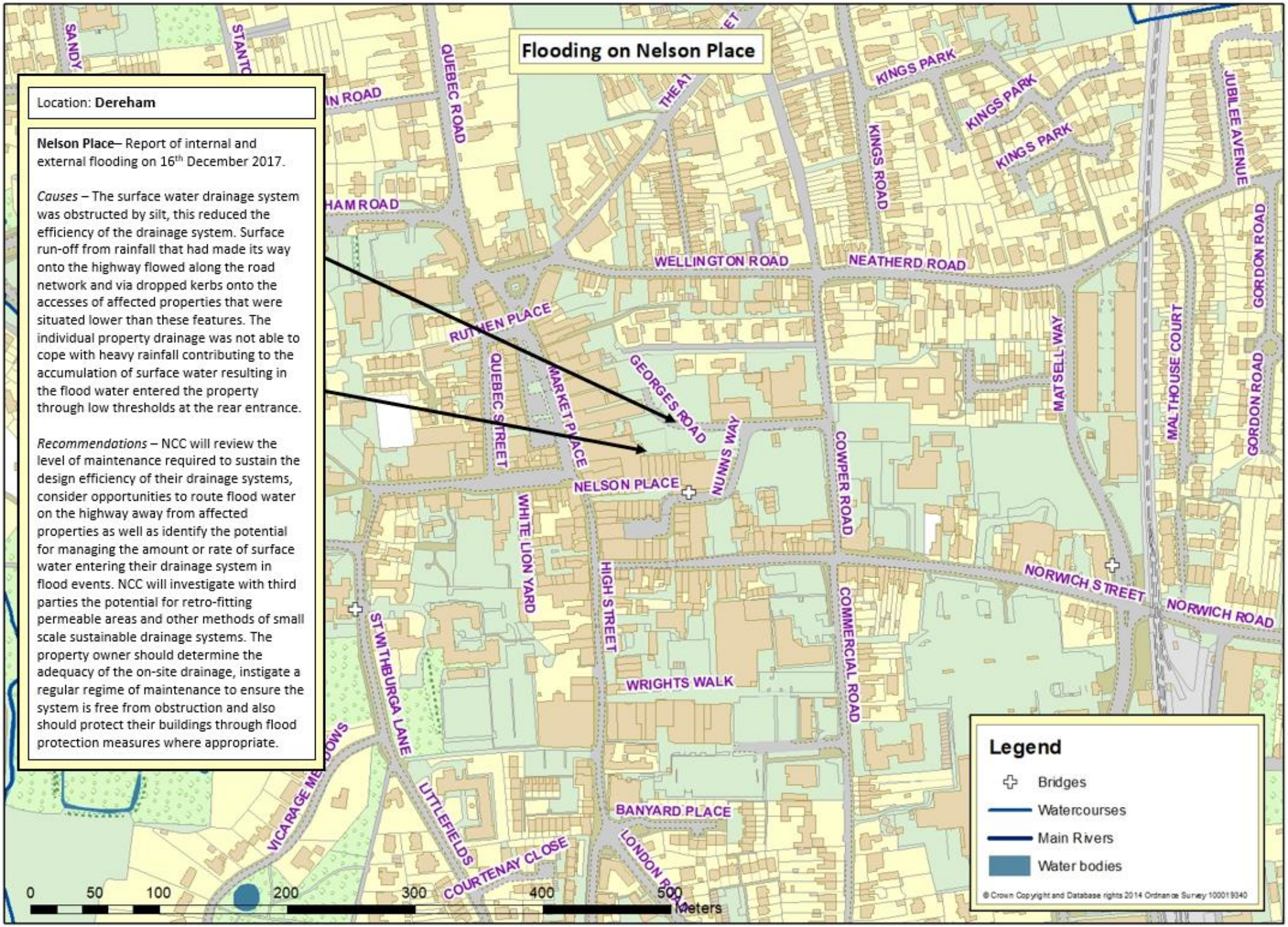
Causes of flooding within the area and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the area 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.

Flooding experienced at / on	**Causes of flooding**	**Who has responsibilities to manage the cause(s) of the flood?**
Rashs Green, Dereham, 02/01/2018	Reports from affected party indicate run-off from rainfall was concentrated along overland flow paths on which the affected properties are adjacent.	Land owners
Rashs Green, Dereham, 02/01/2018 Nelson Place, Dereham, 26/12/2017	Surface run-off from rainfall that had made its way onto the highway flowed along the road network and via dropped kerbs onto the accesses of affected properties that were situated lower than these features.	NCC Highways
Rashs Green, Dereham, 02/01/2018	Rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties.	NCC Highways
Rashs Green, Dereham, 02/01/2018 Nelson Place, Dereham, 26/12/2017	The surface water drainage system network/outfall was obstructed by debris and/or silt. This reduced the efficiency of the drainage system contributing to flooding at the affected properties.	Norfolk County Council Anglian Water Property owner
Rashs Green, Dereham, 02/01/2018 Nelson Place, Dereham, 26/12/2017	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 properties.	Norfolk County Council Anglian Water Property owner Riparian owners
Nelson Place, Dereham, 26/12/2017	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 Anglian Water
Rashs Green, Dereham, 02/01/2018 Nelson Place, Dereham, 26/12/2017	The flood water entered the properties through low thresholds at entrances & air bricks.	Property owners
Rashs Green, Dereham, 02/01/2018	The loss of pre-existing drainage features such as drains, dykes, ditches, culverts within the catchment exacerbated the flooding.	Norfolk County Council Riparian owners
Nelson Place, Dereham, 26/12/2017	Individual property drainage was unmaintained and could not cope with heavy rainfall. Individual property drainage was obstructed by debris or silt. This reduced the efficiency of the drainage system contributing to the accumulation of surface water flood water at the affected property.	Property owner

Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Rashs Green, Dereham, 02/01/2018	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 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
Rashs Green, Dereham, 02/01/2018 Nelson Place, Dereham, 26/12/2017	NCC 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
Rashs Green, Dereham, 02/01/2018	Norfolk County Council will consider options that would ensure water does not pool on the highway.	Norfolk County Council	12 months
Rashs Green, Dereham, 02/01/2018 Nelson Place, Dereham, 26/12/2017	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.	Norfolk County Council Anglian Water	12 months
Rashs Green, Dereham, 02/01/2018 Nelson Place, Dereham, 26/12/2017	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.	Norfolk County Council Anglian Water	12 months
Rashs Green, Dereham, 02/01/2018 Nelson Place, Dereham, 26/12/2017	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with 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 should consider the potential to retrofit permeable areas and other methods of small scale sustainable drainage systems. Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait for measures to be approved through national funding schemes.	Norfolk County Council Property owner	12 months

Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Rashs Green, Dereham, 02/01/2018	Property owner could confirm, where possible, the existence of any connections to a wider drainage network. This work should seek to confirm where the drainage network conveys flows to.	Norfolk County Council Property owner Riparian owners	12 months
Nelson Place, Dereham, 26/12/2017	The property owner should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. leaves, silt or other debris at all times.	Property owner	12 months
Nelson Place, Dereham, 26/12/2017	The property owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency.	Property owner	12 months
Rashs Green, Dereham, 02/01/2018 Nelson Place, Dereham, 26/12/2017	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 Property owner	12 months


Flooding on Nelson Place
Location: Dereham
Nelson Place– Report of internal and external flooding on 16th December 2017.
Causes – The surface water drainage system was obstructed by silt, this reduced the efficiency of the drainage system. Surface run-off from rainfall that had made its way onto the highway flowed along the road network and via dropped kerbs onto the accesses of affected properties that were situated lower than these features. The individual property drainage was not able to cope with heavy rainfall contributing to the accumulation of surface water resulting in the flood water entered the property through low thresholds at the rear entrance.
Recommendations – NCC will review the level of maintenance required to sustain the design efficiency of their drainage systems, consider opportunities to route flood water on the highway away from affected properties as well as identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. NCC will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems. The property owner should determine the adequacy of the on-site drainage, instigate a regular regime of maintenance to ensure the system is free from obstruction and also should protect their buildings through flood protection measures where appropriate.
QUEBEC ROAD
KINGS PARK
KINGS ROAD
JUBILEE AVENUE
WELLINGTON ROAD
NEATHERD ROAD
GORDON ROAD
RUTTEN PLACE
QUEBEC STREET
MARKET PLACE
GEORGES ROAD
NUNNS WAY
MATSELL WAY
MALTHOUSE COURT
COWPER ROAD
NELSON PLACE
WHITE LION YARD
HIGH STREET
NORWICH STREET
NORWICH ROAD
ST WITHBURGA LANE
COMMERCIAL ROAD
WRIGHTS WALK
LITTLEFIELDS
BANYARD PLACE
COURTENAY CLOSE
LONDON ROAD
0 50 100 200 300 400 500 Meters
Legend
Bridges
Watercourses
Main Rivers
Water bodies
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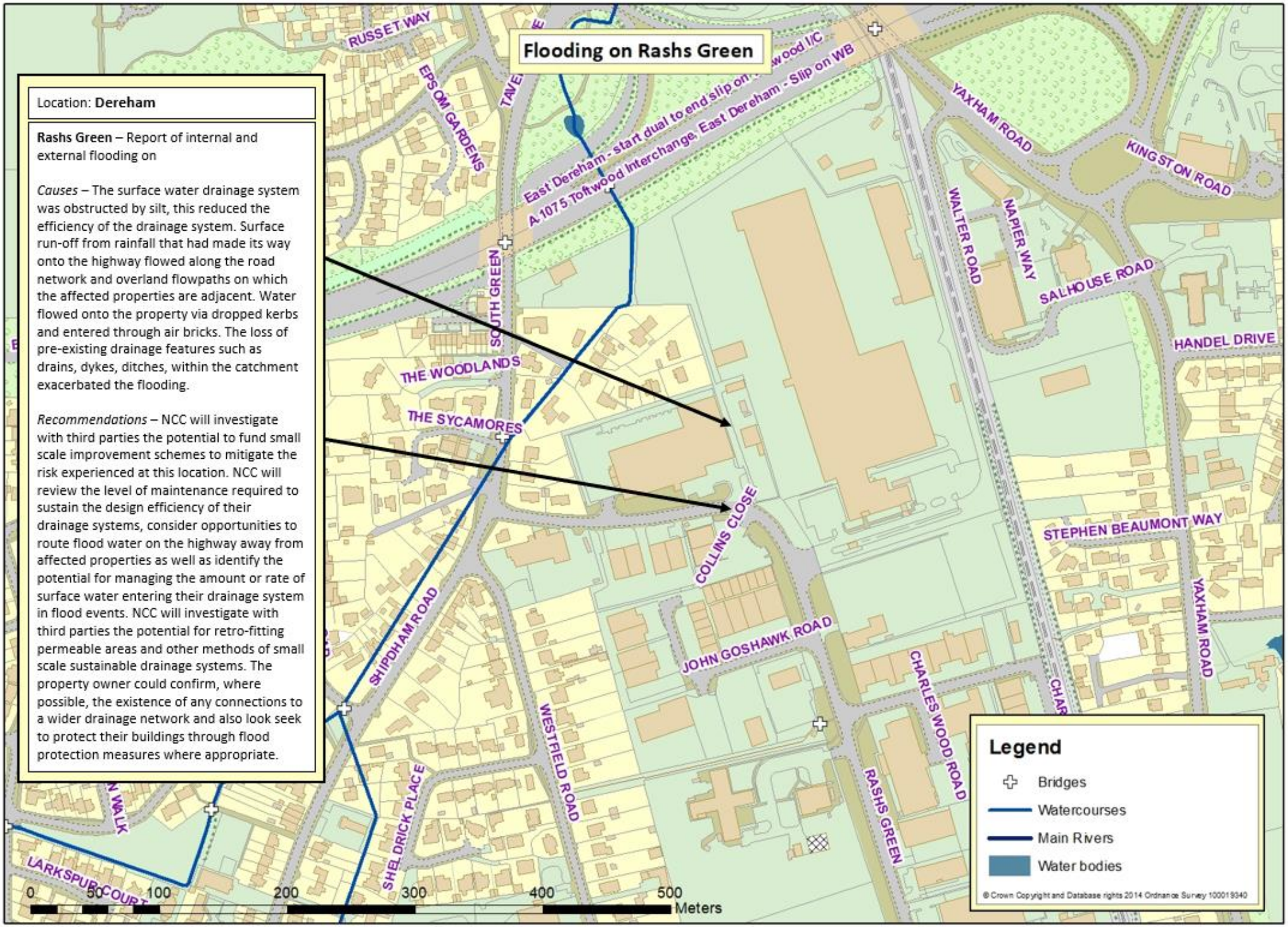
Flooding on Rashs Green
Location: Dereham
Rashs Green – Report of internal and external flooding on
Causes – The surface water drainage system was obstructed by silt, this reduced the efficiency of the drainage system. Surface run-off from rainfall that had made its way onto the highway flowed along the road network and overland flowpaths on which the affected properties are adjacent. Water flowed onto the property via dropped kerbs and entered through air bricks. The loss of pre-existing drainage features such as drains, dykes, ditches, within the catchment exacerbated the flooding.
Recommendations – NCC 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, consider opportunities to route flood water on the highway away from affected properties as well as identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. NCC will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems. The property owner could confirm, where possible, the existence of any connections to a wider drainage network and also look seek to protect their buildings through flood protection measures where appropriate.
East Dereham - start dual to end slip on A1075 Toftwood Interchange, East Dereham - Slip on WB
RUSSET WAY
EPSOM GARDENS
SOUTH GREEN
THE WOODLANDS
THE SYCAMORES
SHIPDHAM ROAD
WESTFIELD ROAD
SHELDRICK PLACE
LARKSPUR COURT
YAXHAM ROAD
KINGSTON ROAD
WALTER ROAD
NAPIER WAY
SALHOUSE ROAD
HANDEL DRIVE
COLLINS CLOSE
STEPHEN BEAUMONT WAY
JOHN GOSHAWK ROAD
CHARLES WOOD ROAD
RASHS GREEN
0 50 100 200 300 400 500 Meters
Legend
Bridges
Watercourses
Main Rivers
Water bodies
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Flooding and flood risk within the Mundford area

Description of location
Properties affected are at the edge of a residential estate located in the small village of Mundford.

Flood incidents within this location
Within this location 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
09/01/2018	On the 09/01/2018 - 1 property was internally flooded on Crown Road, Mundford. This incident was reported by a resident via an online flood report form on the 4 January 2018, (FWF/17/3/5911)	Norfolk County Council (Lead Local Flood Authority) Norfolk County Council assessed validity and impact of the flood report after the incident.
30/12/2017	On the 30/12/2017 - 1 property was internally flooded on Crown Road, Mundford. This incident was reported by a resident via a flood questionnaire on the 2 January 2018, (FWF/17/3/5901)	Norfolk County Council (Lead Local Flood Authority) Norfolk County Council assessed validity and impact of the flood report after the incident.

Recent rainfall within the area
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.

Historic flooding incidents within the area
The following table lists flooding incidents within the catchment that have been recorded:

Date of incident	Impact	Rainfall intensity
06/07/2017	Flooding from highway, onto driveway, into garage, silt from blocking drains	Unknown

Causes of flooding within the area 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.

Flooding experienced at / on	**Causes of flooding**	**Who has responsibilities to manage the cause(s) of the flood?**
Crown Road, Mundford, 09/01/2018 Crown Road, Mundford, 30/12/2017	Surface run-off from rainfall that had made its way onto the highway flowed along the road network and via dropped kerbs onto the accesses of affected properties that were situated lower than these features.	NCC Highways
Crown Road, Mundford, 09/01/2018 Crown Road, Mundford, 30/12/2017	Rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties.	NCC Highways
Crown Road, Mundford, 09/01/2018 Crown Road, Mundford, 30/12/2017	Water was directed from a neighbouring property by their access drive towards the affected properties.	Property owners
Crown Road, Mundford, 09/01/2018 Crown Road, Mundford, 30/12/2017	The flood water entered the properties through low thresholds at entrances.	Property owners

Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Crown Road, Mundford, 09/01/2018 Crown Road, Mundford, 30/12/2017	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
Crown Road, Mundford, 09/01/2018 Crown Road, Mundford, 30/12/2017	Norfolk County Council will consider options that would ensure water does not pool on the highway.	Norfolk County Council	12 months
Crown Road, Mundford, 09/01/2018 Crown Road, Mundford, 30/12/2017	NCC will investigate with property owners and third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems.	Property owners	12 months
Crown Road, Mundford, 09/01/2018 Crown Road, Mundford, 30/12/2017	Amendments should be made to neighbouring properties to ensure water is not directed to other properties.	Norfolk County Council Property owners	12 months
Crown Road, Mundford, 09/01/2018 Crown Road, Mundford, 30/12/2017	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with 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 could also carry out their own measures where funding is not forthcoming or where residents are unwilling to wait for measures to be approved through national funding schemes.	Norfolk County Council Property owners	12 months

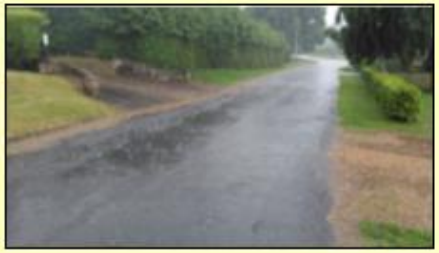
Flooding on Crown Road

Location: **Mundford**

Crown Road– Report of internal and external flooding on 30th December 2017 & 9th January 2018

Causes – Surface run-off from rainfall and that directed from neighbouring property access drives made its way onto the highway, flowed along the road network and via dropped kerbs onto the accesses of affected properties that were situated lower than these features. The flood water entered the properties through low thresholds at entrances.

Recommendations – NCC will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, consider options that would ensure water does not pool on the highway and also amendments to neighbouring properties to ensure water is not directed to other properties. NCC will investigate with property owners and third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems. Property owners should protect their buildings through flood protection measures where appropriate.



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.

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.