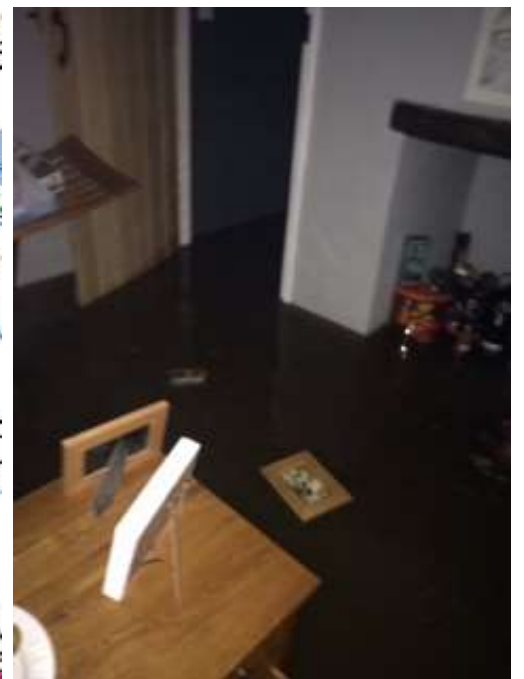




Investigation Report into the flooding in Breckland in 2016

Report Reference: FIR028

Draft Report prepared by Robert Webster on June 2019



* OS 25k mapping has been used within this report which are not current

Executive Summary

(a) Flooding incidents and causes

This report summarises the following 2016 flooding events:

Thetford Redcastle Catchment – Canons Walk, Thetford; Burrell Way, Thetford

Thetford Centre Catchment – King Street, Thetford

Stonebridge South Catchment – Hilda Raker Close, Wretham

Croxton Catchment – The Street, Croxton

Upper Great Fen Catchment – Kenninghall Road, Banham

Attleborough East Catchment – Station Road, Attleborough

Thompson Carr Catchment – Hallfield Road, Thompson

Ashill Centre Catchment – Church Street, Ashill

Ashill South Catchment – Cressingham Road, Ashill

Upper River Blackwater Catchment – High Street, Shipdam; Little Hale Road, Shipdam

Upper River Yare Catchment – Dereham Road, Whinburgh and Westfield; Dereham Road, Garvestone

Upper River Wissey Catchment – Church Street, Bradenham

The above events were caused by Surface run-off flowpaths; Surface run-off from roads; Individual property drainage unmaintained; Drainage system or outfall blockage, unmaintained or obstructed; Surcharging of the drainage system; Drainage system overloaded and Neighbouring property. This led to the internal flooding of 16 properties.

(b) Key recommendations

The recommendations set out in the report have been summarised below. 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 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.
- Seek to remind riparian owners of their responsibility to undertake appropriate levels of maintenance to sustain the efficiency of their 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.
- Undertake investigations to determine the full extent of watercourses, culverts, highway drainage and any other drainage infrastructure within the area to assess their condition and capacity.
- Liaise with landowners and discuss appropriate land management techniques to reduce runoff.
- Consider opportunities to protect affected properties from greenfield runoff – such as land drains, filter drains and attenuation.
- Consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.
- Monitor recent improvement works to ensure that they are effective and will prevent flooding.
- Liaise with private asset owners to ensure that their features do not cause flooding to an adjacent landowner.
- Investigate into specific reports of highway drainage system collapses.

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.
- Investigate into specific reports of sewer flooding.
- Investigate into specific reports of system collapses.

Breckland District Council should;

- Review their approach to the use of their permissive powers to maintain watercourses under the Land Drainage Act 1991.

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 in 2016 as:

- multiple residential properties were internally flooded.
- multiple commercial properties were internally flooded.
- multiple critical services installations were affected by flooding.

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.

Location:
Breckland

Drawing:
Map 1 - Breckland Catchments

Legend

-  Thetford Redcastle
-  Thetford Centre
-  Stonebridge South
-  Croxton
-  Upper Great Fen
-  Attleborough East
-  Thompson Carr
-  Ashill Centre
-  Ashill South
-  Upper River Blackwater
-  Upper River Yare
-  Upper River Wissey
-  Main Rivers
-  1 in 100 Flood Risk

Flooding and flood risk within the Thetford Redcastle Catchment

Description of catchment

The catchment slopes from south-west to north and is urban. The catchment discharges into the Little Ouse.

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 | 35 | 11 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 85 | 19 |
| [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 | 3 | 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 | 1 | 0 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

Flood incidents within this catchment

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 |
|-------------------------|---|---|
| 16/09/2016 | On the 16/09/2016 - 1 property was internally flooded on Burrell Way, Thetford. This incident was reported by a resident via an electronic report on the 16 September 2016, (FWF/16/3/4013) | A resident responded and pumped out during the incident. Norfolk County Council (Highways) undertook works to raise the level of the kerb on the road after the incident. Norfolk County Council (Lead Local Flood Authority) visited the area to observe flooding impact on affected property. |
| 25/06/2016 | On the 25/06/2016 - 1 property was internally flooded on Canons Walk, Thetford. This incident was reported by the Fire and Rescue Service via email | A management company visited after the incident. |

| | | |
|--|---|---|
| | correspondence on the 10 July 2016, (FWF/16/3/3347) | Norfolk County Council (Lead Local Flood Authority) visited the area to observe flooding impact on affected property. |
|--|---|---|

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:

25 June 2016 - 20mm rainfall was recorded as falling in 2.25 hours at the Thetford (Mundford Road) WTW rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 2.5 rainfall event.

16 September 2016 - 50mm rainfall was recorded as falling in 8 hours at the Thetford (Mundford Road) WTW rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 15 rainfall event.

Historic flooding incidents within the catchment

There are no reports of historic flooding incidents 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? |
|-----------------------------------|---|---|
| Burrell Way, Thetford, 16/09/2016 | Surface run-off from rainfall that had made its way onto highway flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Norfolk County Council |
| Canons Walk, Thetford, 25/06/2016 | Rainfall was directed into the drainage system causing it to surcharge elsewhere. This surcharging contributed to the flooding at the affected properties. | Property Owner |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|--|---|---|-----------|
| Burrell Way, Thetford, 16/09/2016 | Highway improvement works have recently been undertaken on Burrell Way – Norfolk County Council to monitor area and reassess if flooding occurs again. | Norfolk County Council | 12 months |
| Burrell Way, Thetford, 16/09/2016 | Property owner to make building contents more resilient to flooding. | Property Owner | 12 months |
| Canons Walk, Thetford, 25/06/2016 | Property Owner should identify methods of removing excess surface water to alternative points of discharge. This could include a range of mechanisms both within the existing drainage system as well as private property. | Property Owner | 12 months |
| Burrell Way, Thetford, 16/09/2016 & Canons Walk, Thetford, 25/06/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 |

Burrell Way – Internal flooding experienced on 16 September 2016

Causes – Runoff from rainfall that made its way onto the adjacent highway and flowed along the road into the access of an affected property on Burrell Way

Recommendations – Highway improvement works have recently been undertaken on Burrell Way – Norfolk County Council to monitor area and reassess if flooding occurs again



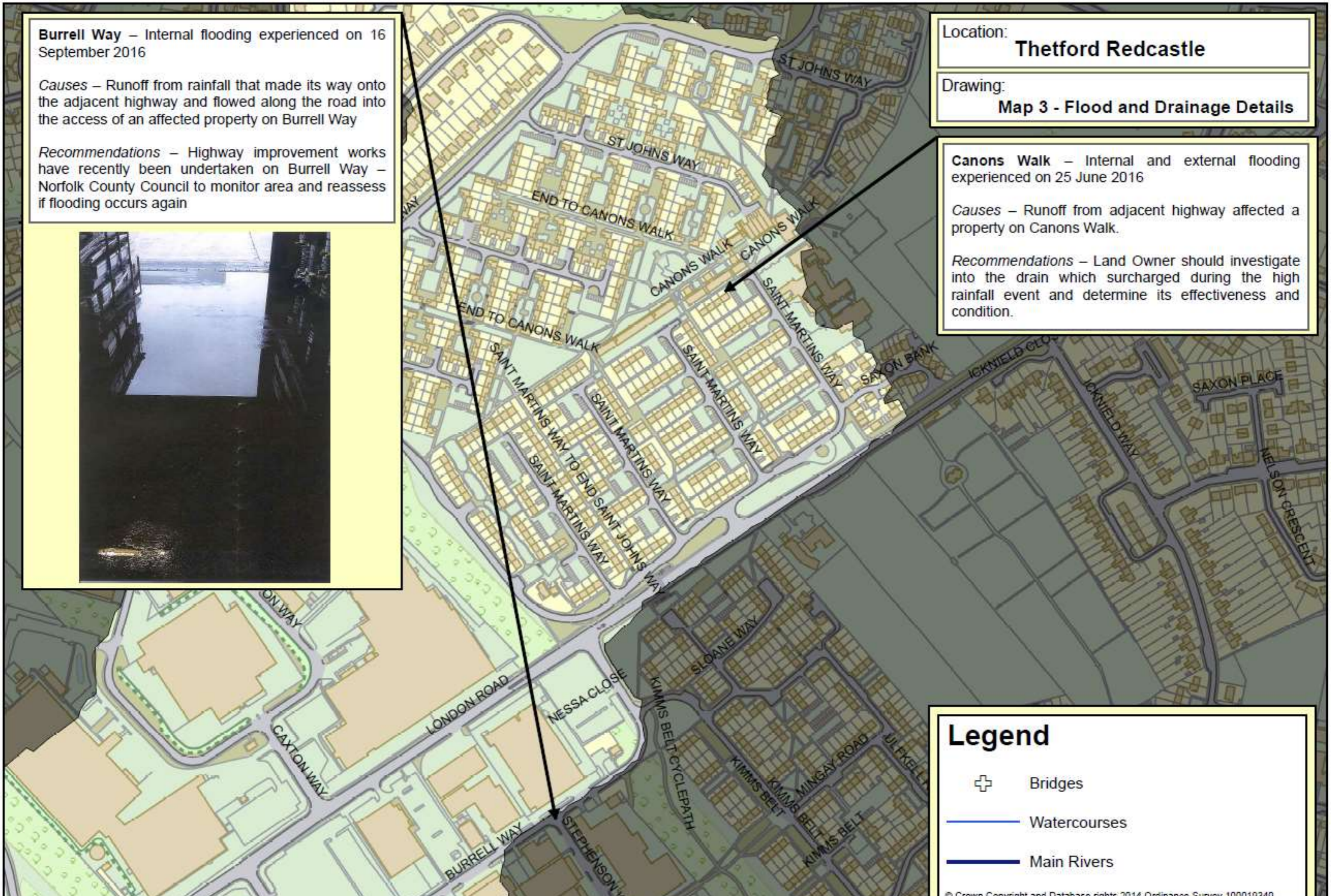
Location:
Thetford Redcastle

Drawing:
Map 3 - Flood and Drainage Details

Canons Walk – Internal and external flooding experienced on 25 June 2016

Causes – Runoff from adjacent highway affected a property on Canons Walk.

Recommendations – Land Owner should investigate into the drain which surcharged during the high rainfall event and determine its effectiveness and condition.



Legend

- Bridges
- Watercourses
- Main Rivers

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Flooding and flood risk within the Thetford Centre Catchment

Description of catchment

The catchment slopes from north-east to south-west and is urban. The catchment discharges into the Little Ouse.

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 | 0 | 1 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 2 | 4 | 4 |
| [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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

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 |
|-------------------------|---|---|
| 16/06/2016 | On the 16/06/2016 - 1 property was internally flooded on King Street, Thetford. This incident was reported by a resident via a flood questionnaire on the 23 June 2016, (FWF/16/3/2786) | A resident carried out measures to minimise the impact of flooding during the incident. Anglian Water Services Ltd visited affected residents to offer advice and to gather information after the incident. Norfolk County Council (Lead Local Flood Authority) visited the area to observe flooding impact on affected property. |

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:

16 June 2016 - 56mm rainfall was recorded as falling in 7 hours at the Thetford (Mundford Road) WTW rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 26 rainfall event.

Historic flooding incidents within the catchment

There are no reports of historic flooding incidents within this catchment.

Causes of flooding within the catchment and recommendations

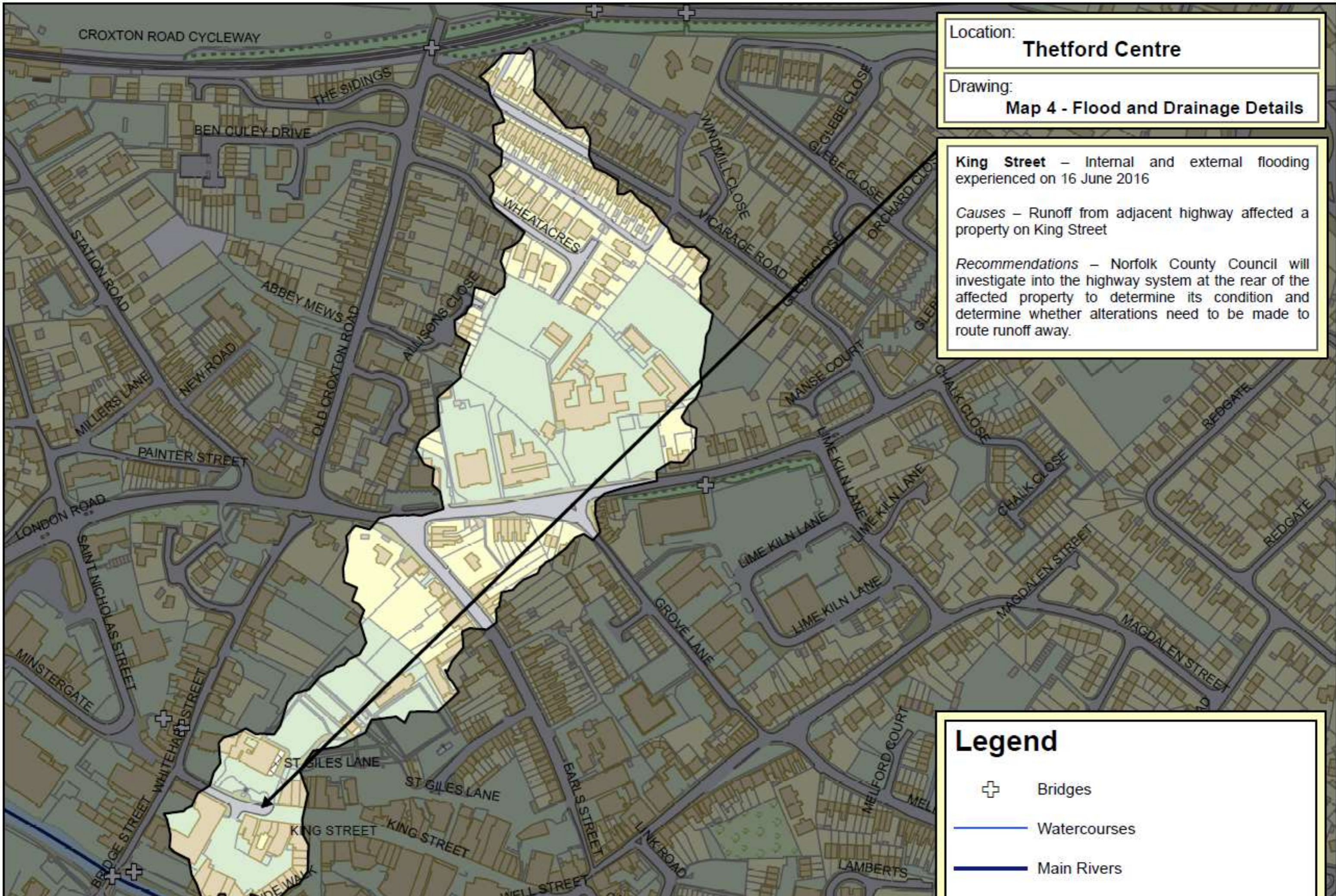
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the 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? |
|-----------------------------------|---|---|
| King Street, Thetford, 16/06/2016 | Surface run-off flowed from the highway due to the system surcharging onto the rear access of the property, which contributed to the flooding of the affected property. | NCC Highways |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|-----------------------------------|---|---|-----------|
| King Street, Thetford, 16/06/2016 | 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 Highways | 12 Months |
| King Street, Thetford, 16/06/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 |



Location:
Thetford Centre




Drawing:
Map 4 - Flood and Drainage Details

King Street – Internal and external flooding experienced on 16 June 2016

Causes – Runoff from adjacent highway affected a property on King Street

Recommendations – Norfolk County Council will investigate into the highway system at the rear of the affected property to determine its condition and determine whether alterations need to be made to route runoff away.

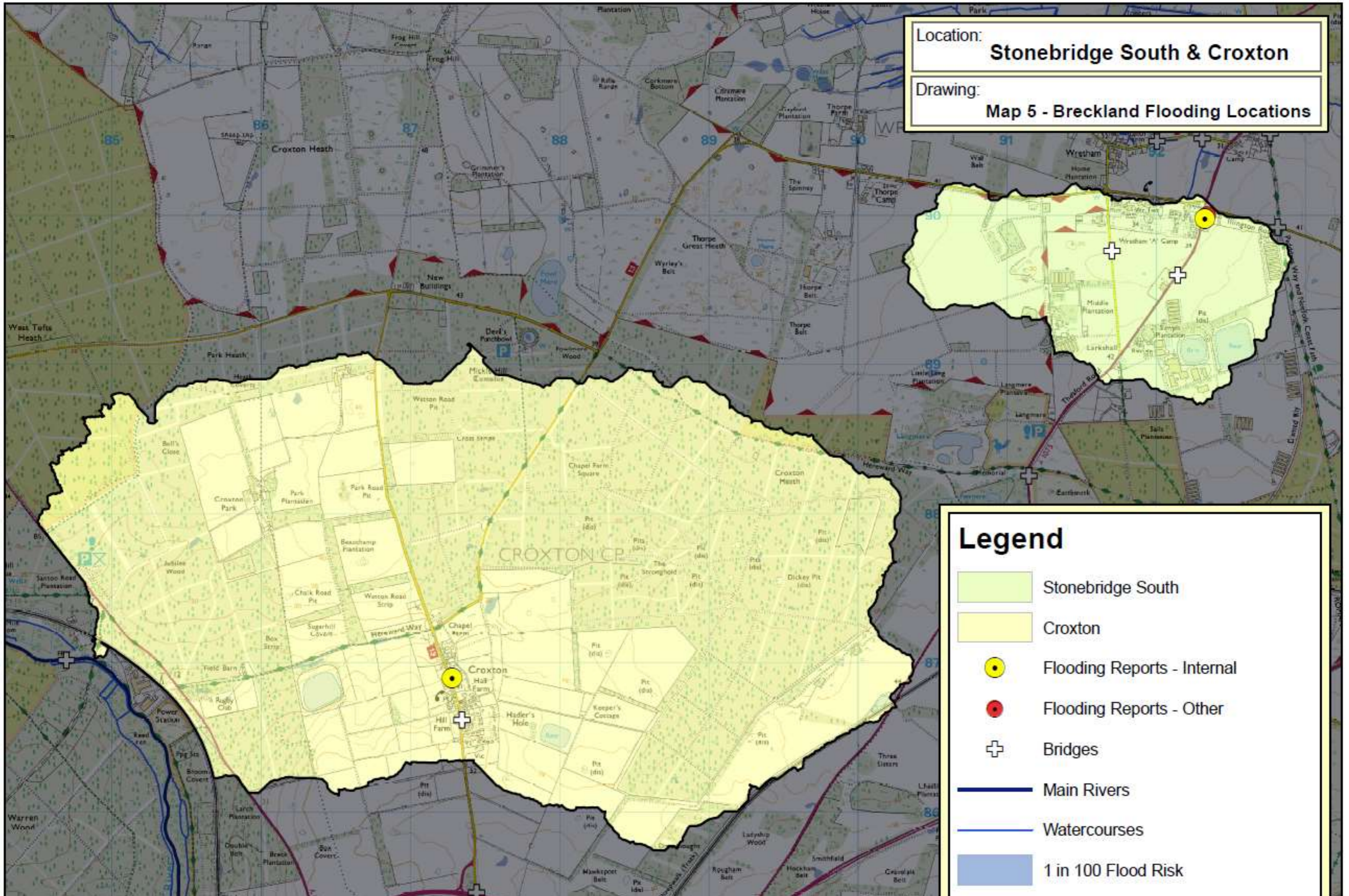
Legend

-  Bridges
-  Watercourses
-  Main Rivers

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Location: **Stonebridge South & Croxton**

Drawing: **Map 5 - Breckland Flooding Locations**



Legend

- Stonebridge South
- Croxton
- Flooding Reports - Internal
- Flooding Reports - Other
- Bridges
- Main Rivers
- Watercourses
- 1 in 100 Flood Risk

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Flooding and flood risk within the Stonebridge South Catchment

Description of catchment

The catchment slopes from south-west to north and is rural aside from a developed area. Approximately 0.75km downstream is a tributary of the River Thet which the catchment discharges into.

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 | 0 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 0 | 0 |
| [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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

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 |
|-------------------------|--|---|
| 11/06/2016 | On the 11/06/2016 - 1 property was internally flooded on Hilda Raker Close, Wretham. This incident was reported by a resident via an online flood report form on the 14 June 2016, (FWF/16/3/2738) | A management company visited affected residents to offer advice and to gather information after the incident. Norfolk County Council (Highways) 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.

Historic flooding incidents within the catchment

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

| Date of incident | Impact | Rainfall intensity |
|------------------|---|--------------------|
| Unknown | Flooding has occurred regularly over the past few years but never internally before | 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.

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? |
|--|--|---|
| Hilda Raker Close, Wretham, 11/06/2016 | Surface run-off flowed from the highway onto the access of the properties which contributed to the flooding of the affected properties. | Norfolk County Council |
| Hilda Raker Close, Wretham, 11/06/2016 | Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned. | Local Landowners |
| Hilda Raker Close, Wretham, 11/06/2016 | Surface run-off flowed from the private road onto the access of the properties, which contributed to the flooding of the affected properties. | Landowner/Housing Association |
| Hilda Raker Close, Wretham, 11/06/2016 | Individual property drainage was obstructed during the rainfall event which caused the failure of the upstream drainage system contributing to the accumulation of surface water flood water at the affected properties. | Landowner/Housing Association |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|--|---|---|-----------|
| Hilda Raker Close, Wretham, 11/06/2016 | 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 |
| Hilda Raker Close, Wretham, 11/06/2016 | The property owner should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves / roots) at all times. | Landowner/Housing Association | 3 months |
| Hilda Raker Close, Wretham, 11/06/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 |



Location:
Stonebridge South

Drawing:
Map 6 - Flood and Drainage Details

Hilda Raker Close – Internal flooding and nearby external flooding experienced on 11 June 2016

Causes – Significant runoff from adjacent fields, private road and adjacent highway affected a property on Hilda Raker Close. Additionally reported that a private drain in front of the property wasn't operating correctly during the rainfall event

Recommendations – Local landowners should consider runoff prevention methods and ensure any private drains are operational. NCC to consider opportunities to re-route highway runoff away from affected properties



Legend

-  Bridges
-  Watercourses
-  Main Rivers

Flooding and flood risk within the Croxton Catchment

Description of catchment

The catchment slopes from east to west and is rural aside from the village of Croxton. The catchment discharges into the Little Ouse.

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 | 0 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 16 | 2 |
| [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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

Flood incidents within this catchment

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 |
|-------------------------|--|--|
| 16/09/2016 | On the 16/09/2016 - 1 property was internally flooded on The Street, Croxton. This incident was reported by a resident via an online flood report form on the 19 September 2016, (FWF/16/3/3336) | 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 the area to observe flooding impact on affected property. |

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.

Historic flooding incidents within the catchment

There are no reports of historic flooding incidents 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? |
|---------------------------------|--|---|
| The Street, Croxton, 16/09/2016 | <ul style="list-style-type: none"> • Surface run-off flowed from the highway onto the access of the properties which contributed to the flooding of the affected properties. • It was reported that the surface water drainage system below the footway was obstructed by structural failure. This caused the failure of the upstream drainage system contributing to flooding at the affected property. | Norfolk County Council |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|---------------------------------|--|---|-----------|
| The Street, Croxton, 16/09/2016 | <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 will investigate into the report of a collapsed highway drainage system below the footway adjacent to the affected property.</p> | Norfolk County Council | 12 months |
| The Street, Croxton, 16/09/2016 | <p>Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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.</p> | Norfolk County Council, Property Owner | 12 months |



Location:
Croxton

Drawing:
Map 7 - Flood and Drainage Details

The Street – Internal flooding experienced on 16 September 2016

Causes – Significant runoff from adjacent highway affected a property on The Street. It is believed that this was caused by the drainage system within the footway being obstructed

Recommendations – Norfolk County Council will investigate into the potential obstruction within the footway drainage system and consider opportunities to route highway water away from affected property



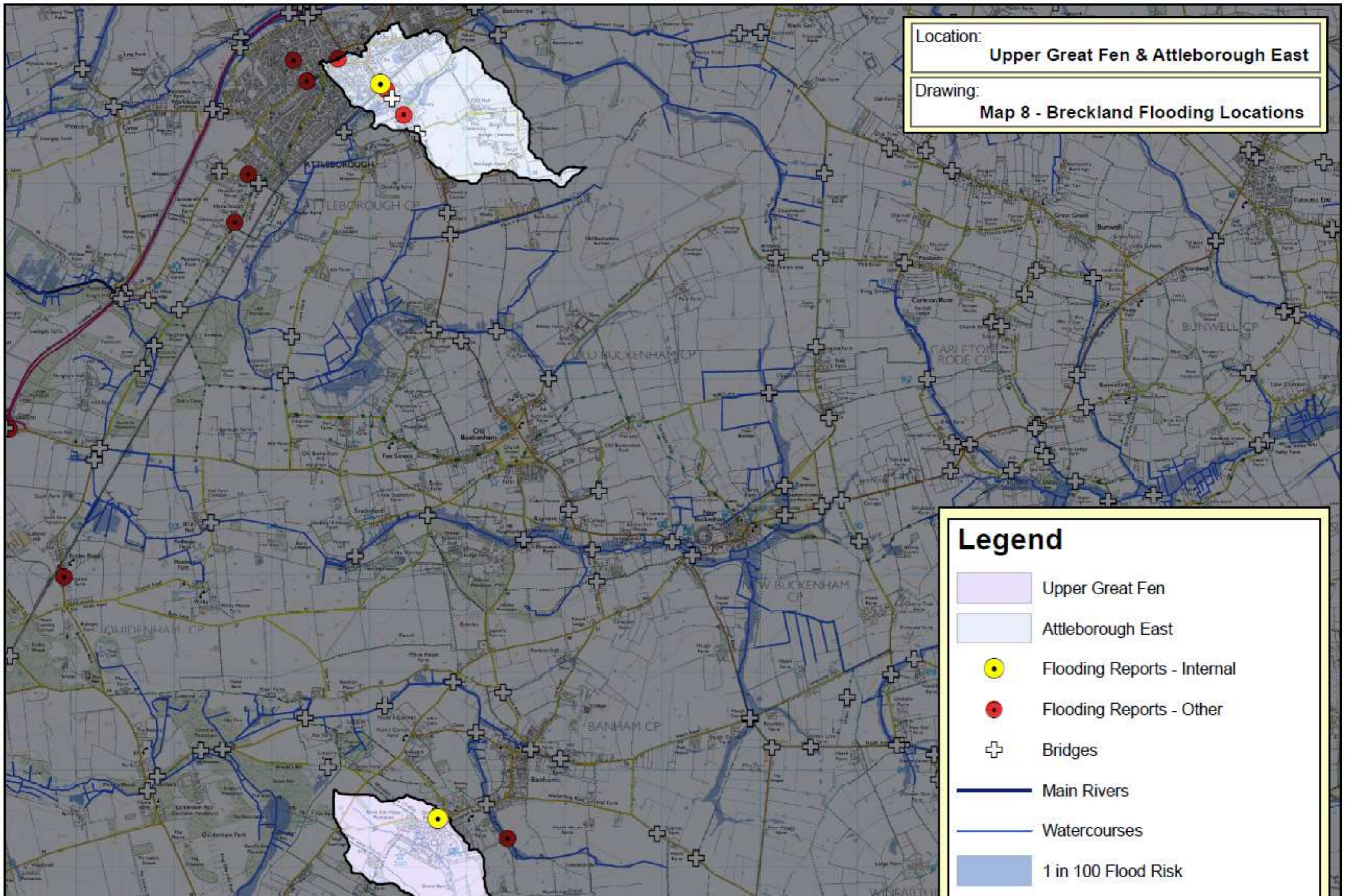
Legend

- ⊕ Bridges
- Watercourses
- Main Rivers









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Location:
Upper Great Fen & Attleborough East

Drawing:
Map 8 - Breckland Flooding Locations



Legend

-  Upper Great Fen
-  Attleborough East
-  Flooding Reports - Internal
-  Flooding Reports - Other
-  Bridges
-  Main Rivers
-  Watercourses
-  1 in 100 Flood Risk

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Flooding and flood risk within the Upper Great Fen Catchment

Description of catchment

The catchment slopes from south-east to north-west and is mostly rural aside from Banham Zoo. Closely downstream is the Great Fen which the catchment discharges into.

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 | 0 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 0 | 0 |
| [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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

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 |
|-------------------------|---|--|
| 31/05/2016 | On the 31/05/2016 - 1 property was internally flooded on Kenninghall Road, Banham. This incident was reported by a resident via an online flood report form on the 5 July 2016, (FWF/16/3/2991) | A resident carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (Lead Local Flood Authority) visited the area to observe flooding impact on affected property. |

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.

Historic flooding incidents within the catchment

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

| Date of incident | Impact | Rainfall intensity |
|------------------|--|--------------------|
| Unknown | Flooding has occurred on Kenninghall Road previously | 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.

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? |
|--------------------------------------|---|---|
| Kenninghall Road, Banham, 31/05/2016 | Surface run-off flowed from the highway and the surrounding area onto the access of the properties which contributed to the flooding of the affected properties. | Local Landowner, Norfolk County Council |
| Kenninghall Road, Banham, 31/05/2016 | It was reported that the highway drainage system was obstructed by structural failure. This caused the failure of the upstream drainage system contributing to flooding at the affected property. | Norfolk County Council |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|--------------------------------------|---|---|-----------|
| Kenninghall Road, Banham, 31/05/2016 | 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 |
| Kenninghall Road, Banham, 31/05/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 |
| Kenninghall Road, Banham, 31/05/2016 | Property Owner to investigate into the effectiveness of any existing drainage within the 'loading area' in front of the affected property. | Property Owner | 12 months |



Location:
Upper Great Fen

Drawing:
Map 9 - Flood and Drainage Details


Kenninghall Road – Internal flooding experienced on 31 May, 11 June and 24 June 2016

Causes – Runoff from adjacent highway affected a property on Kenninghall Road. Also reports of the highway system being collapsed and a gully being blocked

Recommendations – Norfolk County Council will consider opportunities to route highway water away from affected properties to alternative points of discharge. The Property Owner should investigate into the effectiveness of any existing drainage in front of the affected property



Legend

-  Bridges
-  Watercourses
-  Main Rivers

Flooding and flood risk within the Attleborough East Catchment

Description of catchment

The catchment slopes from south-east to west and is mostly rural aside from the developed areas of Attleborough. Approximately 1.2km downstream is a tributary of the River Thet which the catchment discharges into.

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 | 11 | 6 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 48 | 18 |
| [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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

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 |
|-------------------------|--|--|
| 16/09/2016 | On the 16/09/2016 - 1 property was internally flooded on Station Road, Attleborough. This incident was reported by Norfolk County Council (Lead Local Flood Authority) via personal communication on the 30 November 2016, (FWF/16/3/3778) | A resident carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (Lead Local Flood Authority) visited the area to observe flooding impact on affected property. |

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:

16 September 2016 - 38mm rainfall was recorded as falling in 9.75 hours at the Attleborough STW rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 5 rainfall event.

Historic flooding incidents within the catchment

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

| Date of incident | Impact | Rainfall intensity |
|------------------|-----------------------------------|--------------------|
| Unknown | Station Road is prone to flooding | 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.

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? |
|--|--|---|
| Station Road, Attleborough, 16/09/2016 | <ul style="list-style-type: none"> • Run-off from significant rainfall pooled at a low point within the catchment affecting a property. • Surface run-off flowed from the highway onto the access of the properties which contributed to the flooding of the affected properties. • Due to the development of impermeable surfaces run-off was directed quickly to the areas of flooding. | Local Landowners, Norfolk County Council, Anglian Water |
| Station Road, Attleborough, 16/09/2016 | Run-off from significant rainfall was directed towards the surface water/combined 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 |
| Station Road, Attleborough, 16/09/2016 | There was reports of the adjacent foul sewer surcharging during the rainfall event. This surcharging contributed to the flooding at the affected properties. | Anglian Water |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|--|--|---|-----------|
| Station Road, Attleborough, 16/09/2016 | <ul style="list-style-type: none"> Norfolk County Council will lead on developing a partnership funding solution 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 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 |
| Station Road, Attleborough, 16/09/2016 | Norfolk County Council will 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. 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, Anglian Water, Property Owner | 12 months |
| Station Road, Attleborough, 16/09/2016 | Norfolk County Council should work with Anglian Water to identify the potential for managing the | Norfolk County Council, Anglian Water | 12 months |

| | | | |
|--|---|---------------|-----------|
| | amount or rate of surface water entering their drainage system in flood events. | | |
| Station Road, Attleborough, 16/09/2016 | Anglian Water to investigate into reports of combined sewer flooding. | Anglian Water | 12 months |



Location:
Attleborough East

Drawing:
Map 10 - Flood and Drainage Details




Station Road – Internal flooding experienced on 16 September 2016

Causes – Significant runoff from adjacent properties and highway affected a property on Station Road. Also reports of combined sewer flooding

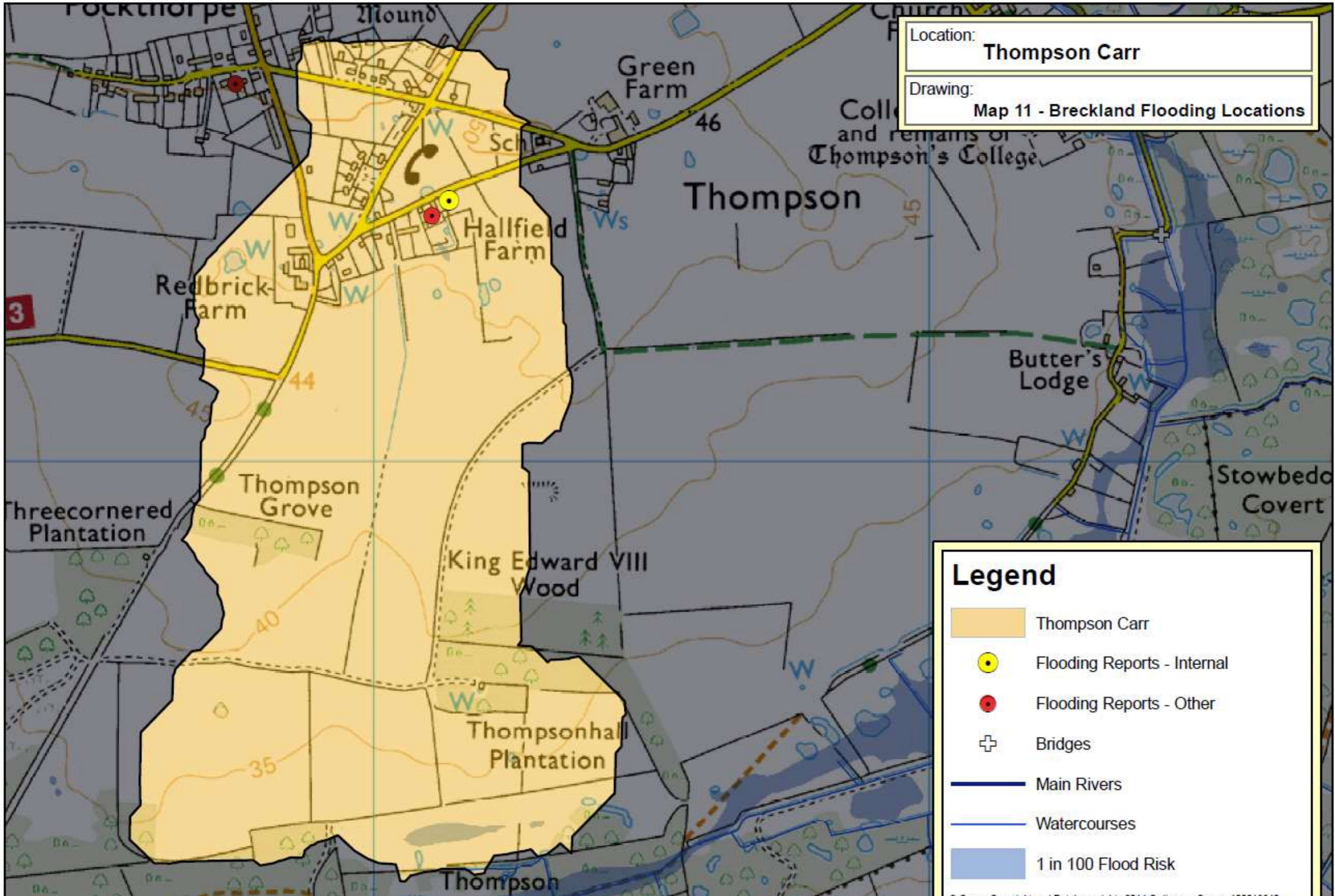
Recommendations – Norfolk County Council will liaise with local landowners to discuss runoff prevention methods and consider opportunities to route highway water away from affected properties. NCC will also work with Anglian Water to manage the surface water entering their system. Anglian Water to investigate into the report of combined sewer flooding



Legend

-  Bridges
-  Watercourses
-  Main Rivers








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Location:
Thompson Carr

Drawing:
Map 11 - Breckland Flooding Locations

Legend

-  Thompson Carr
-  Flooding Reports - Internal
-  Flooding Reports - Other
-  Bridges
-  Main Rivers
-  Watercourses
-  1 in 100 Flood Risk

Flooding and flood risk within the Thompson Carr Catchment

Description of catchment

The catchment slopes from north to south and is mostly rural aside from the developed areas of Thompson. The catchment discharges into the Thompson Carr.

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 | 0 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 0 | 0 |
| [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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

Flood incidents within this catchment

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 |
|-------------------------|---|--|
| 23/06/2016 | On the 23/06/2016 - 1 property was internally flooded on Hallfield Road, Thompson. This incident was reported by a resident via email correspondence on the 30 June 2016, (FWF/16/3/2899) | A local committee visited affected residents to offer advice and to gather information after the incident. A resident carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (Lead Local Flood Authority) liaised with 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.

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

Historic flooding incidents within the catchment

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

| Date of incident | Impact | Rainfall intensity |
|-------------------------|--|---------------------------|
| Unknown | Flooding has occurred on Hallfield Road previously | 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.

Following flooding to people, property and infrastructure;

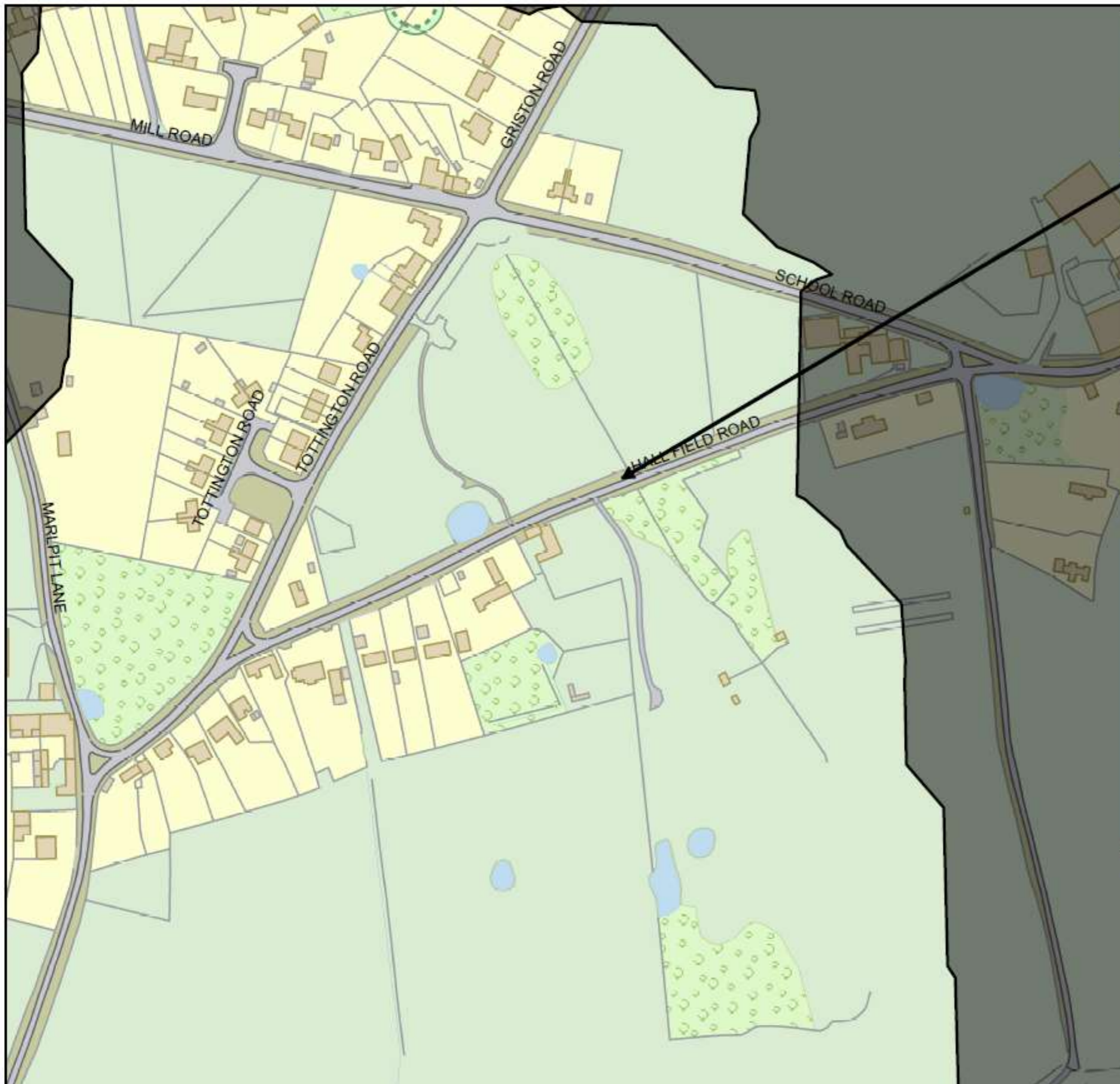
- Risk Management Authorities should
 - communicate with affected residents where their assets have given rise to the flooding of properties.
 - review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding 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? |
|--------------------------------------|---|---|
| Hallfield Road, Thompson, 23/06/2016 | Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned. | Local Landowners |
| Hallfield Road, Thompson, 23/06/2016 | Surface run-off from rainfall made its way onto highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Local Landowners, Norfolk County Council |
| Hallfield Road, Thompson, 23/06/2016 | The local pond and outfall ditch were reported to be obstructed by debris/silt. This reduced the efficiency caused the failure of the upstream drainage system contributing to flooding at the affected properties. | Local Landowner/Committee, |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|--------------------------------------|--|---|-----------|
| Hallfield Road, Thompson, 23/06/2016 | <ul style="list-style-type: none"> 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 Highways to assess the existing highway drainage system to clarify its condition and ongoing maintenance. Norfolk County Council will liaise with local landowner/committee to ensure pond and associated overflow ditch have been maintained to a required standard. Discussions will also be had in regard to runoff prevention methods. | Local Landowners, Norfolk County Council | 12 months |
| Hallfield Road, Thompson, 23/06/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 |

Additional actions taken since the event:

- NCC highways have undertaken maintenance to the gullies and grips serving the flooded location
- The Parish Council has carried out works to excavate the adjacent pond
- LLFA visited the property and followed



Location:
Thompson Carr

Drawing:
Map 12 - Flood and Drainage Details




Hallfield Road – Internal and external flooding experienced on 23 June 2016

Causes – Significant runoff from adjacent fields and runoff from rainfall that made its way onto the adjacent highway and flowed along the road into the access of an affected property on Hallfield Road. Also reports of nearby pond and overflow being blocked

Recommendations – Norfolk County Council will liaise with local landowners to discuss runoff prevention methods and riparian responsibilities. NCC will also look into potential options for re-routing highway runoff away from the affected properties and work with partner organisations to identify funding for flood mitigation

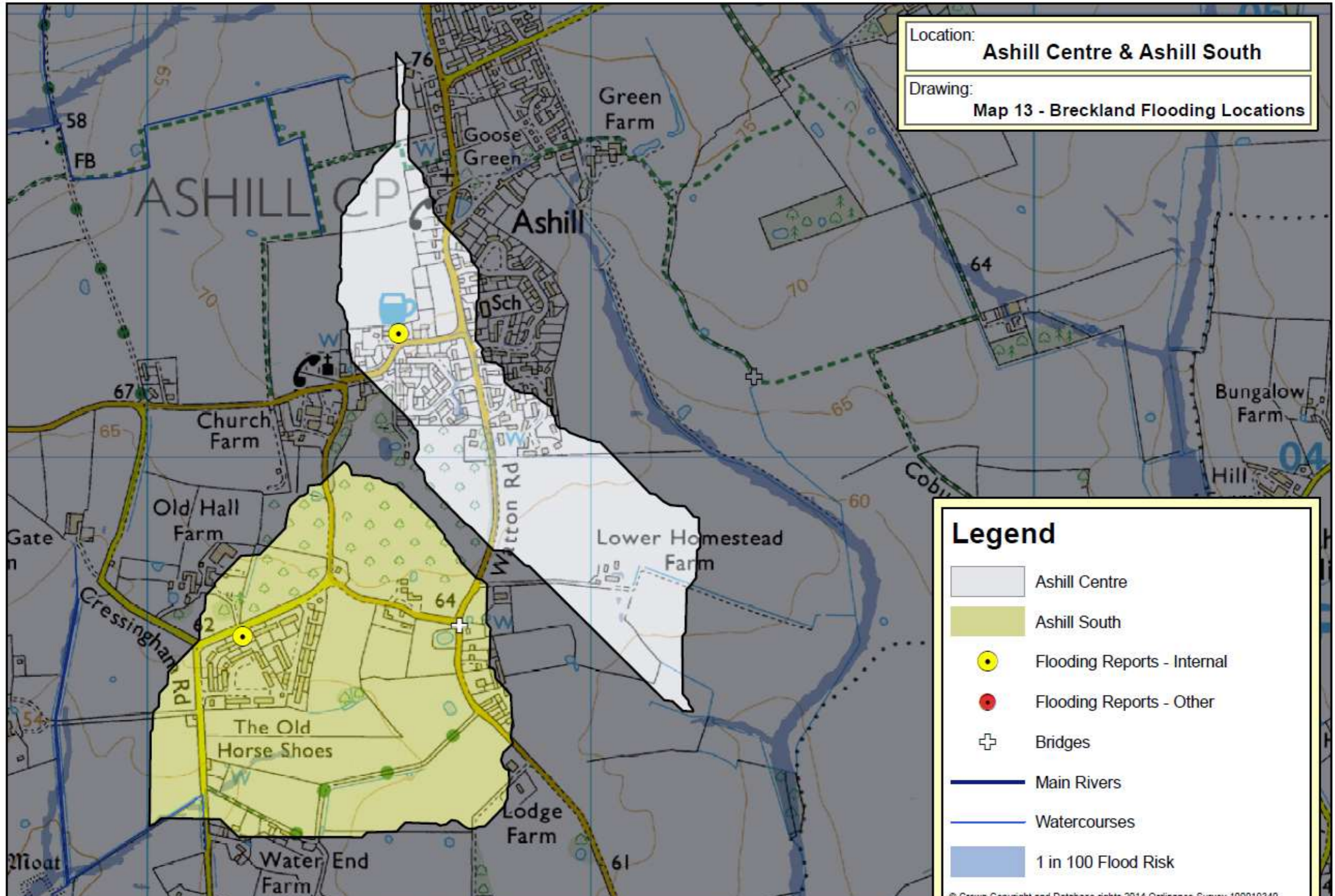


Legend

-  Bridges
-  Watercourses
-  Main Rivers

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Location: **Ashill Centre & Ashill South**
Drawing: **Map 13 - Breckland Flooding Locations**



Legend

- Ashill Centre
- Ashill South
- Flooding Reports - Internal
- Flooding Reports - Other
- Bridges
- Main Rivers
- Watercourses
- 1 in 100 Flood Risk

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Flooding and flood risk within the Ashill Centre Catchment

Description of catchment

The catchment slopes from north to south-east and is roughly a half and half split between rural and urban area.

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 | 0 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 4 | 0 |
| [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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

Flood incidents within this catchment

Within this catchment 1 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 |
|-------------------------|---|--|
| 23/06/2016 | On the 23/06/2016 - 1 property was internally flooded on Church Street, Ashill. This incident was reported by a resident via an online flood report form on the 25 July 2016, (FWF/16/3/3022) | A resident carried out measures to minimise the impact of flooding during the incident. Anglian Water Services Ltd responded and pumped out during the incident. Norfolk County Council (Lead Local Flood Authority) visited the area to observe flooding impact on affected property. |

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.

Historic flooding incidents within the catchment

There are no reports of historic flooding incidents within this catchment.

Causes of flooding within the catchment and recommendations

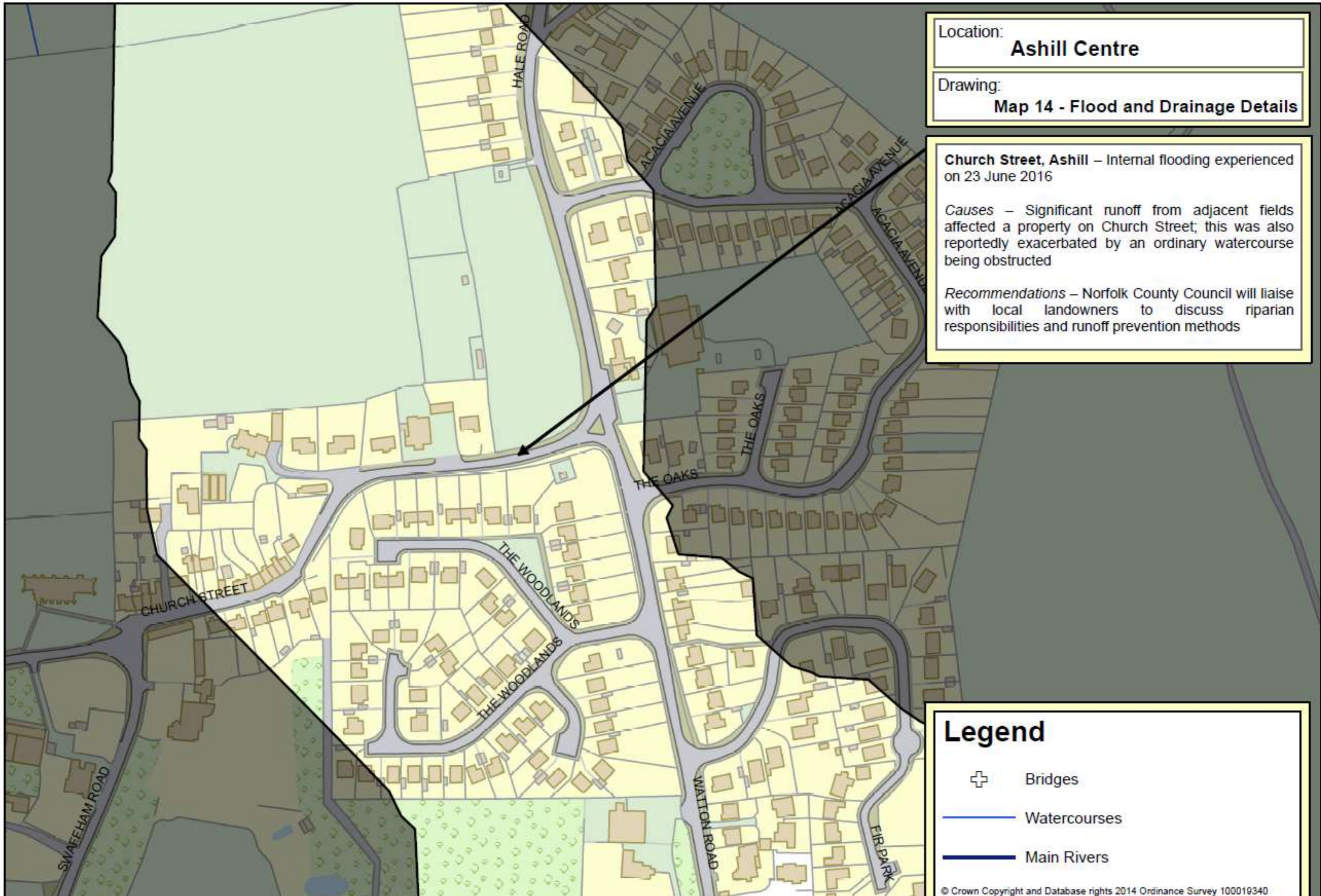
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the 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 Street, Ashill, 23/06/2016 | <ul style="list-style-type: none"> • Run-off from significant rainfall was concentrated along overland flowpaths on which the affected property is positioned. • An adjacent ordinary watercourse was reported to be obstructed which caused overtopping and contributed to flooding at the affected properties. | Local Landowners, Norfolk County Council |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|-----------------------------------|---|---|-----------|
| Church Street, Ashill, 23/06/2016 | Norfolk County Council will liaise with local landowners to discuss riparian responsibilities and runoff prevention methods | Norfolk County Council, Landowners | 12 months |
| Church Street, Ashill, 23/06/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 Owners | 12 months |



Location:
Ashill Centre

Drawing:
Map 14 - Flood and Drainage Details

Church Street, Ashill – Internal flooding experienced on 23 June 2016

Causes – Significant runoff from adjacent fields affected a property on Church Street; this was also reportedly exacerbated by an ordinary watercourse being obstructed

Recommendations – Norfolk County Council will liaise with local landowners to discuss riparian responsibilities and runoff prevention methods

Legend

- ⊕ Bridges
- Watercourses
- Main Rivers

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Flooding and flood risk within the Ashill South Catchment

Description of catchment

The catchment slopes from north-east to south-west and is mostly rural aside from a housing development. Approximately 2.2km downstream is a tributary of the River Wissey which the catchment discharges into.

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 | 0 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 0 | 0 |
| [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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

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 |
|-------------------------|---|---|
| 23/06/2016 | On the 23/06/2016 - 1 property was internally flooded on Cressingham Road, Ashill. This incident was reported by a resident via an electronic report on the 27 June 2016, (FWF/16/3/3937) | Norfolk County Council (Lead Local Flood Authority) liaised with 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.

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

Historic flooding incidents within the catchment

There are no reports of historic flooding incidents 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? |
|--------------------------------------|--|---|
| Cressingham Road, Ashill, 23/06/2016 | Run-off from significant rainfall was concentrated along overland flowpaths on which the affected property is positioned. | Local Landowners |
| Cressingham Road, Ashill, 23/06/2016 | Surface run-off from rainfall made its way onto highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Local Landowners, Norfolk County Council |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|--------------------------------------|---|---|-----------|
| Cressingham Road, Ashill, 23/06/2016 | 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 |
| Cressingham Road, Ashill, 23/06/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 |



Location:
Ashill South

Drawing:
Map 15 - Flood and Drainage Details

Cressingham Road – Internal flooding experienced on 23 June 2016

Causes – Significant runoff from adjacent land and runoff from rainfall that made its way onto the adjacent highway and flowed along the road into the access of an affected property on Cressingham Road

Recommendations – Norfolk County Council will liaise with local landowners to discuss runoff prevention methods and look into options for re-routing highway runoff away from the affected property. NCC will also work with partner organisations to identify funding for flood mitigation and Property Level Protection

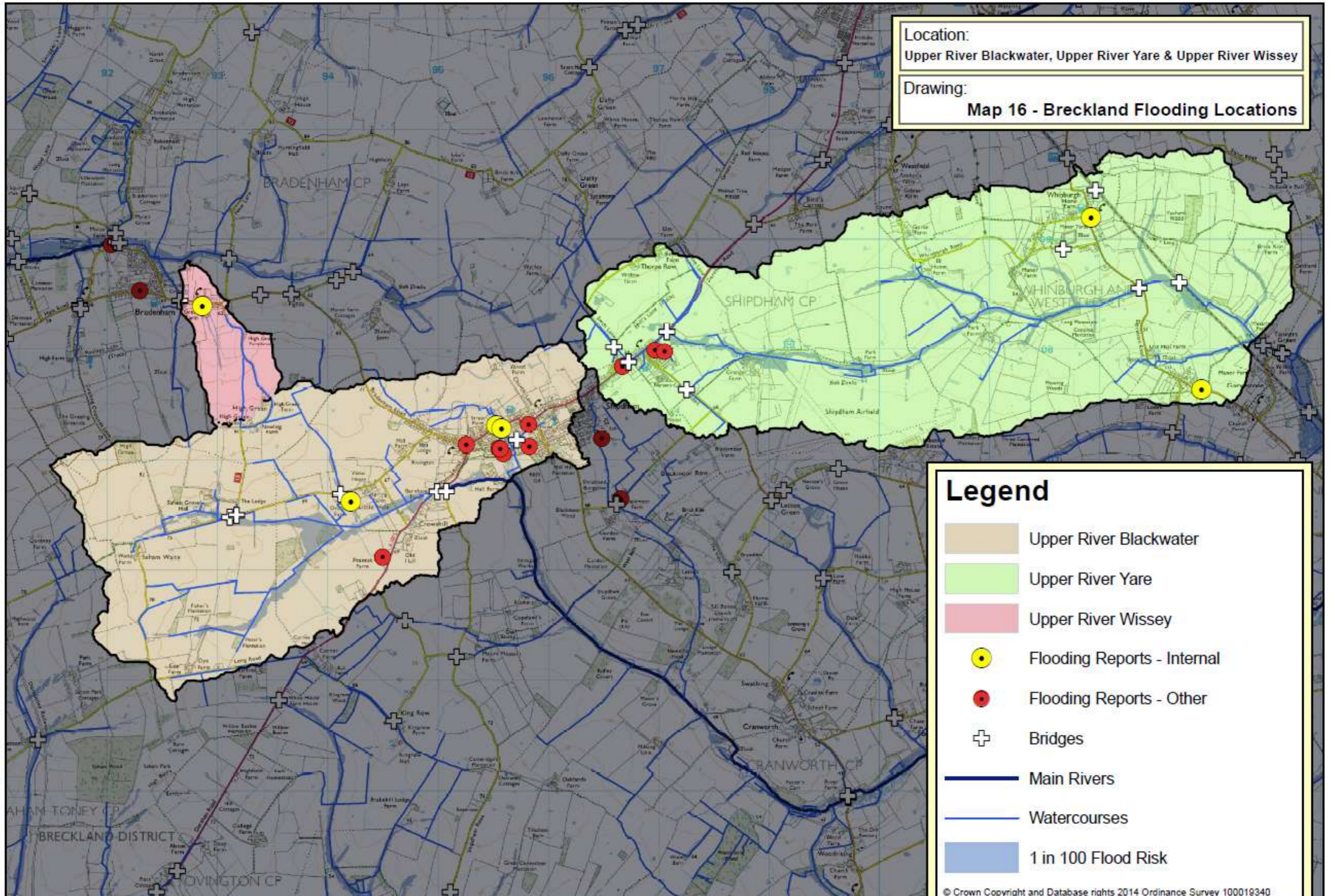
Legend

- ⊕ Bridges
- Watercourses
- Main Rivers

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Location:
Upper River Blackwater, Upper River Yare & Upper River Wissey

Drawing:
Map 16 - Breckland Flooding Locations



Legend

- Upper River Blackwater
- Upper River Yare
- Upper River Wissey
- Flooding Reports - Internal
- Flooding Reports - Other
- Bridges
- Main Rivers
- Watercourses
- 1 in 100 Flood Risk

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Flooding and flood risk within the Upper River Blackwater Catchment

Description of catchment

The catchment slopes from west to east and is mostly rural aside from the developed area of Shipdam. The catchment discharges into the River Blackwater.

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: | 2 | 41 | 1 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 2 | 62 | 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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

Flood incidents within this catchment

Within this catchment 3 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 |
|-------------------------|--|---|
| 23/06/2016 | On the 23/06/2016 - 1 property was internally flooded on Little Hale Road, Shipdam. This incident was reported by a resident via email correspondence on the 29 June 2016, (FWF/16/3/2879) | Norfolk County Council (Lead Local Flood Authority) liaised with affected residents to offer advice and to gather information after the incident. |
| 23/06/2016 | On the 23/06/2016 - 2 properties were internally flooded on High Street, Shipdam. These incidents were reported by: The Fire and Rescue Service via an electronic report on the 10 July 2016, (FWF/16/3/3315) and an online flood | A resident carried out measures to minimise the impact of flooding during the incident. The Fire and Rescue Service responded and pumped out after the incident. |

| | | |
|--|--|---|
| | report form on the 10 July 2016, (FWF/16/3/3390) | Norfolk County Council (Lead Local Flood Authority) visited the area to observe flooding impact on affected properties. |
|--|--|---|

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.

3 of the incidents (100%) of internal flooding in this catchment are within 2.5km of a rain gauge:

23 June 2016 - 50mm rainfall was recorded as falling in 3.5 hours at the Shipdham STW rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 34 rainfall event.

Historic flooding incidents within the catchment

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

| Date of incident | Impact | Rainfall intensity |
|------------------|--|--------------------|
| Unknown | Flooding has occurred to one of the properties on High Street previously | 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.

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? |
|---|---|---|
| Little Hale Road, Shipdam, 23/06/2016 High Street, Shipdam, 23/06/2016 | Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned. | Local Landowners |
| Little Hale Road, Shipdam, 23/06/2016 High Street, Shipdam, 23/06/2016 | Surface run-off from a significant rainfall made its way onto highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Norfolk County Council |
| High Street, Shipdam, 23/06/2016 | The adjacent watercourse burst its banks during the rainfall event, potentially due to a lack of capacity or obstruction. This reduced efficiency caused the failure of the upstream drainage system contributing to flooding at the affected properties. | Local Landowners, Norfolk County Council |
| High Street, Shipdam, 23/06/2016 | There was reports of the adjacent foul sewer surcharging during the rainfall event. This surcharging contributed to the flooding at the affected properties. | Anglian Water |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|---|---|---|-----------|
| High Street, Shipdam, 23/06/2016 | Norfolk County Council to investigate into the ordinary watercourse and associated culverts to determine condition and capacity. Relevant landowners will be contacted if any issues are observed. | Norfolk County Council | 12 months |
| Little Hale Road, Shipdam, 23/06/2016 High Street, Shipdam, 23/06/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 and Property Owner | 12 months |
| High Street, Shipdam, 23/06/2016 | Anglian Water to investigate into reports of foul sewer surcharging. | Anglian Water | 12 months |
| Little Hale Road, Shipdam, 23/06/2016 High Street, Shipdam, 23/06/2016 | 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 |



Location:
Upper River Blackwell

Drawing:
Map 17 - Flood and Drainage Details

High Street – Multiple internal flooding and nearby external flooding experienced on 23 June 2016

Causes – Significant runoff from adjacent fields and runoff from rainfall that made its way onto the adjacent highway and flowed along the road into the access of an affected property on High Street. Also reports of ordinary watercourse bursting its banks and foul system surcharging

Recommendations – Norfolk County Council will liaise with local landowners to discuss runoff prevention methods and consider opportunities to re-route highway runoff away from affected properties. NCC to investigate into the condition of the bridges, watercourses and associated culverts. Anglian Water to investigate into the report of foul sewer flooding. NCC will also work with partner organisations to






Little Hale Road – Internal flooding experienced on 23 June 2016

Causes – Significant runoff from adjacent fields and runoff from rainfall that made its way onto the adjacent highway and flowed along the road into the access of an affected property on Little Hale Road

Recommendations – Norfolk County Council will liaise with local landowners to discuss runoff prevention methods and investigate into the effectiveness of the ordinary watercourses and associated culverts. NCC will also look into potential options for re-routing highway runoff away from the affected property



Legend

-  Bridges
-  Watercourses
-  Main Rivers

Flooding and flood risk within the Upper River Yare Catchment

Description of catchment

The catchment slopes from west to east and is mostly rural aside from a few small developments. The catchment contains and discharges into the River Yare.

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 | 8 | 2 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 19 | 2 |
| [c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event: | 0 | 0 | 1 |
| [d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event: | 0 | 0 | 1 |
| [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 | 1 |
| [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 | 1 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

Flood incidents within this catchment

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 |
|-------------------------|--|--|
| 23/06/2016 | On the 23/06/2016 - 1 property was internally flooded on Dereham Road, Whinburgh and Westfield. This incident was reported by a resident via an electronic report on the 24 June 2016, (FWF/16/3/3905) | A resident carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (Lead Local Flood Authority) visited the area to observe flooding impact on affected property. |
| 23/06/2016 | On the 23/06/2016 - 1 property was internally flooded on Dereham Road, Garvestone. This incident was reported by a resident via email correspondence on the 31 July 2016, (FWF/16/3/3120) | Norfolk County Council (Lead Local Flood Authority) liaised with 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.

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

Historic flooding incidents within the catchment

There are no reports of historic flooding incidents within this catchment.

Causes of flooding within the catchment and recommendations

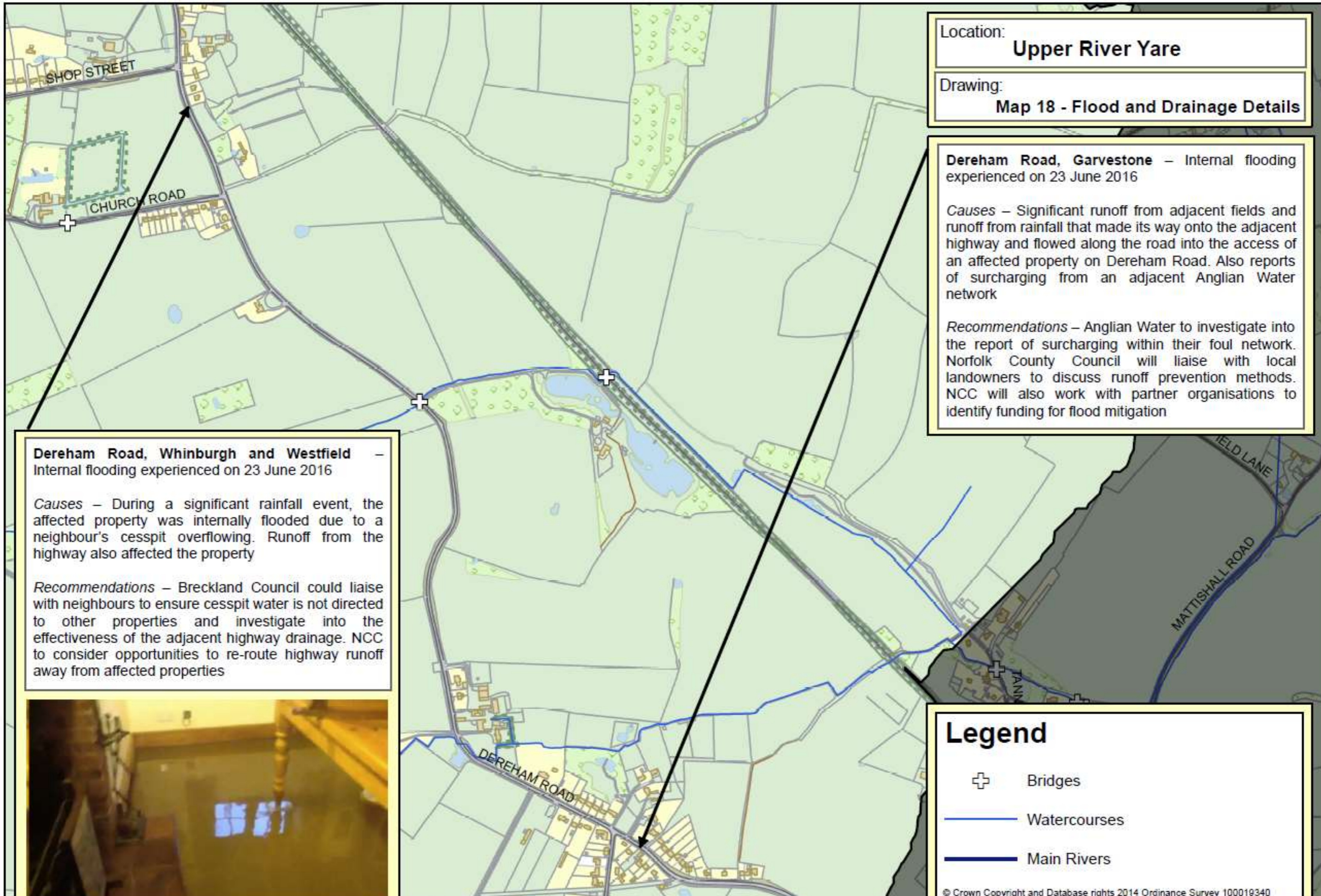
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the 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? |
|---|--|---|
| Dereham Road, Garvestone, 23/06/2016 | Run-off from rainfall was concentrated along overland flowpaths on which the affected property is positioned. | Local Landowners |
| Dereham Road, Garvestone, 23/06/2016 | There was reports of the adjacent foul sewer surcharging during the rainfall event. This surcharging contributed to the flooding at the affected properties. | Anglian Water |
| Dereham Road, Whinburgh and Westfield, 23/06/2016 | Surface run-off flowed from the highway onto the access of the properties which contributed to the flooding of the affected properties | Norfolk County Council |
| Dereham Road, Garvestone, 23/06/2016 | Surface run-off from rainfall made its way onto highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Local Landowners & Norfolk County Council |
| Dereham Road, Whinburgh and Westfield, 23/06/2016 | Run-off from rainfall was directed towards a private cesspool which overflowed and caused flooding to an adjacent neighbour's property. | Local Landowners |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|---|---|---|-----------|
| Dereham Road, Whinburgh and Westfield, 23/06/2016 | 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 |
| Dereham Road, Garvestone, 23/06/2016 | Landowners should assess their land management practices to ensure flood risk is reduced to neighbouring properties. | Local Landowners | 12 months |
| Dereham Road, Whinburgh and Westfield, 23/06/2016 Dereham Road, Garvestone, 23/06/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 |
| Dereham Road, Whinburgh and Westfield, 23/06/2016 | Breckland Council to contact owner of cesspit to discuss cesspit condition and maintenance requirements to prevent impacting Neighbour. Methods to prevent surface water from entering the cesspit will also be discussed. | Breckland Council | 12 months |
| Dereham Road, Garvestone, 23/06/2016 | Anglian Water to investigate into reports of foul sewer surcharging. | Anglian Water | 12 months |



Location:
Upper River Yare

Drawing:
Map 18 - Flood and Drainage Details

Dereham Road, Garvestone – Internal flooding experienced on 23 June 2016

Causes – Significant runoff from adjacent fields and runoff from rainfall that made its way onto the adjacent highway and flowed along the road into the access of an affected property on Dereham Road. Also reports of surcharging from an adjacent Anglian Water network

Recommendations – Anglian Water to investigate into the report of surcharging within their foul network. Norfolk County Council will liaise with local landowners to discuss runoff prevention methods. NCC will also work with partner organisations to identify funding for flood mitigation

Dereham Road, Whinburgh and Westfield – Internal flooding experienced on 23 June 2016

Causes – During a significant rainfall event, the affected property was internally flooded due to a neighbour's cesspit overflowing. Runoff from the highway also affected the property

Recommendations – Breckland Council could liaise with neighbours to ensure cesspit water is not directed to other properties and investigate into the effectiveness of the adjacent highway drainage. NCC to consider opportunities to re-route highway runoff away from affected properties



Legend

-  Bridges
-  Watercourses
-  Main Rivers

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Flooding and flood risk within the Upper River Wissey Catchment

Description of catchment

The catchment slopes from south to north and is mostly rural aside from a housing development. The catchment discharges into the River Wissey.

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 | 2 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 5 | 0 |
| [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 |

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

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 |
|-------------------------|---|---|
| 23/06/2016 | On the 23/06/2016 - 1 property was internally flooded on Church Street, Bradenham. This incident was reported by a resident via email correspondence on the 28 June 2016, (FWF/16/3/2887) | Norfolk County Council (Lead Local Flood Authority) liaised with 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.

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

Historic flooding incidents within the catchment

There are no reports of historic flooding incidents 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 Street, Bradenham, 23/06/2016 | Run-off from significant rainfall was concentrated along overland flowpaths on which the affected property is positioned. | Local Landowners, Norfolk County Council |
| Church Street, Bradenham, 23/06/2016 | <ul style="list-style-type: none"> • Surface run-off flowed from the highway onto the access of the properties which contributed to the flooding of the affected properties. • The adjacent watercourse burst its banks during the rainfall event, potentially due to a lack of capacity or obstruction. This reduced efficiency caused the failure of the upstream drainage system contributing to flooding at the affected properties. | Norfolk County Council |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|--------------------------------------|---|---|-----------|
| Church Street, Bradenham, 23/06/2016 | <ul style="list-style-type: none"> 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 to investigate into concerning ordinary watercourse and associated culverts to determine condition and capacity. Relevant landowners will be contacted if any issues are observed | Norfolk County Council | 12 months |
| Church Street, Bradenham, 23/06/2016 | Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. 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 |



Location: **Upper River Wissey**

Drawing: **Map 19 - Flood and Drainage Details**




Church Street, Bradenham – Internal flooding and nearby external flooding experienced on 23 June 2016

Causes – Significant runoff from adjacent fields and highway affected a property on Church Street. Also reports of ordinary watercourse bursting its banks

Recommendations – Norfolk County Council will liaise with local landowners to discuss runoff prevention methods and investigate into the effectiveness of the watercourses and associated culverts. NCC will also work with partner organisations to identify funding for flood mitigation and consider opportunities to re-route highway runoff away from affected properties



Legend

-  Bridges
-  Watercourses
-  Main Rivers

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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.