Norfolk County Council

Investigation Report into the flooding in Breckland District in Winter 2020-2021

Report Reference: FIR066

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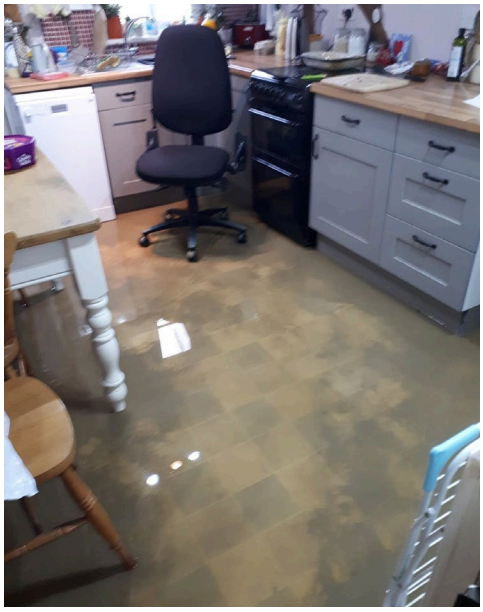

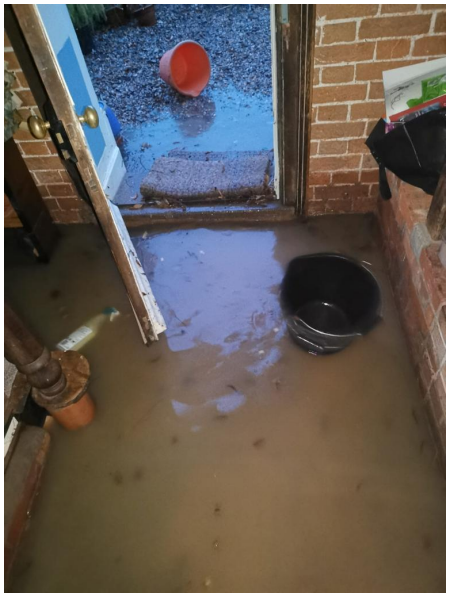

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Introduction

Flooding occurred across Breckland on the 23rd and 24th of December 2020. Norfolk County Council has confirmed 67 incidences of internal flooding on this date which are covered in this report. We note that significantly more properties were flooded internally, based on reports from neighbouring properties or risk management authority reports. However, due to the absence of direct and verifiable reports from property owners, Norfolk County Council as Lead Local Flood Authority (LLFA) does not have the permission to include, hold or publish information for those properties where direct reports have not been submitted. Please note that the LLFA made extensive site visits and provided 'fliers' or letter drops to the majority of those affected by flooding. Any subsequent reports received will be investigated and published in an additional report.

Norfolk received an above normal amount of rainfall throughout December with a total of 1117.7mm rainfall, 204% of the Long-Term Average. On the 23 December rainfall was particularly concentrated within the south eastern part of the district with Kenninghall, Banham and Garboldisham worst affected where there were significant clusters of properties flooded with more isolated properties internally flooded in other parts of the district.

Executive Summary

Whilst not all areas have the presence of a verified rain gauge, the following hydrology summary has been provided where these are available:-

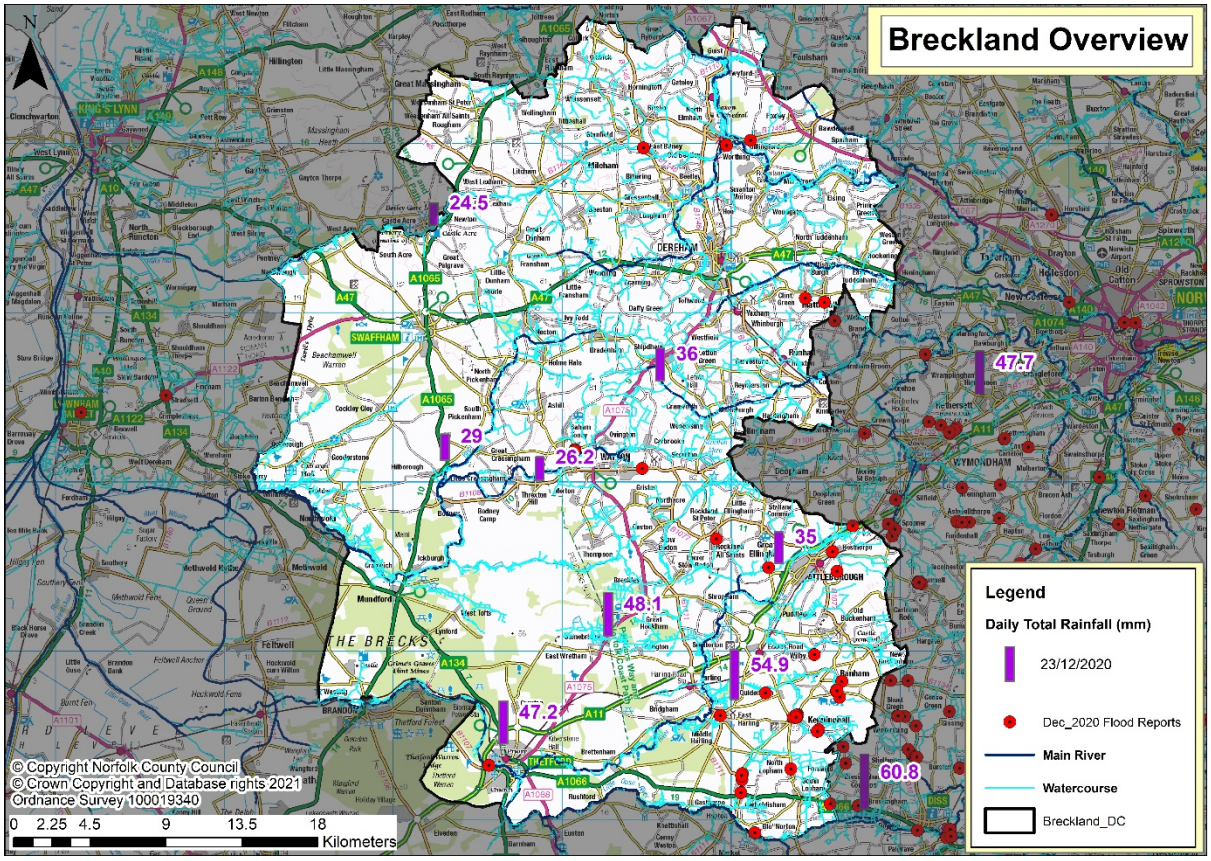


Figure 1 - Overview of Rainfall in Breckland on 23/12/2020

Almost all of Norfolk received above average rainfall totals during December 2020. Soils were at, or close to saturation, across almost all the county at the end of the month. But an exceptionally high rainfall total on the 23rd was recorded across much of the county especially South Norfolk and Breckland with daily totals between 50mm and 80mm on top of soils with high saturation level.

By the end of December, soils in the region only had capacity for 3mm of rainfall, much lower than average soil moisture deficit for the time of year (indicating that soils are wetter than usual). The national average was 9.9mm but even this was wetter than usual indicating how bad East Anglia was.

As a result, river flows were classed as either exceptionally high, with record high December monthly mean flows recorded on the River Thet and Little Ouse in Breckland. Groundwater levels were classed higher than average by the end of the month, with some sites on the North Norfolk border classed as exceptional high.

In terms of spatial variances in the rainfall, the Southern portion of Breckland received the most rainfall on the 23rd Dec whereas northern and central areas were lower however the preceding wetness was high as stated above, areas like Hilborough recorded 3 other days with similar daily rainfall in the month of December leading to increasing saturation, overleaf is an overview of the rainfall and flood flows for each macro catchment were gauged data is available:-

Location Name	District	X	Y	Date	Daily Total Rainfall	Rainfall Return Period (AEP%)
Watton	Breckland	588660	300089	23/12/2020	26.2	2
Watton	Breckland	588660	300089	24/12/2020	7.6	Blank
Attleborough	Breckland	602822	295177	23/12/2020	35	3
Attleborough	Breckland	602822	295177	24/12/2020	10.8	Blank
East Wretham	Breckland	592713	290879	23/12/2020	48.1	10
East Wretham	Breckland	592713	290879	24/12/2020	4.4	Blank
Harling	Breckland	600205	287136	23/12/2020	54.9	19
Harling	Breckland	600205	287136	24/12/2020	4.4	Blank
Castle Acre	Breckland	582384	315162	23/12/2020	24.5	1.5
Castle Acre	Breckland	582384	315162	24/12/2020	7.9	Blank
Shipdham	Breckland	595797	305975	23/12/2020	36	3.5
Shipdham	Breckland	595797	305975	24/12/2020	5.8	Blank
Thetford	Breckland	586515	284505	23/12/2020	47.2	10
Thetford	Breckland	586515	284505	24/12/2020	5.6	Blank
Hilborough	Breckland	583025	301315	23/12/2020	29	2
Hilborough	Breckland	583025	301315	24/12/2020	4.7	Blank

Thet and Little Ouse:- Rain gauges in Harling, Kenninghall, Wretham and Thetford recorded on average 50mm of rainfall in this south western area of Norfolk, most of which are headwater catchments for the Main River Thet. 55mm fell onto the surrounding areas of Harling, Kenninghall and Banham (equates to 1:20yr rainfall event (5% AEP)) which generated the flashy flood flows observed in this area, conveying west towards Thetford through the River Whittle, a tributary of the Thet. The Whittle at Quidenham recorded peak flows at 3.61m3/s and a level of 0.86m on the afternoon of the 24th Dec, according to national data that is higher than the previous highest recorded flow of 3.4 cumecs from 1968 (Source: National River Flows Archive). Similarly, the Thet at Redbridge also recorded maximum flows following significant rainfall in this nearby catchment, the resulting flows peaked late on the 24th Dec and again were very high in the long term record. Peak flows were recorded at 0.57 cumecs and river levels 2.17m at this station (drowned out gauge) which is again comparable to the Great Flood of 1968 (2.12m).

For the purpose of this report and ease of presentation we have divided the report by parish, then sub catchment. In some cases a catchment map has been generated to show the proximity of the properties to overland flow paths, however, in areas of isolated flooding where the flooding does not relate to a flow path a catchment map has not been generated.

Flooding incidents

The flooding that occurred in the locations listed below led to the internal flooding of 66 properties.

Location	Sub Catchment	Number of affected properties
Attleborough – Burgh Common and Long Street Attleborough	N/A	1
Banham	Great Fen	6
Besthorpe (Mill Lane and Norwich Road)	N/A	2
Beetley	N/A	1
Billingford	N/A	1
Blo' Norton	N/A	2
Carbrooke	N/A	1
Foulden	N/A	1
Garboldisham	N/A	5
Harling	N/A	1
Hoe (Worthing)	N/A	5
Kenninghall	Upper Whittle	23
Mattishall	N/A	2
Necton	N/A	1
North Lopham	N/A	1
Quidenham (Inc. Wilby)	N/A	2
Rocklands	N/A	1
Saham Toney	Saham Toney	4
Shipdham	N/A	2
Shropham	N/A	1
South Lopham	N/A	1
Thetford	N/A	1
Watton	N/A	1

Key causes

More detail on the causes that occurred at the individual catchment level can be found in each section of this report, however some of the key trends identified in the flooding have been summarised below;

- The combination of a heavily saturated ground conditions alongside a significant rainfall event led to flooding.
- A large number of the properties impacted are situated on overland flow paths and/or are below the level of the nearest highway.
- The flooding in several locations was exacerbated by the loss of drainage features within the catchment (such as ditches) and the amendments of principal drains and watercourses and their connections through culverting, infilling and lack of maintenance which caused a loss of integrity and capacity of the drainage network.
- The capacity of surface water drainage including land drains, highway drainage and private property drainage was exceeded due to the significant levels of rainfall that fell during the event.
- The capacity of the foul network was also exceeded due to the ingress of surface water into the foul network. This caused the foul network to surcharge in a number of locations during the event with several residents reporting foul water entering their property.
- Features such as kerbs, walls, garden fences and alleyways had the effect of containing or channelling flood water near to properties.
- Flood water entered properties through the unprotected structure of the building. This included via features such as low thresholds at entrances, unprotected air bricks and services conduits.

Key recommendations

The recommendations set out in the report have been summarised below.

All Risk Management Authorities should;

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

Property owners of affected properties should;

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

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. 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.
- Work with property owners to assess the road structure to identify if it could be amended to route flood water away from the affected properties to alternative points of discharge, or other solutions as practicable.
- Seek to remind riparian owners of their responsibility to undertake appropriate levels of maintenance to sustain the efficiency of the drainage systems.
- Communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders
- Determine if works are needed to remove the risk posed by structures that form obstructions to watercourse flows and communicate with affected parties and riparian owners
- Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

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.

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.

In this instance it was deemed necessary to complete a formal investigation as:
[list reasons to justify investigation]

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

The flood investigation report aims to:

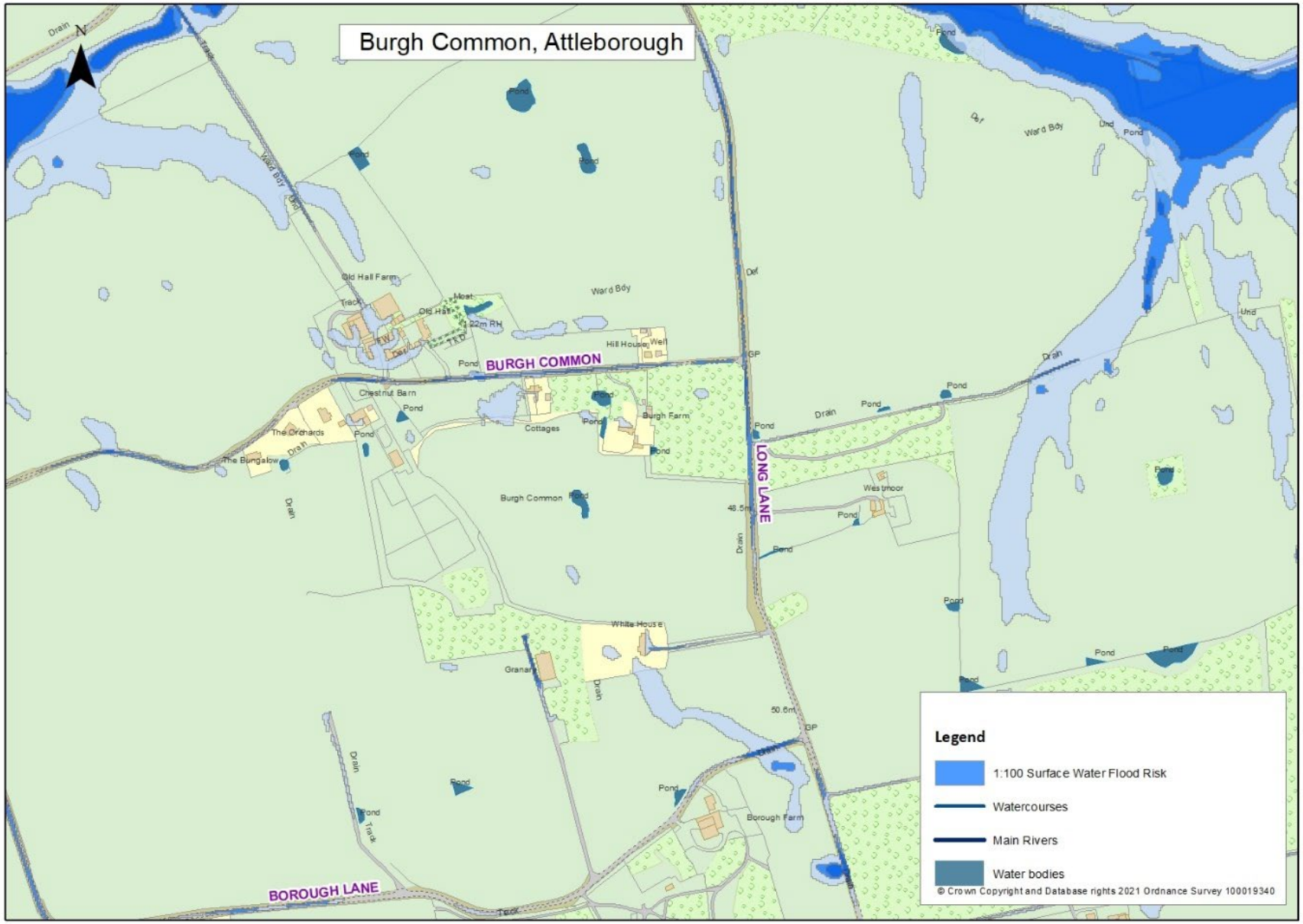
- provide a transparent and consistent review of recent flooding.
- identify those organisations and individuals who have responsibility to manage the causes of the flooding.
- identify what their response has been or will be to the flooding.
- make recommendations as to how the flood risk could be mitigated 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.

Burgh Common, Attleborough



Flood incidents within this location

Within this catchment 1 incident of internal flooding has been assessed as part of this investigation. This incidents is detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Burgh Common, Attleborough. This incident was reported by • a resident via an online flood report form on the 24/12/2020, (3272)	A resident carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the 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 2.5km 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.

The rainfall gauge record for the 23/12/2020 indicated that the return period was measured as a 1:3 year event.

Historic flooding incidents within the catchment

There are no historical records of flooding.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The table below details the causes that led to flooding and the recommendations to mitigate the causes and impacts of the flooding experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Burgh Common, Attleborough	Surface run-off from rainfall flowed off adjacent fields and into an undersized culvert. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected property. Further downstream a second culvert was damaged which caused water to surcharge out of the ditch and flow down the highway.	The culvert owners should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency. Norfolk County Council will assist with this.	Riparian owners Norfolk County Council (LLFA)

Flood incidents within Long Street, Attleborough

Within Long Street 1 incident of internal flooding has 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
23/12/2020	On the 24/12/2020 - 1 property was internally flooded on Long Street. This incident was reported by • a resident via an online flood report on the 24/12/2020, (3271)	Norfolk County Council (Highways) visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the catchment

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

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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.

The rainfall gauge record for the 23/12/2020 indicated that the return period was measured as a 1:3 year event.

Historic flooding incidents within the catchment

There are no historic records of flooding.

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The findings of the investigation are detailed on the following pages. The table below details the causes that led to flooding and the recommendations to mitigate the causes and impacts of the flooding experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding.

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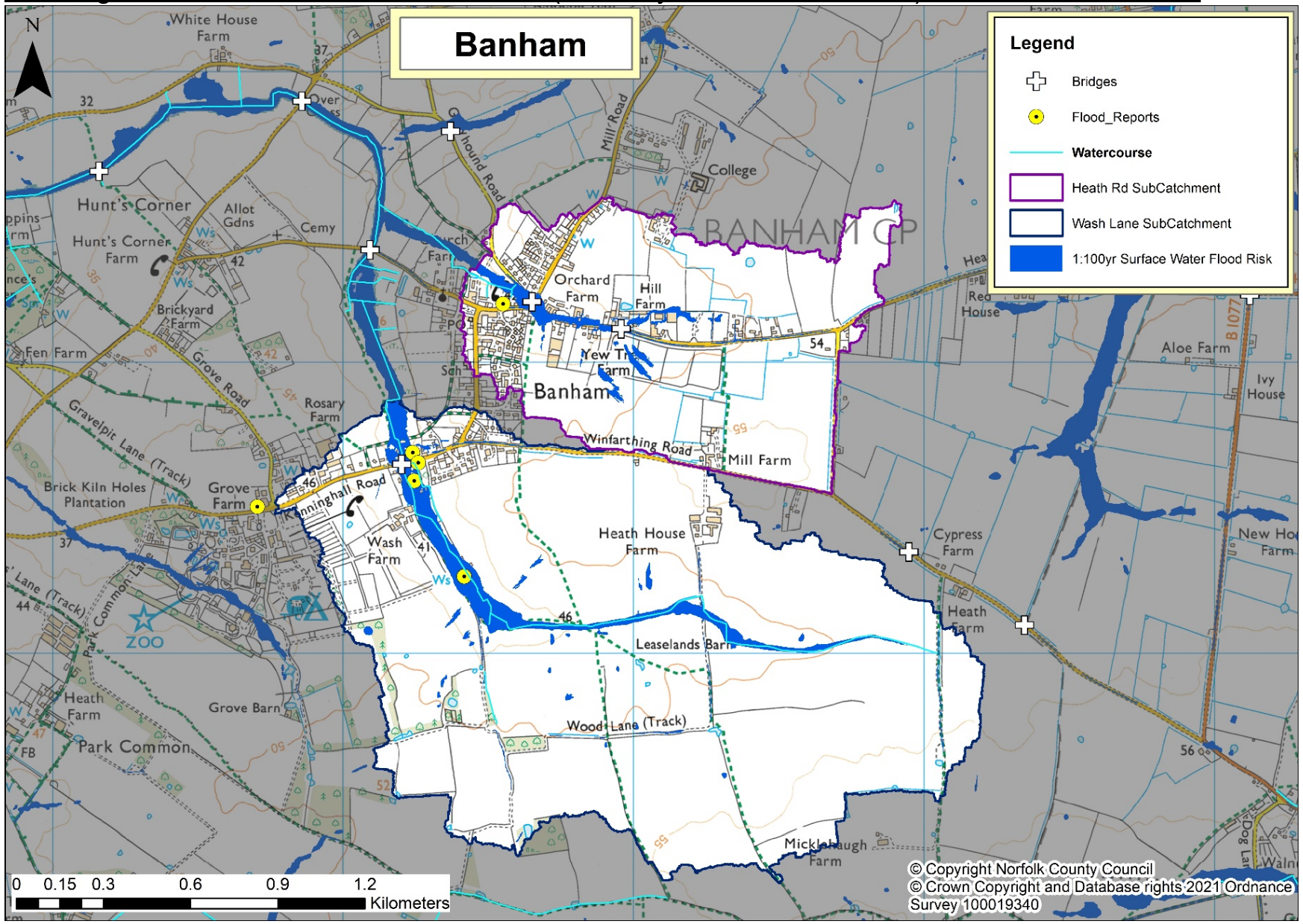
  - determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.

- 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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Long Street, Attleborough 23/12/2020	Due to saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as [rain/snow] to the areas of flooding.	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait. For example they could retro-fit permeable areas and other methods of small scale sustainable drainage systems	Property owners Norfolk County Council

Flooding and flood risk within the Great Fen (Tributary of the River Whittle) catchment in Banham



Description of catchment

Banham resides within the Great Fen catchment, an upper tributary of the River Whittle. The River Whittle flows in a westerly direction towards East Harling, the next major downstream settlement. The Whittle is part of the Main River Thet catchment which drains most of SW Breckland. The Great Fen is approx. 9.4 km^2 in size and gently falls SE to NE towards Banham and then heads west to its confluence with the River Whittle. The headwaters are largely dominated by agricultural land uses with Banham being the only area of significant hardstanding. The Great Fen catchment can be differentiated into two main flow routes 1) Wash Lane system on the southern side of the village flowing north and 2) Heath Rd system on the Eastern side of the village flowing west. These are the areas of greatest flood risk both from fluvial and pluvial sources.

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 1:30yr event (3.33% chance of occurring in any year) and the 1:100yr event (1% chance of occurring in any year). This assessment does not consider flood risk from groundwater or reservoir failure.

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] Number of properties subject to surface water flood risk at 1 in 30 year event:	0	17	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	29	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	No Coverage	No Coverage	No Coverage
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	No Coverage	No Coverage	No Coverage

Flood incidents within this catchment

Within this catchment 6 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
23/12/2020	On the 23/12/2020 - 3 properties were internally flooded on Wash Lane, Banham. These incidents were reported by: • a resident via an online flood report form on the 30/01/2021, (FWF/21/4023)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Residents carried out measures to minimise the impact of flooding during the incident.

Date of Incident	Incident as reported	What was the response to the flood incident
	• a resident via a flood questionnaire on the 8/01/2021, (FWF/21/3641) • a resident via a flood questionnaire on the 30/04/2021, (FWF/21/4588)	
23/12/2020	On the 23/12/2020 - 2 properties were internally flooded on Kenninghall Road, Banham. These incidents were reported by: • a resident via an online flood report form on the 28/12/2020, (FWF/20/3320) • a resident via a flood questionnaire on the 17/04/2021, (FWF/21/4464)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Elected representatives visited affected residents to offer advice and to gather information during the incident. The Fire and Rescue Service responded and pumped out during the incident.
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Crown Street, Banham. This incident was reported by a resident via an online flood report form on the 24 December 2020, (FWF/20/3260)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the catchment

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

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns.

A substantial amount of rainfall was recorded at an unverified tipping bucket gauge in Kenninghall. A total of 54mm was captured in 12hrs which equates to a 20yr storm (5% AEP) for this watershed.

(*return periods based on data collected from Environment Agency rain gauges and FEH13 Depth Duration Frequency curves).

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
31/05/2016	1 property was internally flooded on Kenninghall Road, Banham related to intense rainfall and surface water flooding	n/a

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.

Wash Lane and Kenninghall Road, Banham - 23/12/2020

Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels (See Figure 1, page 4 of the report for the catchment area) Wash Lane watercourse and adjacent ditches consequently overtopped their bank(s) adjacent to properties on the eastern side of Wash Lane due to the flashy runoff from the upstream catchment. Two main flow paths were observed:- • Breach onto Wash Lane itself from where the main watercourse crosses Wash Lane about half-way up the track to run on the west side. Resulting in major flood flow down Wash Lane itself. This was constricted by Kenninghall Rd culvert. • Another flow path on eastern side of Wash Lane where a much smaller watercourse is evident, this was likely conveying runoff from the upstream catchment too. This is obstructed by a 90º left hand bend towards AW's pump station at Wash Lane Junction. Likely that flow exceeded the pipe and overtopped adjacent banks into Kenninghall Rd and continued north where it would re-join the main watercourse. Flood water entered the properties through low thresholds at entrances / the air bricks / the electricity conduits. Wrack marks on structures such as culvert and footbridges indicate head losses downstream linked to afflux (surcharging). Noted especially at Kenninghall Rd culvert where utility ducting also crosses the D/S face of the road culvert and Back Lane Footbridge. Constrictions and blockages were identified at several locations along all watercourses associated with structures trapping debris. Excessive vegetation is noted within the Wash Lane channel likely contributing to blockages especially on the section downstream of Kenninghall Rd. Surface water runoff across Kenninghall Rd towards the low spot at Wash Lane junction also added to the problem. Accumulation of fluvial/pluvial flows exceeded	**Norfolk County Council (LLFA):** Regulatory body for ordinary watercourses/surface water **Norfolk County Council (Highways):** Public highway maintenance, land & asset owner **Breckland District Council**: Planning Authority + public open space maintenance.

the design capacity of the surface water drainage systems within Kenninghall Rd.	

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review maintenance responsibilities for the Wash Lane Stream(s) and its associated drainage infrastructure and implement to a wider action plan.	NCC (LLFA)	**6 months**
Review the inspection and maintenance schedule of all surface water drainage assets within the adopted Highway.	NCC (Highways)	**6 months**
Review access arrangements for inspection and maintenance. A two-stage channel would improve ease of access, some reduction in flood risk due to additional storage.	NCC (LLFA)	**6 months**
Riparian owners to clear watercourses (open and/or piped) through areas of concern particularly downstream of Kenninghall Rd. Ensures sufficient capacity and reduction of blockage potential likely to cause reduced conveyance and breaches.	Homeowners	**6 months**
Advise residents of Property Level Resilience measures and funding opportunities. Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait / Property Owners should consider the potential to retrofit permeable areas and other methods of small-scale sustainable drainage systems.	NCC (LLFA)	**Ongoing**
Any areas of land seeking planning permission should be providing betterment over national planning policy if wishing to discharge to Wash Lane watercourse.	Breckland District Council: Planning Authority	**Ongoing**
Determine if works are needed to remove the risk posed by structures that form obstructions to flows and communicate with affected parties and riparian owners. Investigate/model culverts and identity if it has capacity.	NCC (LLFA and Highways) Homeowners	**12 months**

Riparian owners to consider increasing size of piped watercourses and/or providing additional surface water storage that may currently act as a constriction.		
RMAs to investigate and seek opportunities for partnership funding to deliver a capital scheme which aims to increase standard of protection in Wash Lane and Kenninghall Rd. Works recommended include: - 1) Natural Flood Management Scheme on agricultural land to the South of Kenninghall Rd. Two landowners have been identified. 2) Improve conveyance of channels through widening, straightening and regrading – section downstream of Kenninghall Rd culvert needs attention.	NCC (LLFA) NCC (Highways)	**12- 24 months**

Flooding and flood risk within the Crown Street, Banham

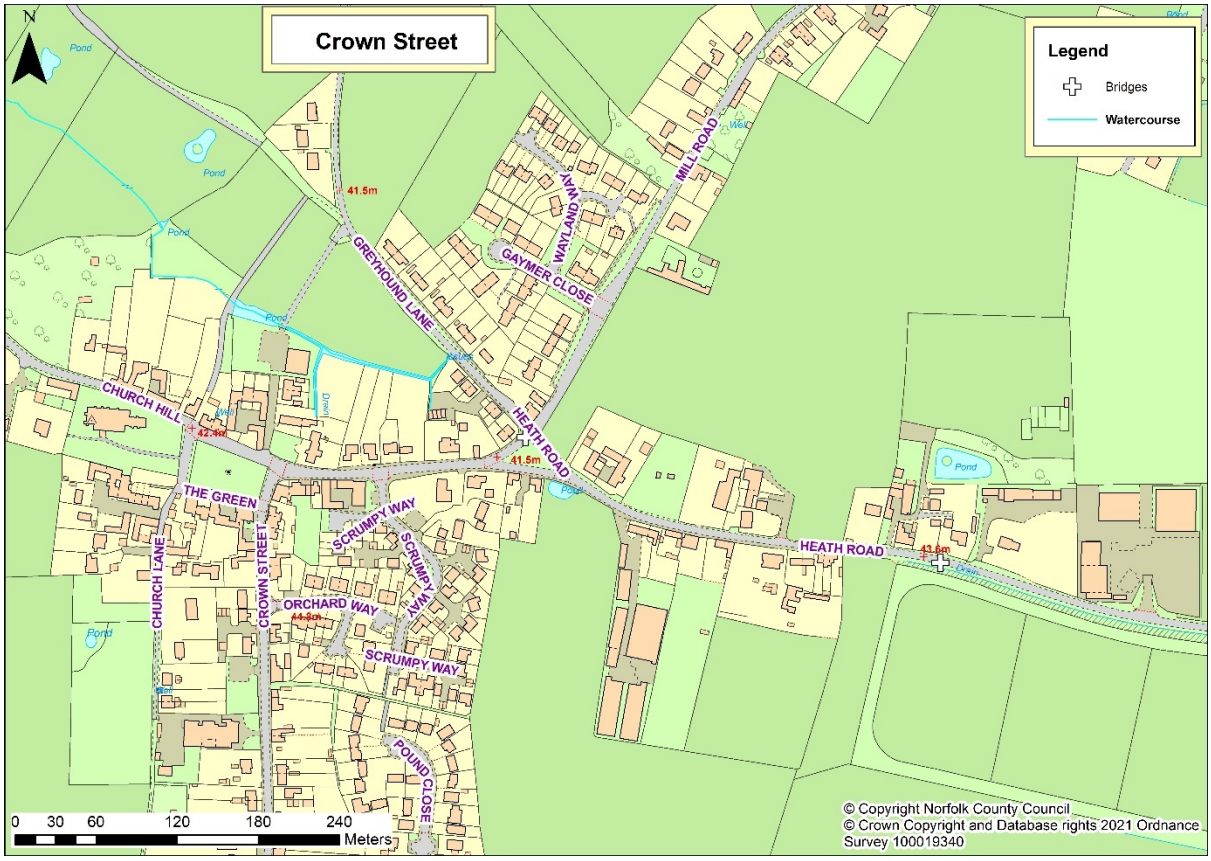


Figure 4 - Detailed Map -Crown Street/Heath Rd

Flood incidents within this catchment

Within this catchment 1 incidents of internal flooding has 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
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Crown Street, Banham. This incident was reported by • a resident via an online flood report form on the 24/01/2021, (FWF/20/3260)	Norfolk County Council (Lead Local Flood Authority) 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.

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 2.5km 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 historical records of flooding.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The table below details the causes that led to flooding and the recommendations to mitigate the causes and impacts of the flooding experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding.

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.

Location and date of flooding	**Causes of flooding**	**Recommendation**	**Who has responsibilities to manage the cause(s) of the flood?**
Crown Street, Banham, 23/12/2020	Run-off from rainfall was concentrated along overland flowpaths on which the affected property is adjacent to.	Norfolk County Council will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems	Norfolk County Council
Crown Street, Banham, 23/12/2020	Due to saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding. Surface run-off from rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features.	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.	Norfolk County Council Property Owner

Flooding and flood risk within the Beetley catchment

Flood incidents within this catchment

Within this catchment 1 incidents of internal flooding have been assessed as part of this investigation. Whilst there is a need for actual evidence that a property flooded internally we acknowledge that at least 2 additional properties were affected and in one instance their workshop was flooded. However, the residents of these did not formally report this and therefore the County Council are not able include any further details within the report. The reported incident is detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
24/12/2020	On the 24/12/2020 - 1 property was internally flooded on Fakenham Road, East Bilney. This incident was reported by • a resident via email correspondence on the 4/03/2021, (FWF/21/4303)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Norfolk Rivers IDB visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the catchment

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

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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

No records of historical flooding.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The table below details the causes that led to flooding and the recommendations to mitigate the causes and impacts of the flooding experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?	Timescales
Fakenham Road, Beetley, 24/12/2020	Run-off from significant rainfall was concentrated along overland flowpaths on which the affected property is positioned on	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait. For example they could retro-fit permeable areas and other methods of small scale sustainable drainage systems	Norfolk County Council (LLFA) Property owner	12 Months
Fakenham Road, Beetley, 24/12/2020	Surface run-off made its way onto the highway then flowed along the road network and into the surface water drainage network. These flows	Norfolk County Council will review the capacity & level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk	Norfolk County Council (Highways)	6 Months

	could not be accommodated. The affected resident has requested that additional gullies and a drain are installed close to the property to divert water away from the property.	identified. NCC should assess whether the capacity of the current system is able to provide protection that aligns with British standards. This may require a survey of the system being undertaken		
Fakenham Road, Beetley, 24/12/2020	Observations from the property owners suggest that there was a blockage in the upstream watercourse which in turn forced the water to overtop the watercourse and flood the property. In addition the property owner has also requested that a new ditch is created close to the AW pumping station to divert water when there is a larger rainfall event and the watercourse surcharges.	Riparian owners should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves / roots) at all times. Anglian Water to review and action the installation of a drainage channel around their pumping station to enable the diversion of surface water from the ordinary watercourse to re direct flow during spate conditions.	IDB – Land Drainage Powers Anglian Water	6 Months

Flooding and flood risk within the Mill Lane, Besthorpe

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
24/12/2020	On the 24/12/2020 - 2 properties were internally flooded on Mill Lane, Besthorpe. These incidents were reported by: • a resident via an online flood report form on the 26/12/2020, (FWF/20/3297) • a resident via personal communication on the 15/01/2021, (FWF/21/3738)	Norfolk County Council (Lead Local Flood Authority) 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.

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 2.5km 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

No historical records of flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Mill Lane, Besthorpe, 24/12/2020	Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned on.	Norfolk County Council will investigate with third parties 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
Mill Lane, Besthorpe, 24/12/2020	Run-off from significant rainfall within the watercourse was obstructed by a blockage to the trash screen which is immediately adjacent to the affected properties and directed flood water towards the affected properties. The trash screen currently reduces the potential for blockage with a large underground culvert that	An assessment of the risk posed by the structure and its suitability should be undertaken. In addition the ongoing responsibility for the maintenance of the structure should also be clarified as ownership of the asset is not known.	Norfolk County Council, Riparian Owners

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Mill Lane, Besthorpe, 24/12/2020	Surface run-off from [significant] rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features.	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.	Property owners Norfolk County Council

Flood incidents within this Norwich Road, Besthorpe

Within this catchment 1 incident of internal flooding has 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
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Norwich Road, Besthorpe. This incident was reported by • a resident via an online flood report form on the 4/01/2021, (FWF/21/3603)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the catchment

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

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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
02/06/2018	Internal	Significant

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Norwich Road, Besthorpe, 23/12/2020	Run-off from significant rainfall was concentrated along overland flowpaths on which the affected property is positioned on/adjacent to].	Norfolk County Council will investigate with third parties 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
Norwich Road, Besthorpe, 23/12/2020	The watercourse/river was fully obstructed by high water levels downstream.This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	Norfolk County Council will communicate with the owner who should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves/roots) at all times.	Norfolk County Council
Norwich Road, Besthorpe, 23/12/2020	The flood water entered the property through low thresholds at entrances.	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will	

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
		communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.	

Flood incidents within Billingford

Within Billingford 1 incident of internal flooding has 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
24/12/2020	On the 24/12/2020 - 1 property was internally flooded on Elmham Road, Billingford. This incident was reported by • a resident via an online flood report form on the 25/12/2020, (3292)	A resident carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report 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 2.5km 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 historic records of flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Elmham Road, Billingford, 24/12/2020	Surface run-off from rainfall flowed off adjacent fields and made its way onto the highway then flowed along the road network and into the surface water drainage network. These flows could not be accommodated as the system was partially obstructed by debris. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	Norfolk County Council will review the capacity & level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified. NCC should assess whether the capacity of the current system is able to provide protection that aligns with British standards. This may require a survey of the system being undertaken	Norfolk County Council (Highways)

Flooding and flood risk within the Blo' Norton catchment

Flood incidents within this location

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

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	On the 23/12/2020 - 2 properties were internally flooded on Fen Road, Blo' Norton. These incidents were reported by • a resident via an online flood report form on the 28/01/2021, (FWF/21/3337) • a resident via an online flood report form on the 28/01/2021, (FWF/21/3997)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Anglian Water Services Ltd visited affected residents to offer advice and to gather information during the incident.

Recent rainfall within the location

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 2.5km 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 this location

No historical records.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Fen Road, Blo' Norton, 23/12/2020	Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned on.		
Fen Road, Blo' Norton, 23/12/2020	Surface run-off from 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 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
Fen Road, Blo' Norton, 23/12/2020	Due to the saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding.	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait.	

Flooding and flood risk within Carbrooke

Flood incidents within this catchment

Within this catchment 1 incidents of internal flooding has 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
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Norwich Road, Carbrooke. This incident was reported by • a resident via an online flood report form on the 28/12/2020, (FWF/20/3334)	Norfolk County Council (Lead Local Flood Authority) 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.

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 2.5km 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

No records of historical flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Norwich Road, Carbrooke, 23/12/2020	Run-off from significant rainfall was concentrated along overland flowpaths on which the affected property is positioned on.		Property Owners
Norwich Road, Carbrooke, 23/12/2020	Surface run-off from significant rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features.	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 Highways
Norwich Road, Carbrooke, 23/12/2020	The watercourse was fully obstructed by debris or silt and high water levels. Sections of the watercourse system have been historically culverted and this has increased the risk of blockages and in addition the capacity of the watercourse. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	The riparian owners should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves/roots) at all times.	Property owners Norfolk County Council (Land Drainage powers)
Norwich Road, Carbrooke, 23/12/2020	Due to saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding.	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for	Property owners Norfolk County Council

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
		grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait. For example they could retro-fit permeable areas and other methods of small scale sustainable drainage systems	

Flood incidents in Foulden

Within Foulden 1 incident of internal flooding has 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
22/12/2020	On the 22/12/2020 - 1 property was internally flooded on Foulden. This incident was reported by • a resident via an email communication on the 4/01/2021, (3605)	A resident carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the 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 2.5km 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
Various dates	Previous reports of external 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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Foulden	Run-off from rainfall was directed towards the watercourse. These flows could not be accommodated as the system was already overloaded. This caused the watercourse to spill out onto the highway and flow down the road towards the affected properties. There are multiple culverts along the watercourse that create pinch points for water flow during flood events. Some of these culverts may be damaged or blocked, further impeding flow.	The property owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency. Norfolk County Council, riparian owners and property owners should review the capacity & level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified. NCC should assess whether the capacity of the current system is able to provide protection that aligns with British standards. This may require a survey of the system being undertaken.	Norfolk County Council (Highways) Norfolk County Council (LLFA) Property owners Riparian owners

Flooding and flood risk within the Garboldisham catchment

Flood incidents within this catchment

Within this catchment 6 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
23/12/2020	On the 23/12/2020 - 5 properties were internally flooded on Kenninghall Road, Garboldisham. These incidents were reported by: • a resident via an online flood report form on the 26/12/2020, (FWF/20/3294) • a resident via an online flood report form on the 16/01/2021, (FWF/21/3804) • a resident via an online flood report form on the 15/01/2021, (FWF/21/3799) • a resident via an online flood report form on the 15/01/2021, (FWF/21/3797)	Norfolk County Council (Lead Local Flood Authority) 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.
23/12/2020	On the 23/12/2020 - 1property was internally flooded on Manor Road, Garboldisham. This incidents was reported by: • a resident via an online flood report form on the 11/01/2021, (FWF/21/3749)	Norfolk County Council assessed validity and impact of the flooding.
	On the 23/12/2020 - 1 property was internally flooded on Church Road, Garboldisham. This incident was reported by • a resident via an online flood report form on the 23/12/2020, (FWF/20/3250)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the catchment

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

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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

No records of historical flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Manor Road, Garboldisham 23/12/2020 Kenninghall Road, Garboldisham, 23/12/2020 Church Road, Garboldisham, 23/12/2020	Run-off from rainfall was concentrated along overland flowpaths on which the affected properties are positioned on or immediately adjacent to.		Norfolk County Council LLFA
Manor Road, Garboldisham 23/12/2020 Kenninghall Road, Garboldisham, 23/12/2020 Church Road, Garboldisham, 23/12/2020	Surface run-off from rainfall made its way onto roads and flowed along the road network and onto the accesses of affected properties that were situated lower than these features.	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
Kenninghall Road, Garboldisham, 23/12/2020	The watercourse was fully obstructed by a high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	The riparian owners of adjacent watercourses should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves/roots) at all times.	Riparian Owners
Kenninghall Road, Garboldisham, 23/12/2020 Church Road, Garboldisham, 23/12/2020	Due to the saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding.	Norfolk County Council will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems.	Norfolk County Council (LLFA)

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
		Amendments could be made to the management of neighbouring land to ensure water is not directed to other properties. There is potential to install additional ditches or a bund above the and behind the properties affected by the flooding from the rear. Norfolk County Council should assist with this.	
Manor Road, Garboldisham, 23/12/2020 Kenninghall Road, Garboldisham, 23/12/2020	Surface run-off from significant rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features.	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.	Norfolk County Council and Property Owners
Manor Road, Garboldisham, 23/12/2020	The resident affected reported that there was a blockage to a Highways owned culvert which	Review the inspection and maintenance schedule of all surface water drainage assets	Norfolk County Council Highways

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
	exacerbated the flooding.	within the adopted Highway.	

Flood incidents in Harling

Within Harling 1 incident of internal flooding has 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
24/12/2020	On the 24/12/2020 - 1 property was internally flooded on The Glebe, Harling. This incident was reported by • a resident via an online flood report form on the 15/03/2021, (4321)	Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report 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 2.5km 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
16/08/2020	3 properties internally flooded	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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
The Glebe, Harling, 24/12/2020	Run-off from significant rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water into the foul drainage network and towards the affected properties. Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are adjacent to. The flood water entered the properties through the air bricks.	Property owners should protect their buildings through flood protection measures where appropriate. NCC will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.	Property owners

Flooding incidents in Hoe (Worthing)

Within Worthing 5 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
24/12/2020	On the 24/12/2020 - 5 properties were internally flooded on Church Road, Worthing. These incidents were reported by • a resident via an online flood report form on the 17/01/2021, (3806) • a resident via an online flood report form on the 19/01/2021, (3825) • a resident via an online flood report form on the 18/01/2021, (3855) • a resident via a flood questionnaire received on the 01/02/2021, (4033) • a resident via an online flood report form on the 29/12/2020, (3335) • a resident via an online flood report form on the 06/01/2021, (3621)	A resident carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the 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 2.5km 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.

Historic flooding incidents within the catchment

There are no historic records of flooding

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The findings of the investigation are detailed on the following pages. The table below details the causes that led to flooding and the recommendations to mitigate the causes and impacts of the flooding experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding.

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.

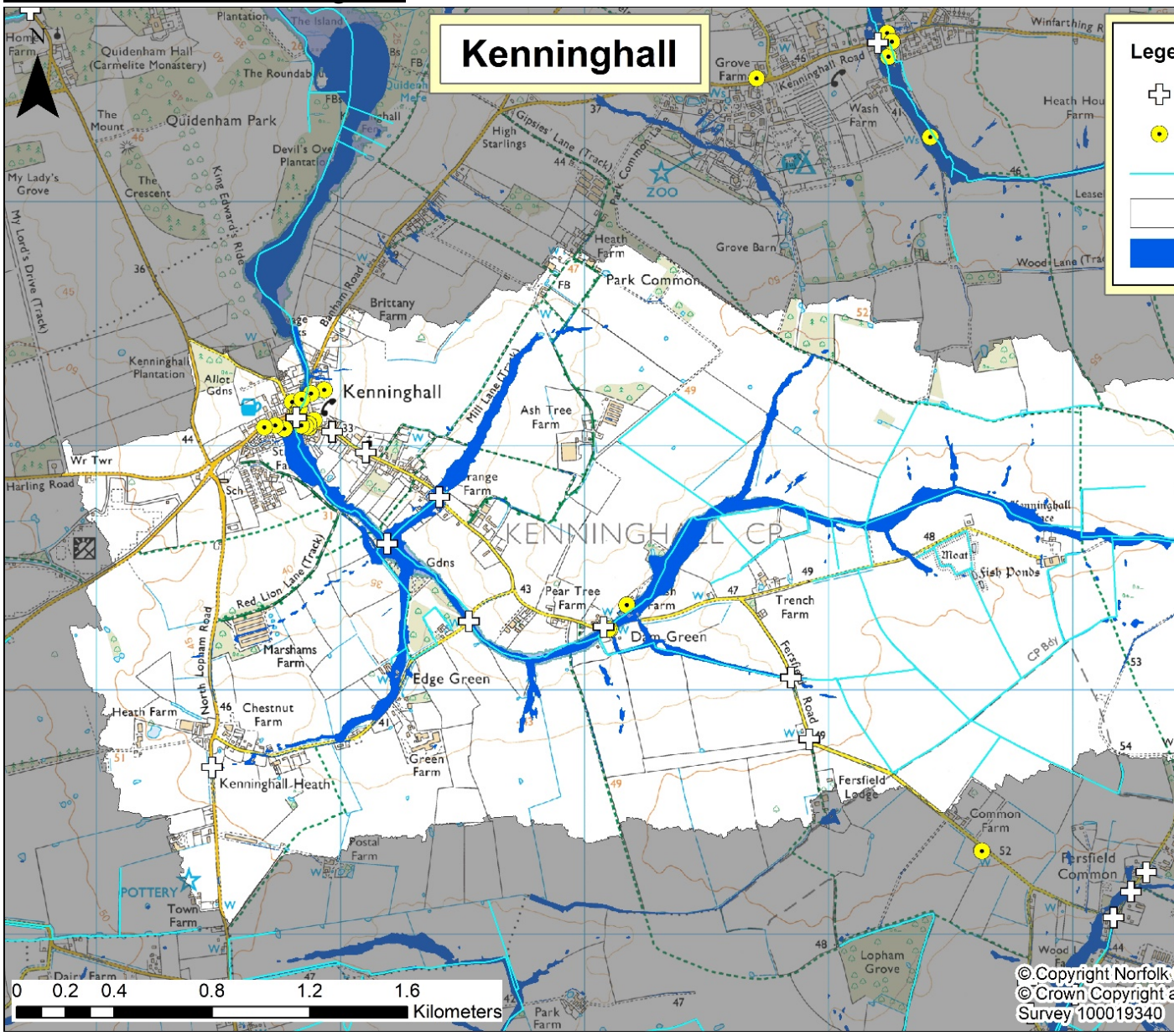
- Risk Management Authorities should
  - communicate with affected residents where their assets have given rise to the flooding of properties.
  - review the appropriateness of their response to flooding.
  - determine the integrity and/or capacity of their assets where they have contributed to the flooding 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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Church Road, Worthing	Run-off from rainfall was directed towards the main river. These flows could not be accommodated as the system was already overloaded and obstructed by vegetation.	The Environment Agency have permissive powers only to undertake maintenance, responsibility rests with the riparian owners, any maintenance done under our permissive powers is done on a risk based approach within the funding we have available. Riparian owners should be encouraged to maintain watercourses and EA to continue to take a risk based approach to its maintenance program. Environment Agency should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.	Property owners Environment Agency

Flooding and flood risk within The Upper Whittle (Beck) catchment at Kenninghall



Description of catchment

Kenninghall resides in the upper headwaters of the River Whittle catchment, known locally as The Beck, which flows in a westerly direction towards East Harling, the next major downstream settlement. The Whittle is part of the Main River Thet catchment which drains most of SW Breckland. The upper Whittle catchment is approx. 10km^2 in size consisting largely of agricultural land uses and gently falls South East to North West from 55mOD to 30mOD within Kenninghall itself. The sources of greatest flood risk are from fluvial and pluvial sources.

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] Number of properties subject to surface water flood risk at 1 in 30 year event:	0	27	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	40	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	19	0
[e] Number 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] Number of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

Flood incidents within this catchment

Within this catchment 23 incidents of internal flooding have been assessed as part of this investigation (it is noted that further properties, 40+, were known to have flooded in this event but NCC have not received official reports to date) . These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	On the 23/12/2020 - 7 properties were internally flooded on Market Place, Kenninghall. These incidents were reported by: • a resident via an electronic report on the 26/01/2021, (FWF/21/3938) • a resident via an electronic report on the 10/01/2021, (FWF/21/3639)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Norfolk County Council (Highways) assessed the capacity of their drainage system after the incident.

Date of Incident	Incident as reported	What was the response to the flood incident
	• a resident via an electronic report on the 16/03/2021, (FWF/21/4343) • a resident via an online flood report form on the 18/03/2021, (FWF/21/4371) • a resident via an online flood report form on the 1/03/2021, (FWF/21/4265) • a resident via an online flood report form on the 10/01/2021, (FWF/21/3642) • a resident via an electronic report on the 7/01/2021, (FWF/21/3627)	East Harling IDB visited affected residents to offer advice and to gather information after the incident. Elected representatives visited affected residents to offer advice and to gather information during the incident. The Fire and Rescue Service responded and pumped out during the incident.
23/12/2020	On the 23/12/2020 - 8 properties were internally flooded on West Church Street, Kenninghall. These incidents were reported by: • a resident via an electronic report on the 16/01/2021, (FWF/21/4342) • a resident via an electronic report on the 8/01/2021, (FWF/21/3631) • a resident via an online flood report form on the 28/03/2021, (FWF/21/4401) • a resident via an electronic report on the 8/01/2021, (FWF/21/3632) • a resident via an online flood report form on the 18/01/2021, (FWF/21/3816) • a resident via an online flood report form on the 11/04/2021, (FWF/21/4438) • a resident via an online flood report form on the 15/03/2021, (FWF/21/4360) • a resident via an online flood report form on the 16/03/2021, (FWF/21/4341)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Norfolk County Council (Highways) assessed the capacity of their drainage system after the incident. East Harling IDB visited affected residents to offer advice and to gather information after the incident. Elected representatives visited affected residents to offer advice and to gather information during the incident. The Fire and Rescue Service responded and pumped out during the incident.

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Quidenham Road, Kenninghall. This incident was reported by • a resident via an online flood report form on the 26/12/2020, (FWF/20/3289)	Elected representatives visited affected residents to offer advice and to gather information during the incident. The Fire and Rescue Service responded and pumped out during the incident.
23/12/2020	On the 23/12/2020 - 2 properties were internally flooded on Banham Road, Kenninghall. These incidents were reported by: • a resident via an electronic report on the 15/03/2021, (FWF/21/4340) • a resident via an online flood report form on the 23/01/2021, (FWF/21/3883)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Elected representatives visited affected residents to offer advice and to gather information during the incident. The Fire and Rescue Service responded and pumped out during the incident.
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on 1 The Beck, Kenninghall. This incident was reported by • a resident via an electronic report on the 5/02/2021, (FWF/21/4379)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Elected representatives visited affected residents to offer advice and to gather information during the incident.
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on 2 Crown Courtyard, Kenninghall. This incident was reported by • a resident via an online flood report form on the 10/01/2021, (FWF/21/3644)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Elected representatives visited affected residents to offer advice and to gather information during the incident.

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Back Lane, Kenninghall. This incident was reported by • a resident via an online flood report form on the 9/01/2021, (FWF/21/3643)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Elected representatives visited affected residents to offer advice and to gather information during the incident.
	On the 23/12/2020 - 2 properties were internally flooded on Fersfield Road, Kenninghall. These incidents were reported by: • a resident via an online flood report form on the 23/12/2020, (FWF/20/3720) • a resident via an online flood report form on the 8/01/2021, (FWF/21/3633)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Elected representatives visited affected residents to offer advice and to gather information during the incident.

Recent rainfall within the catchment

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

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

A substantial amount of rainfall was recorded at an unverified tipping bucket gauge in Kenninghall. A total of 54mm was captured in 12hrs which equates to a 20yr storm (5% AEP) for this watershed. River levels at Quidenham, some 3km downstream recorded peak flows on the afternoon of the 24th Dec higher than the Great Flood of 1968 (see executive summary), this both indicated the severity of the event (approx. 1:50yr fluvial return) and a short time to peak (flashy response) in the catchment of approx. 6hrs which is usually uncommon for winter storms indicating just how saturated the catchment was prior to the 23rd.

(*return periods based on data collected from Environment Agency rain gauges and FEH13 Depth Duration Frequency curves).

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
1968	Fluvial Flooding to Market Square	Unknown
1987	Fluvial Flooding to Market Square	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.

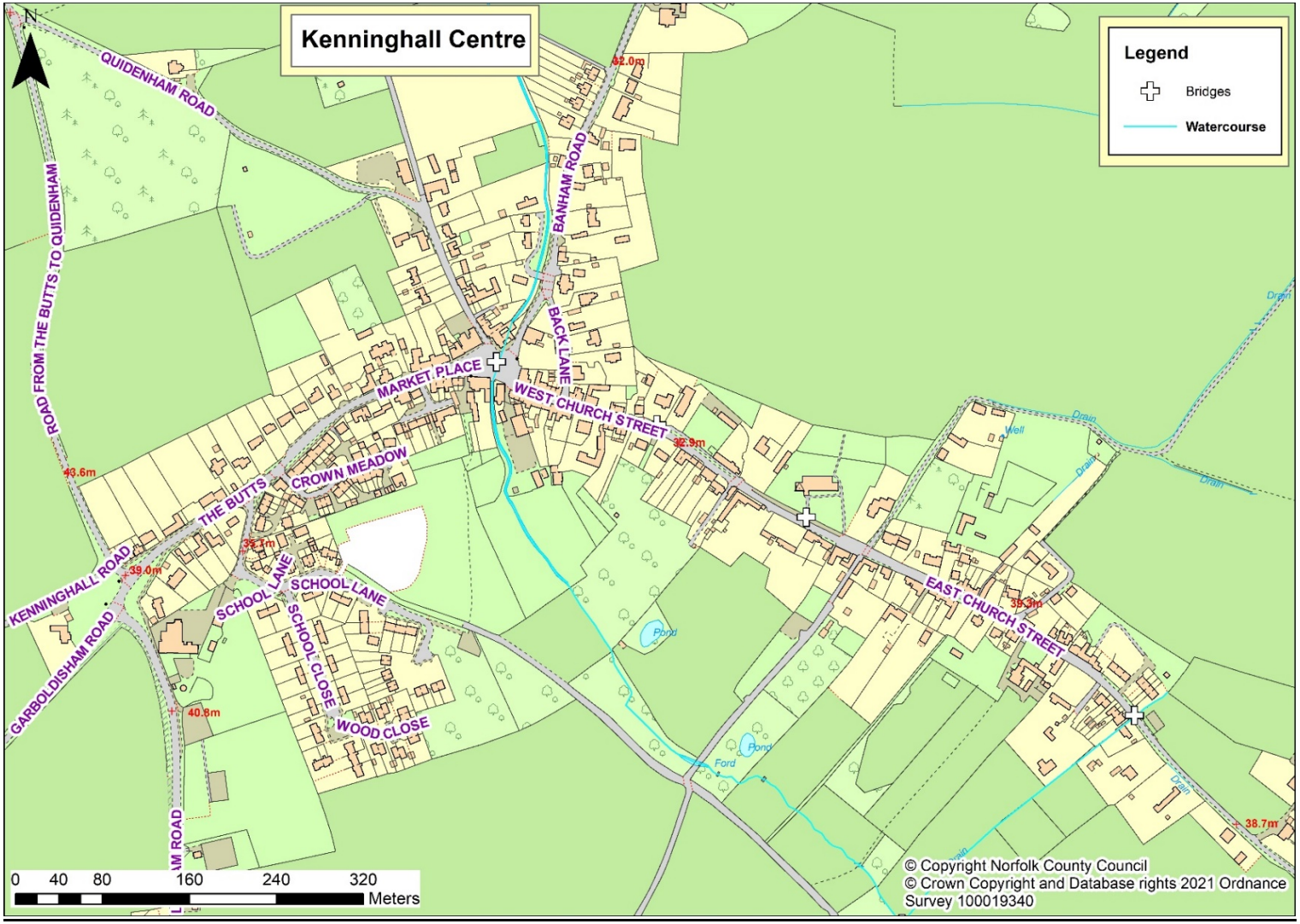
Following flooding to people, property and infrastructure

- 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.

Market Place/ West Church Street/ Banham Rd/ The Beck/ Back Lane/ Crown Courtyard/ Quidenham Road, Kenninghall, 23/12/2020



Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
A substantial amount of rain fell on the 23rd Dec onto a catchment with prior high saturation levels. The catchment is 9.6km2 upstream of Kenninghall generating a flashy response to which local watercourses and drainage infrastructure could not cope.	Norfolk County Council: Highways - Public highway maintenance & asset owner Norfolk County Council: LLFA – Land Drainage Powers
Within the centre of Kenninghall the floodplain is naturally constrained by a valley bounded by high ground near to the Community Centre and West Church Street. The inability of the river to spread out over a wider floodplain led to the severe depths witnessed in the centre of the village (1.2m deep reading on village shop) and of which are similar to flood levels witnessed in the Great Flood of 1968. The flood water entered the properties through low thresholds at entrances / the air bricks / the electricity conduits. A tributary, within East Church Street was also heavily constrained by road crossings but was also backed by the high levels in the Beck. Overall, it appears the Beck was overtopping its bank(s) upstream of Kenninghall as far as Dam Green and conveyance of floodwater within the constrained floodplain inundated Kenninghall rather than localised overtopping within the centre of the village itself.	Norfolk County Council: Highways - Public highway maintenance & asset owner Norfolk County Council: LLFA – Land Drainage Powers
Locals witnessed a torrent of overland flow from the west off East Harling Rd adding to the main problems in the Market Square. Possibly surface water runoff from fields.	Norfolk County Council: Highways - Public highway maintenance & asset owner Norfolk County Council: LLFA – Land Drainage Powers
Blockages were identified at several locations along the watercourse post-event, associated with large in-channel trees. Two major blockages were evident in the downstream section along Banham Rd.	Norfolk County Council: Highways - Public highway maintenance & asset owner

	Norfolk County Council: LLFA – Land Drainage Powers
Although there was no evidence of blockage, the entrance to the market square culvert is likely to be a major constriction to flood flows. The u/s inlet is approx. 2m x 0.6m where freeboard alone for such a major culvert should have bel 0.6m as per Ciria C768.	Norfolk County Council: Highways - Public highway maintenance & asset owner Norfolk County Council: LLFA – Land Drainage Powers
Indirect issue was lack of forecasting - no Flood Warnings are available locally (only flood alerts) even though a monitoring station on the Whittle in Quidenham just downstream.	Environment Agency

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review maintenance responsibilities for The Beck and its associated drainage infrastructure and implement to a wider action plan.	NCC (LLFA)	**6 months**
Review the inspection and maintenance schedule of all surface water drainage assets within the adopted Highway. Particularly the Market Square Brick Arch culvert and its u/s face.	NCC (Highways)	**6 months**
Review access arrangements for inspection and maintenance. Emphasis on access to the Inlet and Outlet for the culvert under the Market Square which currently very constrained.	NCC (Highways)	**6 months**
Riparian owners to clear watercourses (open and/or piped) through areas of concern particularly downstream of the Market Square. Ensures sufficient capacity and reduction of blockage potential which is likely to cause reduced conveyance and breaches.	Homeowners	**6 months**
Advise residents of Property Level Resilience measures and funding opportunities.	NCC (LLFA)	Ongoing

Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait / Property Owners should consider the potential to retrofit permeable areas and other methods of small-scale sustainable drainage systems.		
Any areas of land seeking planning permission should be providing betterment over national planning policy if wishing to discharge to Whittle watercourse.	Breckland District Council: Planning Authority	Ongoing
Determine if works are needed to remove the risk posed by structures that form obstructions to flows and communicate with affected parties and riparian owners. Investigate/model culverts and identity if have capacity for flood flows. Riparian owners to consider increasing size of piped watercourses and/or providing additional surface water storage that may currently act as a constriction.	NCC (LLFA and Highways) Homeowners	12 months
Monitor and review capacity of highway culverts at Market Square. Suggest adding telemetry to monitor water levels and flow rates on both sides on NCC culverts.	NCC (LLFA and Highways)	12- 24 months
RMAs to investigate partnership funding to deliver a capital scheme which aims to increase standard of protection in Kenninghall. Works recommended include: - 3) Feasibility Study / hydraulic assessment to understand baseline flood risk and potential alleviation options for Kenninghall. This will assess the full catchment and identify areas for storage as material changes to the market square culvert are highly unlikely in terms of improving conveyance at this pinch point 4) A community led Natural Flood Management Scheme by the community on agricultural land to the South of Kenninghall. One landowner has been identified to date.	NCC (LLFA), NCC (Highways) and Parish Council	12- 24 months

5) Pending feasibility study outputs deliver a capital scheme to raise Standard of Protection for properties near the Beck.		
Suggest upgrading the warning system in Kenninghall using gauges on River Whittle.	EA	12 months

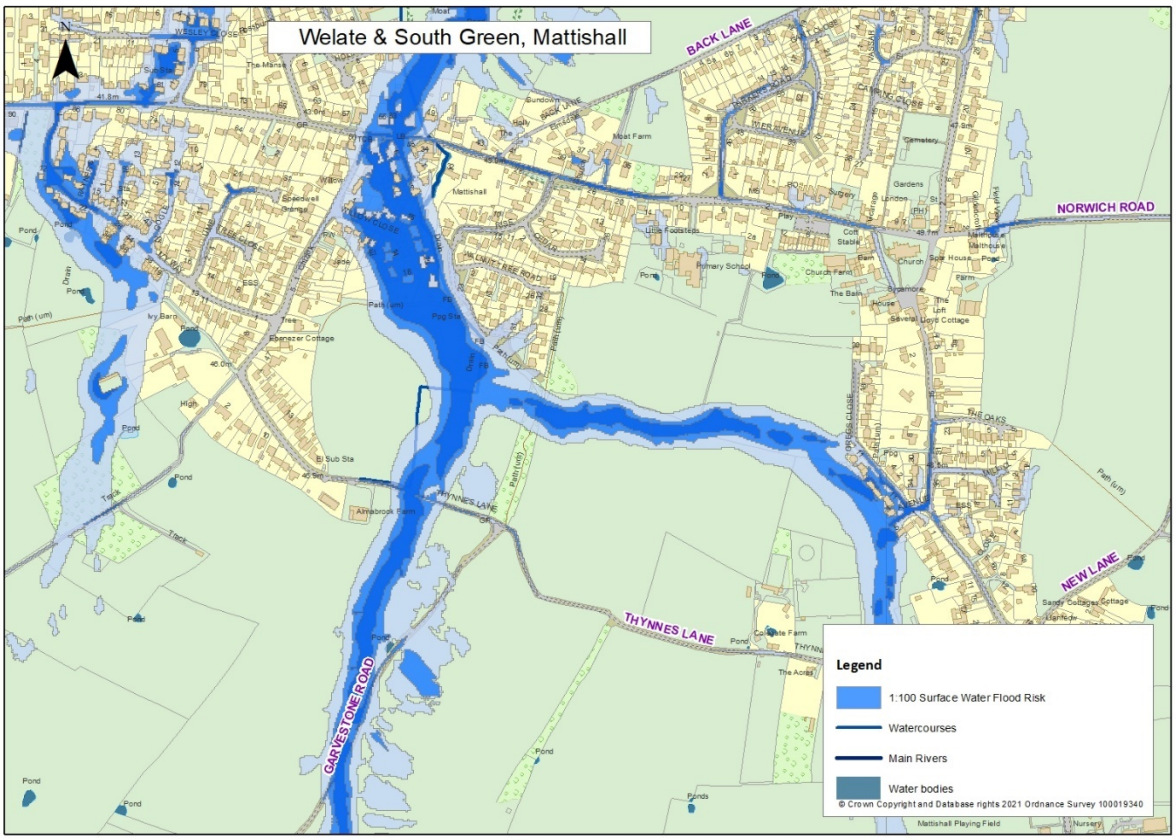
Fersfield Road, Kenninghall, 23/12/2020

Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
A substantial amount of rainfall fell on the 23rd Dec onto a catchment with prior high saturation levels. The catchment is approx. 5.5km2 upstream of Fersfield Rd Culvert generating a flashy response to which local watercourses and drainage infrastructure could not cope.	
A Brick arch culvert under Fersfield Rd likely acted as a pinch point causing the watercourse to breach upstream. Several grips cut into the verge (bankside of the watercourse) allowed water to easily escape onto the highway and then into properties.	NCC (Highways)
Although there was no evidence of blockage, the entrance to the market square culvert is likely to be a major constriction to flood flows. The u/s inlet is approx. 2m x 1m where freeboard alone for such a major culvert should have bel 0.6m as per Ciria C768.	NCC (Highways)
Lack of forecasting - no Flood Warnings are available locally (only flood alerts).	EA

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Determine if works are needed to remove the risk posed by structures that form obstructions to flows and communicate with affected parties and riparian owners. Investigate/model culverts and identity if have capacity for flood flows. Riparian owners to consider increasing size of piped watercourses and/or providing additional	NCC (LLFA and Highways) Homeowners	12 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
surface water storage that may currently act as a constriction.		
Riparian owners to clear watercourses (open and/or piped) through areas of upstream hydraulic structures such as culverts/bridges. Ensures sufficient capacity and reduction of blockage potential which is likely to cause reduced conveyance and breaches.	Homeowners	6 months
RMAs to investigate partnership funding to deliver a capital scheme which aims to increase standard of protection in Kenninghall. Works recommended include: - 6) Feasibility Study / hydraulic assessment to understand baseline flood risk and potential alleviation options for Kenninghall. This will assess the full catchment and identify areas for storage as material changes to the market square culvert are highly unlikely in terms of improving conveyance at this pinch point 7) A community led Natural Flood Management Scheme by the community on agricultural land to the South of Kenninghall. One landowner has been identified to date. 8) Pending feasibility study outputs deliver a capital scheme to raise Standard of Protection for properties near the Beck.	NCC (LLFA), NCC (Highways) and Parish Council	12- 24 months

Mattishall


Welate & South Green, Mattishall
BACK LANE
NORWICH ROAD
THYNNES LANE
NEW LANE
GARVESTONE ROAD
Legend
1:100 Surface Water Flood Risk
Watercourses
Main Rivers
Water bodies
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Flood incidents within Mattishall

Within Mattishall 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
24/12/2020	On the 24/12/2020 - 1 property was internally flooded on Welgate, Mattishall. This incident was reported by • Norfolk County Council (Highways) via email correspondence on the 21/01/2021, (3867)	Norfolk County Council (Lead Local Flood Authority) 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.
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on South Green, Mattishall. This incident was reported by • a resident via an online flood report form on the 24/12/2020, (3256)	A resident carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report after the incident. NCC Highways carried out improvements to the drainage system. Anglian Water removed fat deposits from the Foul sewer system.

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 2.5km 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

No records of historical flooding.

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 miti*gate 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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
South Green, Mattishall, 23/12/2020	Surface run-off from rainfall flowed off adjacent fields into a land drainage system which was fully obstructed by an undersized culvert. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected property. The foul drainage system network was partially obstructed by fat deposits. This reduced the efficiency of the drainage system within Mattishall.	The culvert owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency. The most effective solution would be to restore the open ditch. AW will review the capacity & level of maintenance required to sustain the design efficiency of their drainage systems.	Riparian owners AW
Welgate, Mattishall, 24/12/2020	Surface run-off from rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features.	Amendments should be made to neigbouring land to ensure water is not directed towards properties. The landowner should consider restoring historical drainage features such as a pond.	Local Landowners

Flooding and flood risk within the Necton catchment

Flood incidents within this catchment

Within this catchment 2 incident 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
31/12/2020	On the 31/12/2020 - 1 property was internally flooded on School Road, Necton. This incident was reported by • a resident via personal communication on the 12/03/2021, (FWF/21/4256)	Norfolk County Council (Lead Local Flood Authority) 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.

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 2.5km 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
16/08/2020	1 Internally flooded property	Unknown

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The findings of the investigation are detailed on the following pages. The table below details the causes that led to flooding and the recommendations to mitigate the causes and impacts of the flooding experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
School Road, Necton, 31/12/2020	Run-off from significant rainfall was concentrated along overland flowpaths on which the affected property sits on.		
School Road, Necton, 31/12/2020	Surface run-off from 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 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 Highways
School Road, Necton, 31/12/2020	Due to the saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain/snow to the areas of flooding.	Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.	Norfolk County Council and Property Owner
School Road, Necton, 31/12/2020	The loss of pre-existing drainage features (such as drains, dykes, ditches, ponds, culverts) within the catchment exacerbated the flooding.	Property owner could confirm, where possible, the existence of any connections to a wider drainage network. This work should seek to confirm	Property Owner

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
		where the drainage network conveys flows to.	

Flood incidents within North Lopham

Within North Lopham 1 incident of internal flooding has 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
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on The Street, North Lopham. This incident was reported by • a resident via an email 15/01/2021, (3736)	Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report 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 2.5km 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.

The affected property is not within 2.5km of a rainfall gauge.

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
2014	The resident reports that they flooded internally	Not known
1998	The resident reports that they flooded internally	Not known
Various	There have been several unverified reports of internal flooding in the past number of years	Not known

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The findings of the investigation are detailed on the following pages. The table below details the causes that led to flooding and the recommendations to mitigate the causes and impacts of the flooding experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
The Street, North Lopham, 23/12/2020	The property sits on a hill, run of on the hill is obstructed by the property causing it to pool against the wall away from the property. There is no surface water drainage on the adjacent field to direct water away from the property The property has structural issues that cannot cope with the presence of surface/groundwater.	. The resident should seek professional advice on drainage that could be installed on the neighbouring land to direct water away from the property The adjacent landowner could consider measures to divert water away from the property, such as a storage ditch The property owner should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.	Property owners Local landowners LLFA

Flood incidents within Quidenham (Including Wilby)

Within Quidenham 2 incident of internal flooding has 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
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Quidenham Road, Quidenham. This incident was reported by • a resident via email correspondence on the 20/01/2021, (3996)	A resident carried out measures to minimise the impact of flooding during the incident.
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Back Lane, Wilby. This incident was reported by • a resident via an online flood report form on the 1/01/2021, (3600)	Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report 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 2.5km 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

No records of historical flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Quidenham Road, Quidenham, 23/12/2020	Surface run-off from rainfall flowed off adjacent fields and onto the accesses of affected property. The water was unable to escape due to a courtyard.	Amendments should be made to neigbouring land to ensure water is not directed towards properties. Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait. Property owners should consider the potential to retrofit permeable areas and other methods of small scale sustainable drainage systems.	Property owners Norfolk County Council (LLFA)
Back Lane, Wilby, 23/12/2020	Surface run-off from rainfall flowed off adjacent fields and made its way onto the highway and flowed along the road network and onto the accesses of affected property.	Riparian owners should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves / roots) at all times.	Riparian owners Local landowners

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
	Run-off from rainfall was directed towards the land drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected property.	Amendments should be made to neighbouring land to ensure water is not directed towards properties.	

Rocklands

Flood incidents within Rocklands

Within Rockland St Mary 1 incident of internal flooding has 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
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on The Street, Rocklands. This incident was reported by • a resident via an online flood report form on the 26/12/2020, (3299)	Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report 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 2.5km 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

No historical flooding records.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
The Street, Rocklands, 23/12/2020	Surface run-off from rainfall flowed off adjacent fields and made its way onto the highway then flowed along the road network and onto the accesses of affected property that is situated lower than these features. Run-off from rainfall was directed towards the surface and foul drainage networks. These flows could not be accommodated as the system was already overloaded. This caused the systems to surcharge and flood water towards the affected property.	. Amendments should be made to neighbouring land to ensure water is not directed towards properties. Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.	Property owners Local landowners

Saham Toney

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] Number of properties subject to surface water flood risk at 1 in 30 year event:	0	37	2
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	63	2
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] Number 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] Number of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

Flood incidents within this catchment

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

Date of Incident	Incident as reported	What was the response to the flood incident
24/12/2020	On the 24/12/2020 - 4 properties were internally flooded on Cley Lane, Saham Toney. These incidents were reported by • a resident via an online flood report form on the 11/01/2021, (3638)	Norfolk County Council (Highways) 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.

Date of Incident	Incident as reported	What was the response to the flood incident
	• a resident via an online flood report form on the 11/01/2021, (3637) • a resident via an online flood report form on the 8/012021, (3635) • a resident via personal communication on the 1/02/2021, (4032)	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 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 2.5km 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
16/08/2020	3 properties were internally flooded	Not Known
23/06/2016	15 properties were internally flooded	Not Known

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.

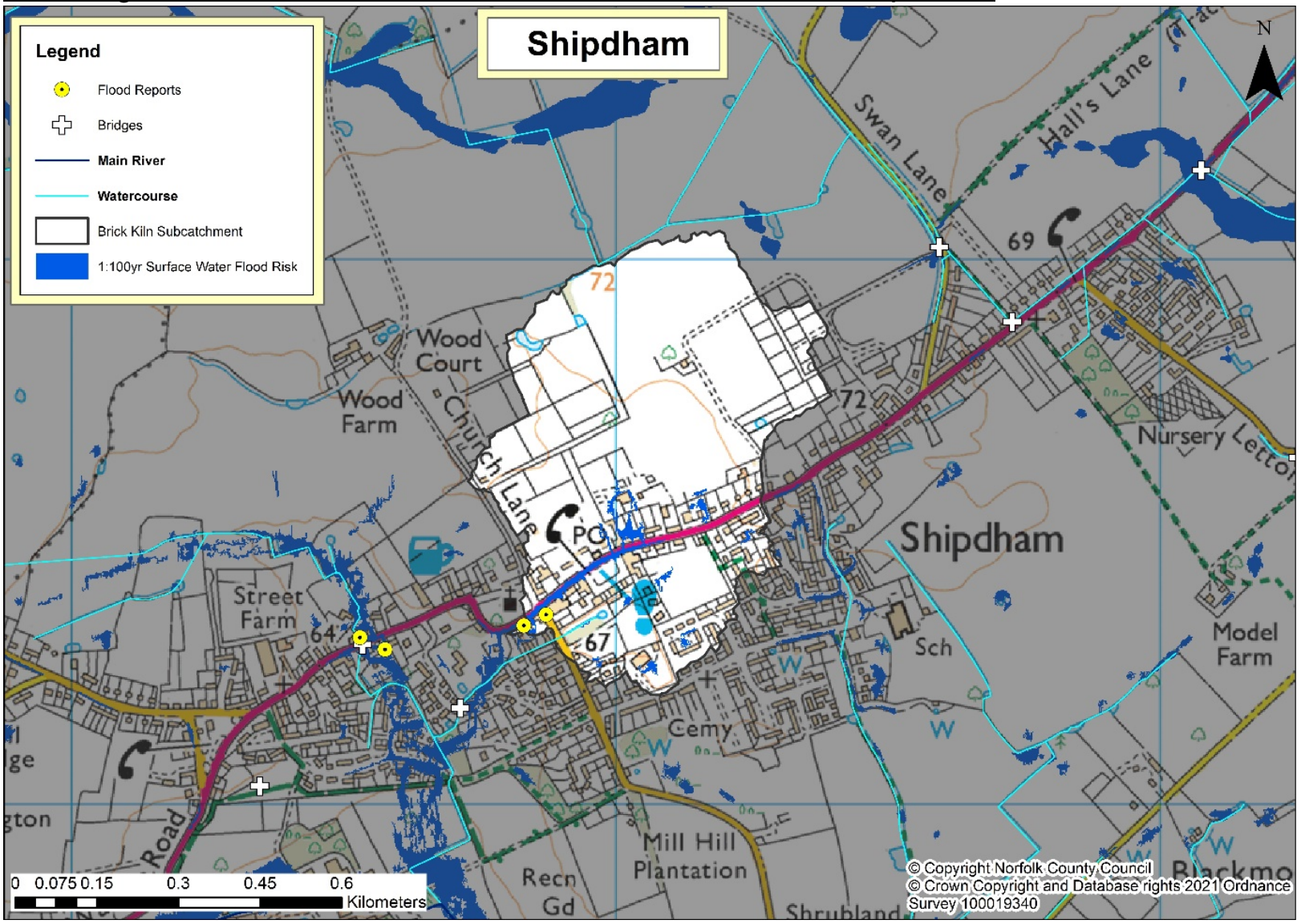
- Property owners of affected properties should seek their own legal advice.

- 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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Cley Lane Saham Toney, 24/12/2020	Surface run-off from rainfall flowed off adjacent fields and made its way onto the highway then flowed along the road network and onto the accesses of affected properties that were situated lower than these features.	Norfolk County Council will consider further opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. Flood mitigation options are currently being evaluated as part of wider scheme in Saham Toney.*1 Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. This could include a range of measures such as Natural Flood Management. *[1]	Norfolk County Council (Highways) Norfolk County Council (LLFA)

[1] The County Council are currently working with partners, the parish council and local landowners to develop a holistic flood alleviation scheme to reduce peak flows firstly reaching the main village and then improving their safe conveyance through the village too

Flooding and flood risk within the Brick Kiln catchment, Shipdham



Description of catchment

Small urbanised catchment (0.4km^2) centred around Chapel Street, Shipdham. The catchment falls North to South towards Church Close where the main risk areas are located.

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] Number of properties subject to surface water flood risk at 1 in 30 year event:	0	1	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	3	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0

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
02/02/2021	On the 02/02/2021 - 1 property was internally flooded on Chapel Street, Shipdam. This incident was reported by • a resident via an online flood report form on the 14/03/2021, (FWF/21/4330)	Norfolk County Council (Lead Local Flood Authority) 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.
23/01/2021	On the 23/01/2021 - 1 property was internally flooded on Church Close, Shipdham. This incident was reported by	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer

Date of Incident	Incident as reported	What was the response to the flood incident
	• a resident via an online flood report form on the 11/03/2021, (FWF/21/4326)	advice and to gather information after the incident. A resident carried out measures to minimise the impact of flooding during the incident.

Recent rainfall within the catchment

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

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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.

The rainfall gauge provided a recording of a 1:35 return period.

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
23/06/2016	3 internally flooded properties	1:34 yr

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

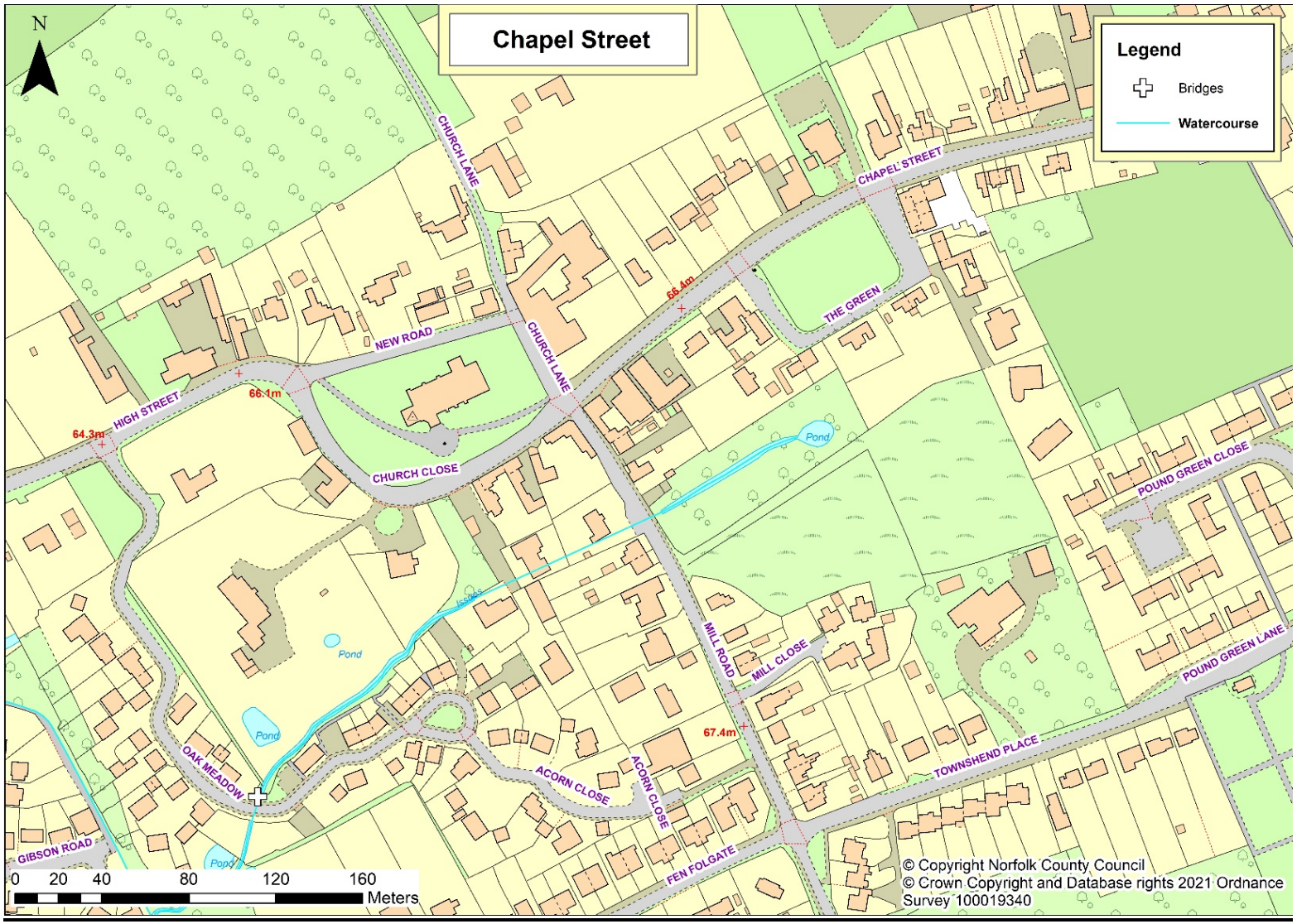
- Risk Management Authorities should
  - communicate with affected residents where their assets have given rise to the flooding of properties.
  - review the appropriateness of their response to flooding.

    - 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.

Chapel Street and Church Close, Shipdham



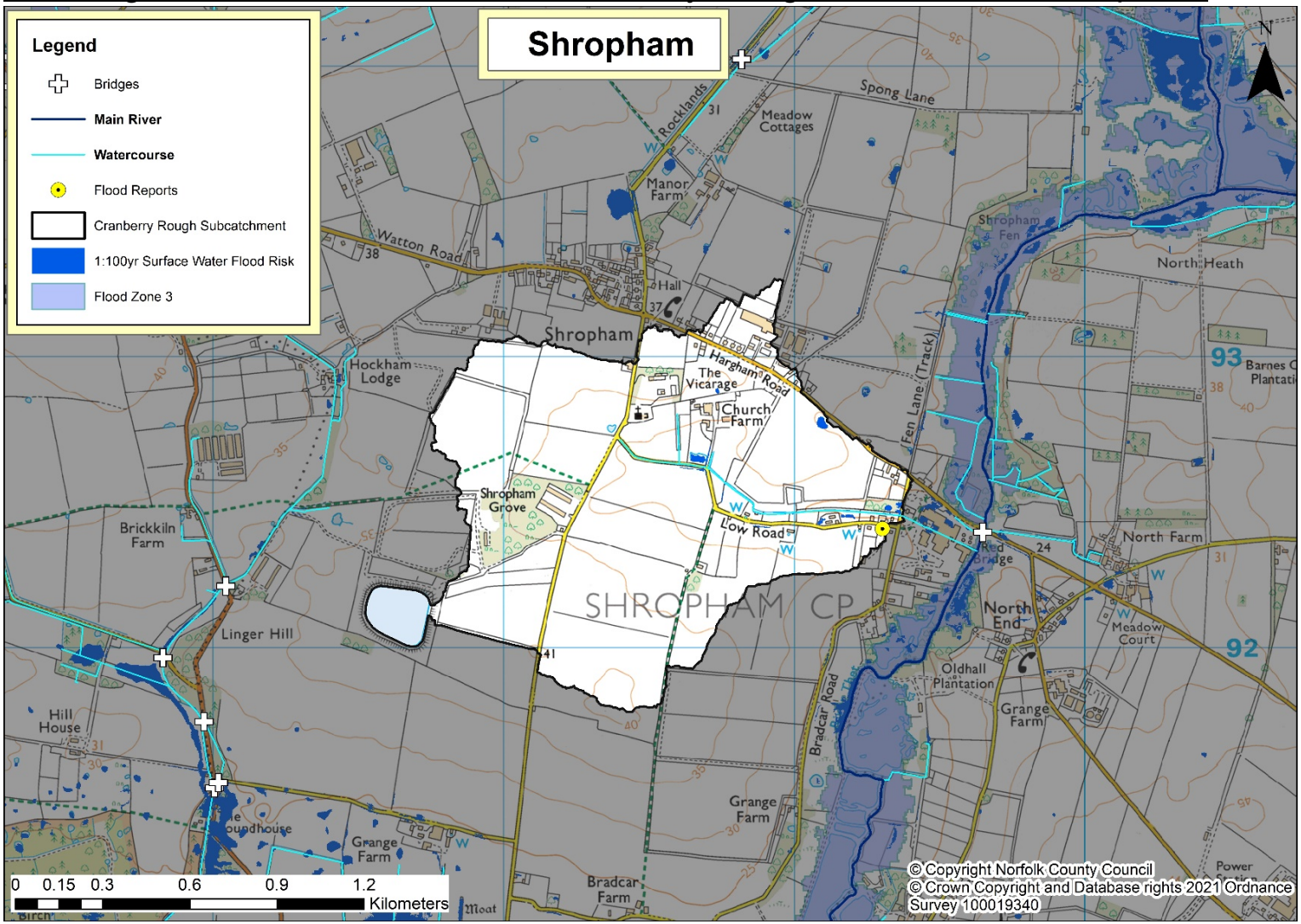
Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Large volumes of run-off from rainfall and snow melt made its way onto the highway and flowed along the road network and into the accesses of affected properties that were situated lower than these features.	**NCC (Highways)** **NCC (LLFA)**
Runoff cascaded down the A1075 east to west towards Church Close where it eventually pooled at a low point within the catchment affecting properties. Witnesses observed two flow channels on either side of Chapel Street, but the deeper flow was on the southern side of the road. This flow line did not breach the southern kerb line though. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties. No road closures – cars forced water out of highway when in flood.	**NCC (Highways)**
To date there is no evidence of field runoff escaping onto the road from the upper catchment. Main runoff contributor was likely the road catchment, which has an area of hardstanding approx. 3,140m2 as shown in Figure 2. The high point (Brick Kiln Lane) to low point (Chapel Close) is effectively drained but its gradient promoted fast runoff towards the low point. Assuming the gullies and laterals were free flowing during event, it's possible that flow may have skipped over gullies due to the high velocity generated by the gradient. However, locals observed water spouting out of gullies/manholes near to the Green indicating an issue within the highway drainage itself and then unable to r-enter because the gullies were blocked further down Chapel Street/Church Close. This flooding is likely attributed to a capacity issue (surcharging) or a blockage in the system. Highway drainage system appears to discharge to a open watercourse on the southern Church Close corner, this was in need of de-silting but was not obstructed with the highway outfall also clear. This indicates there is an issue within the highway drainage network within Chapel Street instead.	**NCC (Highways)**

Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
The flood water entered the properties through low thresholds at entrances/the air bricks/the electricity conduits. Private drop kerbs also allowed water to escape highway and into private accesses.	**NCC (Highways)** **NCC (LLFA)**

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Investigate and cleanse existing road drainage in effected area. Return to serviceable condition.	NCC (Highways)	3 months
Review the capacity & level of maintenance required to sustain the design efficiency of the drainage system that serve the flooding location in line with the risk identified. Assess whether the capacity of the current system can provide protection that aligns with British standards. This will require a survey of the system being undertaken. If no blockage is found then system to be assessed against the contributing area it serves.	NCC (Highways)	6-12 months
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. By segregating the catchment into smaller lumps, the chances of overloading a single system are greatly reduced.	NCC (Highways)	6-12 months
Norfolk County Council will consider all options that would prevent water from pooling on the highway. This may include using larger gully lids to intercept fast moving flowpaths as observed.	NCC (Highways)	6-12 months
Consideration should also be given to downstream receptors if the highway drainage capacity is improved and runoff is conveyed more effectively to local watercourses. Suggest SuDS principles to be incorporated into the highway drainage network.	NCC (Highways)	6-12 months
Property owners should protect their buildings through flood protection measures where appropriate. [Enter relevant organisation(s)] will communicate with local residents to advise them how	NCC (LLFA)	3 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.		
The relevant organisation/property owner to undertake riparian duties and undertake a regular regime of maintenance to ensure watercourses receiving highway water (i.e. Southern Corner of Church Close) are free from obstruction (i.e. tree leaves/roots and other foreign objects) at all times.	Riparian Landowners NCC (Highways) NCC (LLFA)	12 months

Flooding and flood risk within the Cranberry Rough catchment – Shropham



Description of catchment

Small tributary catchment (1.5km^2) of the Main River Thet in Shropham. Main risk area is Low Road.

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] Number of properties subject to surface water flood risk at 1 in 30 year event:	0	0	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	0	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0

Flood incidents within this catchment

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

Date of Incident	Incident as reported	What was the response to the flood incident
27/01/2021	On the 27/01/2021 - 1 property was internally flooded on Low Road, Shropham. This incident was reported by • Norfolk County Council (Highways) via an electronic report on the 2/02/2021, (FWF/21/4044)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful

in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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

No records of historical flooding.

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.

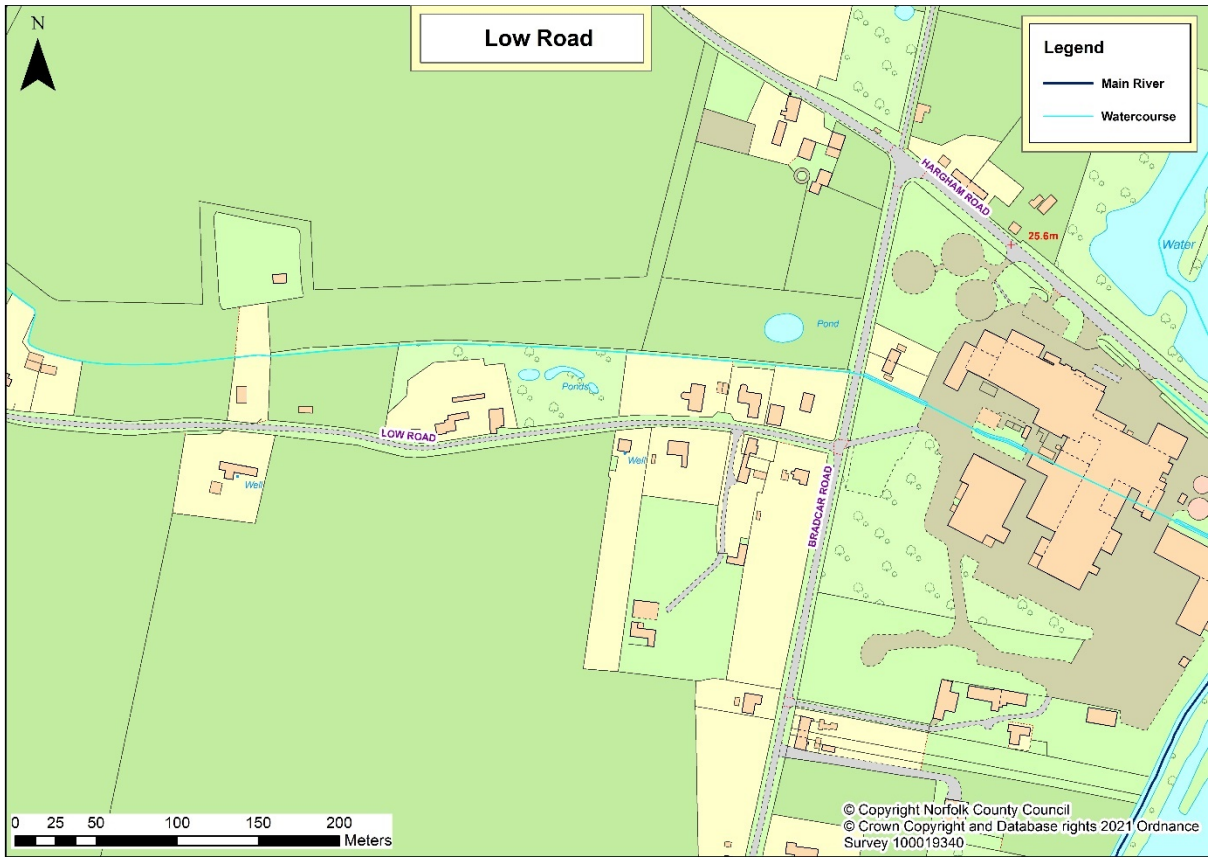
Following flooding to people, property and infrastructure

- 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.

Low Road, Shropham, 27/01/2021



Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned on/adjacent to.	Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water Norfolk County Council (Highways): Public highway maintenance, land & asset owner
The highway drainage system network was fully obstructed by debris or silt. This caused the failure of the upstream drainage system contributing to flooding at the affected properties. The volume of flooding in Low Rd and surrounding areas may have been exacerbated by all gullies being blocked in the low spot road restricting flow getting off the highway to local ditches.	Norfolk County Council (Highways): Public highway maintenance, land & asset owner
The flood water entered the properties through low thresholds at entrances/the air bricks.	
Partial blockages were identified at several locations along Watercourse, especially opposite Low Road on the northern side of properties. Large in-channel trees were trapping debris leading to reduced flow capacity. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	NCC (LLFA) Riparian Landowners

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review maintenance responsibilities for watercourse and its associated drainage infrastructure and implement to a wider action plan.	NCC (LLFA)	**6 months**
Review the inspection and maintenance schedule of all surface water drainage assets within the adopted Highway.	NCC (Highways)	**6 months**

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review access arrangements for inspection and maintenance of watercourses.	NCC (LLFA)	**6 months**
NCC Highways to review the capacity & level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified. Assess whether the capacity of the current system is able to provide protection that aligns with British standards. This may require a survey of the system being undertaken. The relevant organisation/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.	NCC (Highways)	**3 months**
The relevant organisation/property owner to undertake riparian duties and undertake a regular regime of maintenance to ensure watercourses are free from obstruction (i.e. tree leaves/roots and other foreign objects) at all times.	Riparian Landowners	**12 months**
Property owners should protect their buildings through flood protection measures where appropriate. NCC (LLFA)will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait. Mitigation measures that can be installed in the property to reduce the impact of flooding could include tanking basements & installing sump pumps. Property Owners should consider the potential to retrofit permeable areas and other methods of small scale sustainable drainage systems.	NCC (LLFA)	**6 months**

South Lopham

Flood incidents within South Lopham

Within this South Lopham 1 incident of internal flooding has 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
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Pooley Street, South Lopham. This incident was reported by • a resident via an online flood report form on the 1/02/2021, (4034)	A resident carried out measures to minimise the impact of flooding during the incident.

Recent rainfall within the catchment

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

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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

No historical flood records.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The following table sets out the causes of the recommendations to mitigate the causes and impacts of the flooding experienced within this catchment. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Pooley Street, South Lopham, 23/12/2020	Surface run-off from rainfall flowed off adjacent fields onto the highway. It was directed towards the surface water drainage networks. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected property.	Amendments should be made to neigbouring land to ensure water is not directed towards properties. Riparian owners should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves / roots) at all times. The IDB should monitor this. Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. This could include a range of measures.	Norfolk County Council (Highways) IDB Local landowners Riparian owners

Thetford

Flood incidents within this catchment

Within this catchment 1 incident of internal flooding has 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
26/12/2020	On the 26/12/2020 - 1 property was internally flooded on Coney Close, Thetford. This incident was reported by • a resident via an online flood report form on the 26/12/2020, (3298)	Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report 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 2.5km 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.

Rainfall data is available and will be included prior to publication.

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
08/05/2019	1 internally flooded property	8.8mm over a 10 hour period
16/09/2016	1 internally flooded property	1:15 yr
25/06/2016	1 internally flooded property	1:2.5 yr
16/06/2016	1 internally flooded property	1:26 yr

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The table below details the causes that led to flooding and the recommendations to mitigate the causes and impacts of the flooding experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Coney Close, Thetford, 26/12/2020	Surface run-off from rainfall flowed off adjacent fields into the watercourse. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected property.	Amendments should be made to neigbouring land to ensure water is not directed towards properties. Riparian owners should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves / roots).	Local landowners Riparian owners

Flooding and flood risk within the Watton catchment

Flood incidents within this catchment

Within this catchment 1 incident of internal flooding has 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
26/01/2021	On the 26/01/2021 - 1 property was internally flooded on Dereham Road, Watton. This incident was reported by • a resident via personal communication on the 26/01/2021, (FWF/21/3967)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. A resident identified the need to renew [or replace] the existing drainage scheme that serves the flooding location during the incident.

Recent rainfall within the catchment

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

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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
16/08/2020	1 property internally flooded	Significant

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The table below details the causes that led to flooding and the recommendations to mitigate the causes and impacts of the flooding experienced. It also sets out which Risk

Management Authorities have responsibility to help manage the causes of the flooding.

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.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Dereham Road, Watton, 26/01/2021	The surface water drainage system was fully obstructed by debris or structural failure. This caused the failure of the upstream drainage system contributing to flooding at the affected properties.	Norfolk Council will communicate with the riparian owners who should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves/roots) at all times. The upstream landowner could provide upstream storage to protect the properties from the overland flowpath. The residents affected suggested that a ditch/bund could be created to reduce the run off from the adjacent field.	Norfolk County Council/Property Owner and upstream landowner.

Disclaimer

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

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

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

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

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

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

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

Appendix A - Key definitions and responsibilities

What is flooding?

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

What is internal and external flooding?

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

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

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

What is Local Flood Risk?

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

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

What is a Catchment?

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

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.