



Norfolk County Council

Investigation Report into the flooding in South Norfolk District in Winter 2020-2021

Report Reference: FIR066

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1. Executive Summary

- 1.1. Flooding occurred across South Norfolk on the 23 and 24 December 2020. Norfolk County Council has confirmed 205 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.
- 1.2. The aim of the report is to determine the causes of the flooding and identify the roles and responsibilities of organisations to incidents of flooding. The report also recommends actions to reduce the impact or frequency of flooding in the future.
- 1.3. The organisations with responsibilities for managing the flooding incidents in the South Norfolk area are all classed as Risk Management Authorities. They are Anglian Water: Norfolk County Council (as Lead Local Flood Authority and Highways Authority): South Norfolk District Council, Internal Drainage Boards, Environment Agency and Highways Agency.
- 1.4. In response to the flood events the Fire and Rescue Service, South Norfolk District Council, Norfolk County Council, Environment Agency and the Internal Drainage Board deployed services to provide assistance to the public. As part of the immediate response to the flood events, the Environment Agency undertook its responsibility as Cat 1 responder, and opened its incident room to monitor river levels, issue Flood Alerts and Warnings and had teams out on the ground throughout the flood incidents. In some locations proactive investigations and remedial work has already been undertaken by Anglian Water and Highways Authorities to identify issues, clear and repair surface water systems to ensure that residents are better protected from flooding. The Water Level Management Alliance (Internal Drainage Board) also provided assistance during and after the event, including the provision of high-powered pumps. The district council offered sand bags to affected residents.
- 1.5. Leading up to the flood events on the 23rd and 24th of December 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 worst affected where there were significant clusters of properties flooded with more isolated properties internally flooded in other parts of the district.

2. Justification for Flood Investigation

2.1 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.

2.2 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

2.3 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.

2.4 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.

2.5 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.

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

2.7 The flood investigation report cannot:

- Resolve the flooding issues or provide designed solutions.
- S.19 of Flood and Water Management does not give local authorities any further powers to force RMA's to undertake any of the recommended actions.

3. Rainfall Events and Data

3.1 Whilst not all areas have the presence of a verified rain gauge, the following hydrology summary has been provided where these are available. See Figure 1 for further spatial context of data collected from the event.

3.2 Almost all of Norfolk received above average rainfall totals during December. 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.

3.3 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.

3.4 As a result, river flows were classed as either exceptionally high, with record high December monthly mean flows recorded on the River Yare, Waveney and Tas in South Norfolk. Groundwater levels were classed higher than average by the end of the month, with some sites on the Mid Suffolk border classed as exceptionally high.

3.5 In terms of spatial variances in the rainfall, the South Western portion of South Norfolk received the most rainfall on the 23rd Dec, overleaf is an overview of the rainfall and flood flows for each macro catchment where gauged data is available: -

Location Name	District	X	Y	Date	Daily Total Rainfall	Rainfall Return Period (AEP%)
Bressingham	South Norfolk	607889	280642	23/12/2020	60.8	1:31yr (3.22%)
Bressingham	South Norfolk	607889	280642	24/12/2020	11.4	Blank
Forncett End	South Norfolk	614383	292957	23/12/2020	29.6	1:2 (50%)
Forncett End	South Norfolk	614383	292957	24/12/2020	7.4	Blank
Gissing	South Norfolk	614600	285774	23/12/2020	76	1:53 (1.9%)
Gissing	South Norfolk	614600	285774	24/12/2020	9.2	Blank
Harleston*	South Norfolk	624901	284099	23/12/2020	3.4	1:1 (100%)
Harleston*	South Norfolk	624901	284099	24/12/2020	0.4	Blank
Poringland	South Norfolk	628330	300950	23/12/2020	43.2	1:7 (14%)
Poringland	South Norfolk	628330	300950	24/12/2020	6.8	Blank
Worlingham	South Norfolk	645209	289383	23/12/2020	41.2	1:5 (20%)
Worlingham	South Norfolk	645209	289383	24/12/2020	3.2	Blank
Hethersett	South Norfolk	614716	305186	23/12/2020	47.7	1:10 (10%)
Hethersett	South Norfolk	614716	305186	24/12/2020	15.6	Blank

* Harleston gauge reported to have a major fault and under recording by 47.76% due to damage. Advised not to use Harleston.

3.6 Upper Waveney (West of Homersfield):- Rain gauges in Bressingham and Gissing recorded on average circa 70mm of rainfall in this west portion of South Norfolk, both areas are separate headwater catchments for the Main River Waveney. Gissing which received 76mm fuelled two flash floods within two tributary catchments of the R.Waveney, firstly an unnamed watercourse conveying South towards through Burston & Shimpling, Frenze towards Diss and secondly East through the Pulhams catchment towards Pulham St Mary and Redenhall. Bressingham saw 61mm fall at the very top of the River Waveney in the west of the District which started the issues along this main river stretch.

3.7 Intermediate areas like Harleston didn't receive nearly as much but the bulk of rain fell in the headwaters as stated previously, though this is a verified reading it would appear an anomaly compared to surrounding areas. Hence higher areas which normally would not expect to see high flows in local watercourses did so and moving

downstream the cumulative runoff volume from each of these upper tributaries caused massive disruption downstream in places like Harleston and Diss. For context the Waveney at Billingford peaked on the 24th Dec at 1.83m and further downstream at Needham Mill at 1.6m which in the long-term record is the highest flood level since 1968 which was 1.8m.

3.8 Lower Waveney:- The downstream reaches of the Waveney received around 40mm on average but here it was high tidal influence causing interaction with main river Waveney which caused main issues. Ellingham Sluice recorded peak levels of 2.6m on the 25th Dec and 2.5m on the 24th

3.9 Upper Yare/Tiffey:- Rain gauges in this catchment captured on average 50mm of rainfall on the 23rd leading to the Tiffey and Yare swelling on the 24th. For context the Yare at Colney peaked on the 25th Dec at 1.5m+ (although again gauge was drowned out so interpolation) which in the long term record is the highest flood level since 1993 which was 1.35m.

3.10 River Tas:- Rain gauges in this catchment at Woodton, Poringland captured on average 45mm of rainfall on the 23rd leading to the Tas @ Shotesham peaking at 1.52m on the 24th

4. Flooding incidents and causes

4.1 The key findings and recommendations are summarised below. More detailed or site specific recommendations are included later in the report on a catchment and street level basis.

4.2 For the purpose of this report and ease of presentation we have divided the report by parish, then macro catchment and then sub catchment. In some cases a sub 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.

4.3 The flooding that occurred in the locations listed below led to the internal flooding of 205 properties.

Location	Macro Catchment	Sub Catchment	Number of affected properties
Alburgh	N/A	N/A	1
Ashwellthorpe & Fundenhall		Ashwellthorpe	5
Ashwellthorpe & Fundenhall		N/A	1
Barford		N/A	1
Bressingham	N/A	N/A	2

Location	Macro Catchment	Sub Catchment	Number of affected properties
Brockdish	Upper Waveney	Grove	16
Brooke	Tas	Brooke Wood	1
Bunwell & Carleton Rode		Bunwell Street	8
Burston & Shimpling	Shimpling	Gissing	4
Burston & Shimpling	Shimpling	Patten	5
Burston & Shimpling	Shimpling	N/A	3
Dickleburgh & Rushall		Dickleburgh & Rushall	6
Diss		Diss East	9
Ditchingham		Ditchingham	20
Earsham		Earsham	5
East Carleton		East Carleton	1
Fersfield		Fersfield	2
Forngett St Peter & Forngett St Mary		Forngett St Peter South	6
Framingham Earl		Framingham	1
Framingham Pigot		Framingham	2
Geldeston	Lower Waveney	Main Run	2
Gissing	Upper Waveney	Low Row	6
Great Moulton	Upper Waveney	Woodrow Lane	2
Hales		Hales	1
Hempnall		Hempnall	7
Ketteringham		Ketteringham	2
Long Stratton		Long Stratton	18
Pulham St Mary	Upper Waveney	Upper Pulhams	6
Redenhall with Harleston		Redenhall	10
Saxlingham Nethergate	Tas	Wash Lane	2
Scole	Upper Waveney		2
Shelfanger		Shelfanger	9

Location	Macro Catchment	Sub Catchment	Number of affected properties
Shotesham	Tas	Upper Shotesham	1
Starston	Upper Waveney	Upper Pulhams	1
Surlingham		Surlingham	2
Swainsthorpe		Swainsthorpe	1
Tharston & Hapton		Tharston & Hapton	2
Tibenham		Tibenham	1
Tivetshall St Mary	Upper Waveney	Upper Patten	1
Topcroft		N/A	1
Welborne (Runnhall)		N/A	2
Winfarthing		N/A	6
Woodton			5
Wymondham		Bays River	19

5. 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 or the appropriate Risk Management Authority 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 systems¹.
- 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.
- Increase the number of rainfall gauges to ensure all areas of high risk have access to rainfall event data.

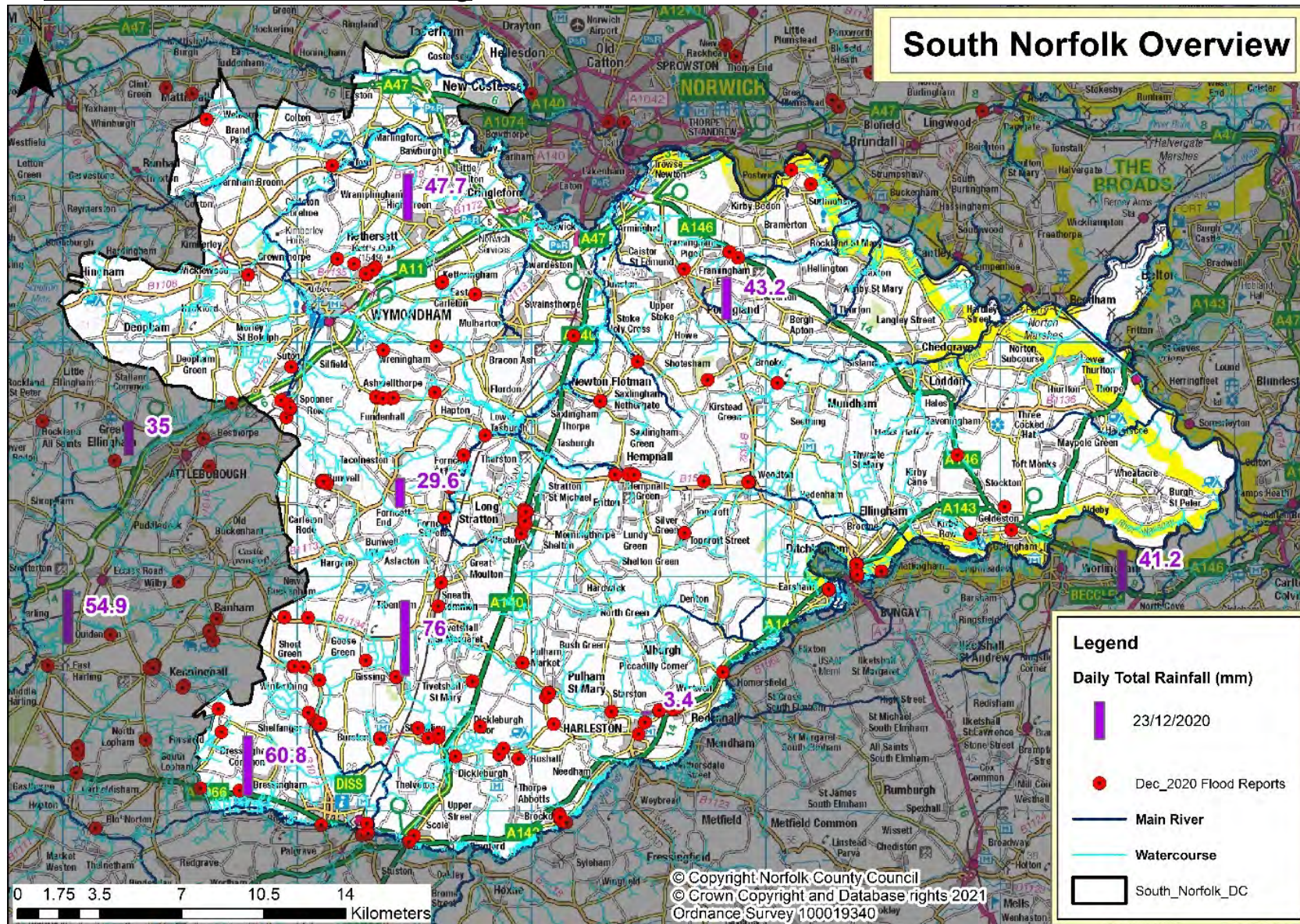
Anglian Water should;

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

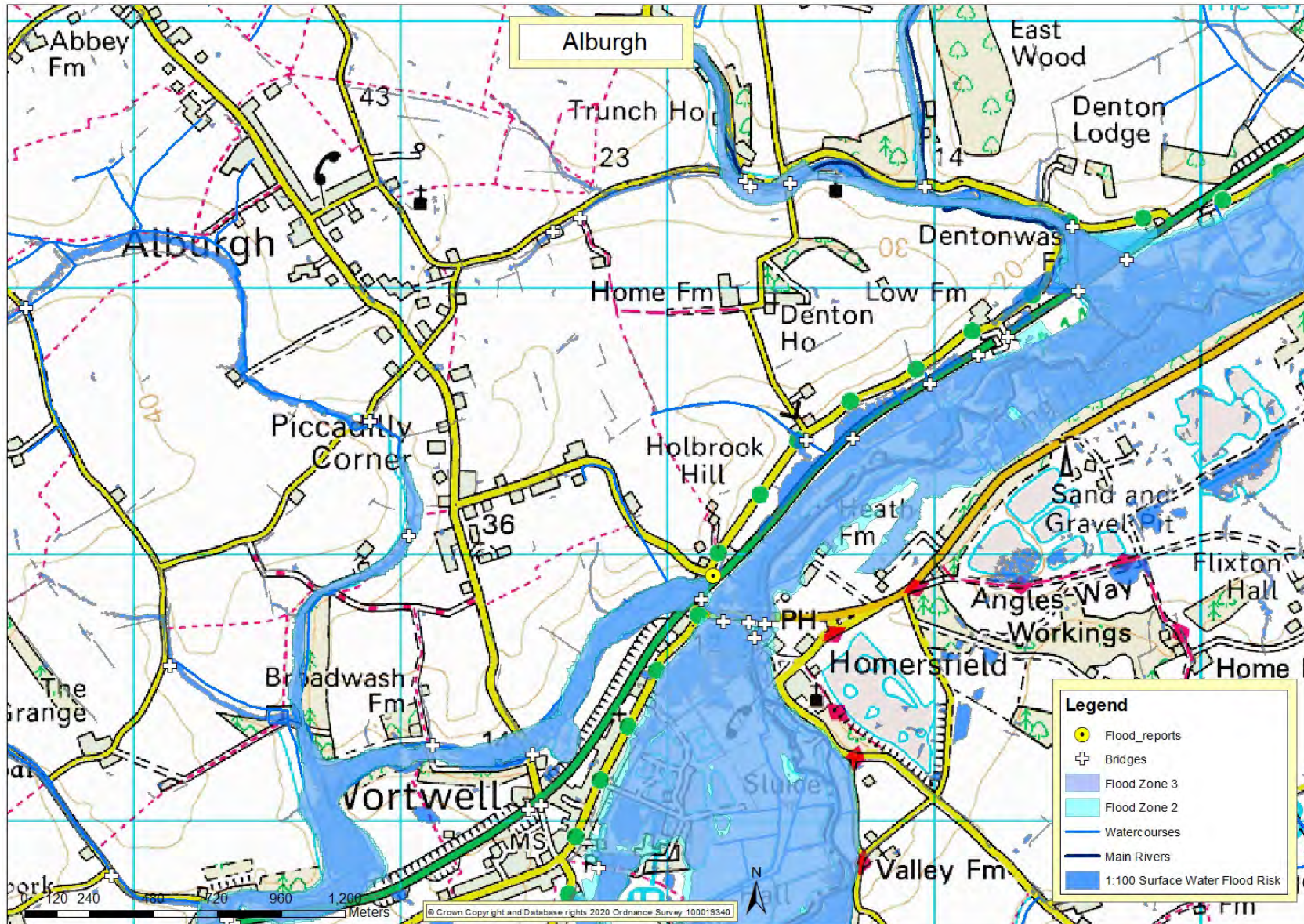
¹ Works by riparian landowners to maintain a watercourse need to be carried out in a sensitive way so as to avoid harming the channel. De-silting and weed-cutting work needs to be well planned and carefully executed, and may require a permit from the Environment Agency or Internal Drainage Board. Works should avoid:

- Bed and bank material (e.g. gravel) being removed and deposited on the banks
- Fish and other aquatic organisms being removed from the water (e.g. freshwater mussels)
- Channels being stripped of all their in-stream vegetation
- All woody debris being removed (e.g. fallen trees and branches)
- Bare, steep earth banks that provide little wildlife habitat"

6. General Location of Flooding



Flooding and flood risk within Alburgh



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
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Station Road, Alburgh. This incident was reported by <ul style="list-style-type: none">a resident via email correspondence on the 21/01/2021, (FWF/21/3887)	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 Lead Local Flood Authority has no previous reports of internal flooding on Station Road, Alburgh.

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	Risk Management Authority with Relevant Flood Risk Function
Station Road, Alburgh, 23/12/2020	<p>A substantial amount of rain fell on the 23rd Dec onto the catchment with prior high saturation levels.</p> <p>Run-off from significant rainfall was concentrated along surface water flowpaths.</p>	
Station Road, Alburgh, 23/12/2020	<p>The property affected by flooding is approximately 1.5 miles downstream of Redenhall where they experienced a 'surge' of water. It is likely that the property at Station Rd was affected by the same surge effect based on the account and timing provided by the resident.</p> <p>The watercourse/river was partially obstructed by unconsented works. This caused the failure of the upstream drainage system contributing to flooding at the affected properties.</p>	IDB
Station Road, Alburgh, 23/12/2020	<p>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.</p>	
Station Road, Alburgh, 23/12/2020	<p>The surface water drainage system network was likely hydraulically obstructed by high flood flows in the Beck watercourse. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties.</p>	<p>Norfolk County Council: Highways - Public highway maintenance & asset owner</p> <p>IDB</p>

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
To determine an appropriate maintenance regime in line with the risk identified and communicate with affected parties and riparian owners.	IDB	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)	Complete
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 bridges and identify if they have sufficient capacity for conveying flood flows.	NCC (LLFA and Highways)	12 months
NCC 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.	NCC and IDB	12-36 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.	NCC	12 months

Description of catchment

A small rural catchment flows south to north through the western side of Ashwellthorpe.

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	12	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
[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 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	<p>On the 24/12/2020 - 1 property was internally flooded on Wymondham Road, Ashwellthorpe and Fundenhall. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 1/012021, (3759) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>The Fire and Rescue Service responded and pumped out during the incident.</p> <p>Norfolk County Council (Highways) visited affected residents to offer advice and to gather information after the incident.</p>
	<p>On the 24/12/2020 - 1 property was internally flooded on New Road, Ashwellthorpe and Fundenhall. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 31/12/2020, (3345) 	<p>The Fire and Rescue Service responded and pumped out during the incident.</p> <p>Norfolk County Council (Highways) visited affected residents to offer advice and to gather information after the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 3 properties were internally flooded on The Street, Ashwellthorpe and Fundenhall. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 12/01/2021, (3780) • a resident via email correspondence on the 10/01/2021, (3640) • a resident via an online flood report form on the 24/12/020, (3251) 	<p>A resident carried out measures to minimise the impact of flooding during the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>The Fire and Rescue Service responded and pumped out during the incident.</p>

Works completed following the flood event

NCC installed new culvert on Wymondham Road and provided a new culvert to a local landowner for installation across the watercourse north of Wymondham Road

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Ashwellthorpe.

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.

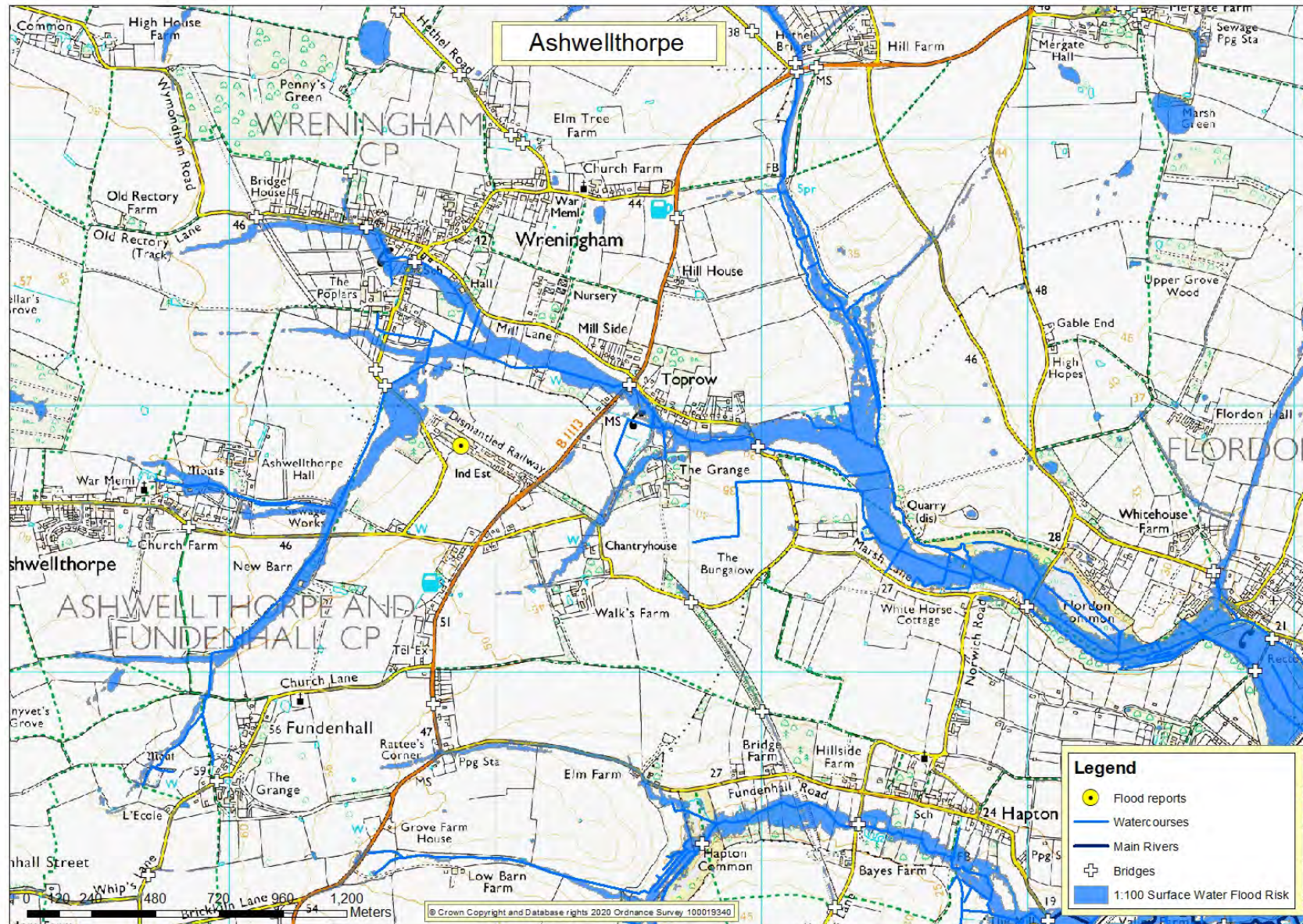
Following flooding to people, property and infrastructure

- 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?
<p>Wymondham Road, 24/12/2020</p> <p>New Road, 24/12/2020</p> <p>The Street, 23/12/2020</p> <p>Ashwellthorpe and Fundenhall,</p>	<p>The surface water drainage system was partially obstructed by silt and high-water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties. Run-off from rainfall pooled at a low point within the catchment affecting properties. Surface run-off and silt from a housing development currently under construction made its way into the ditch network. These flows could not be accommodated as the system was already overloaded. It overflowed into the gardens of the affected properties and made its way to The Street.</p> <p>Surface run-off from rainfall flowed off adjacent fields and into a drainage ditch that was overloaded and so overflowed directing water towards the properties. This exacerbated the flooding.</p> <p>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.</p>	<ul style="list-style-type: none"> Norfolk County Council will liaise with Local Planning Authorities to encourage better monitoring of surface run off and silt management on new developments during construction. 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. 	<p>Norfolk County Council (LLFA)</p> <p>Local Planning Authority</p> <p>Riparian owners</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
<p>New Road Ashwellthorpe and Fundenhall, 24/12/2020</p>	<p>Surface water entered the foul drainage network, overwhelmed the system and surcharged inside properties. The surface water drainage system has historically been modified and amended with various sized culverts. This has created several pinch points within the system that struggle to allow free flow. 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.</p>	<ul style="list-style-type: none"> • Anglian Water 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 e.g. AW to investigate sealing manholes or using low-leak lids where safe to do so. Anglian Water to investigate foul sewer and private connections and consider non return valves where practical and where they do not increase risk elsewhere. 	<p>Anglian Water</p>

Flooding and flood risk in Ashwellthorpe industrial estate



Ashwellthorpe industrial estate

Flood incidents within this area

Within this area 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 Ashwellthorpe Industrial Estate Norwich Road, Ashwellthorpe and Fundenhall. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 4/03/2021, (4234)	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.

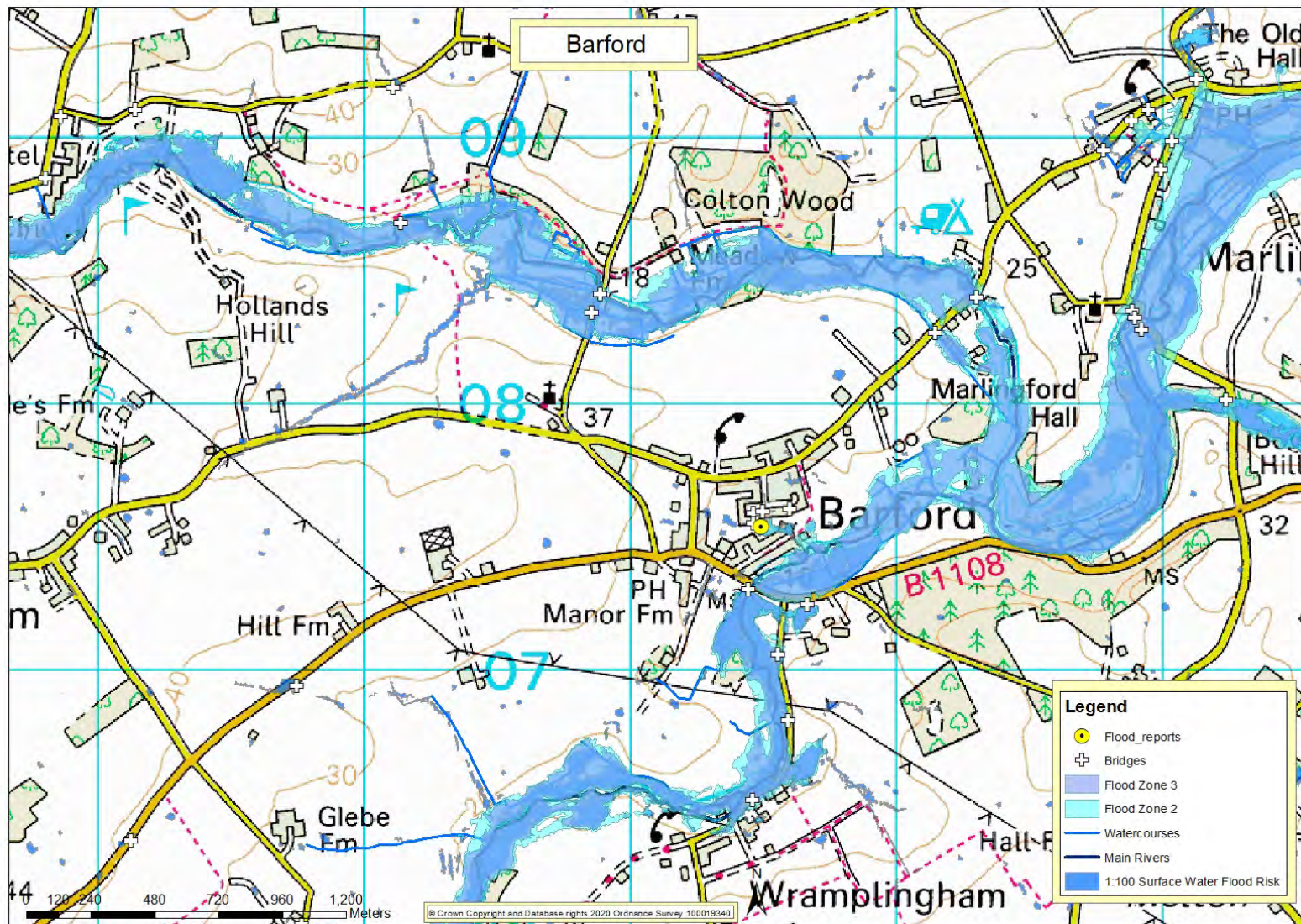
Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this 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 Lead Local Flood Authority has no previous reports of internal flooding in Ashwellthorpe.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
<p>Ashwellthorpe Industrial Estate Norwich Road</p> <p>Ashwellthorpe and Fundenhall,</p> <p>23/12/2020</p>	<p>Surface run-off from rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features. The loss of pre-existing drainage features (ditches,) within the catchment exacerbated the flooding. 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.</p>	<ul style="list-style-type: none"> Norfolk County Council and local landowners could confirm, where possible, the existence of any connections to a wider drainage network. This work should seek to confirm where the drainage network conveys flows to. 	<p>Norfolk County Council (LLFA)</p> <p>Local landowners</p>

Flooding and flood risk in Barford



Flood incidents within Barford

Within this area 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 Eastleigh Gardens, Barford. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 11/03/2021, (4322)	<ul style="list-style-type: none">A resident carried out measures to minimise the impact of flooding after the incident.Anglian Water visited affected residents to offer advice and to gather information after the incident.

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Eastleigh Gardens, Barford.

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?
<p>Eastleigh Gardens, Barford</p> <p>23/1/2020</p>	<p>Run-off from significant rainfall was directed towards land drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water to the highway where it flowed along the road network to the low point which the affected property is positioned.</p> <p>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.</p>	<ul style="list-style-type: none"> • Riparian owners should instigate a regular regime of maintenance to ensure the system is free from obstruction at all times. • Norfolk County Council 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. 	<p>Riparian owners</p> <p>Norfolk County Council (Highways)</p>

Flooding and flood risk in Bressingham



Flood incidents within this area

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

Date of Incident	Incident as reported	What was the response to the flood incident
22/12/2020	On the 22/12/2020 - 1 property was internally flooded on Low Road, Bressingham. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 09/02/2021, (4087)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.
22/12/2020	On the 22/12/2020 - 1 property was internally flooded on Algar Road, Bressingham. This incident was reported by <ul style="list-style-type: none">Norfolk County Council highways via an electronic report on the 02/02/2021, (4046)	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. 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 Lead Local Flood Authority has no previous reports of internal flooding on Low Road or Algar Road, Bressingham.

Causes of flooding within the catchment and recommendations

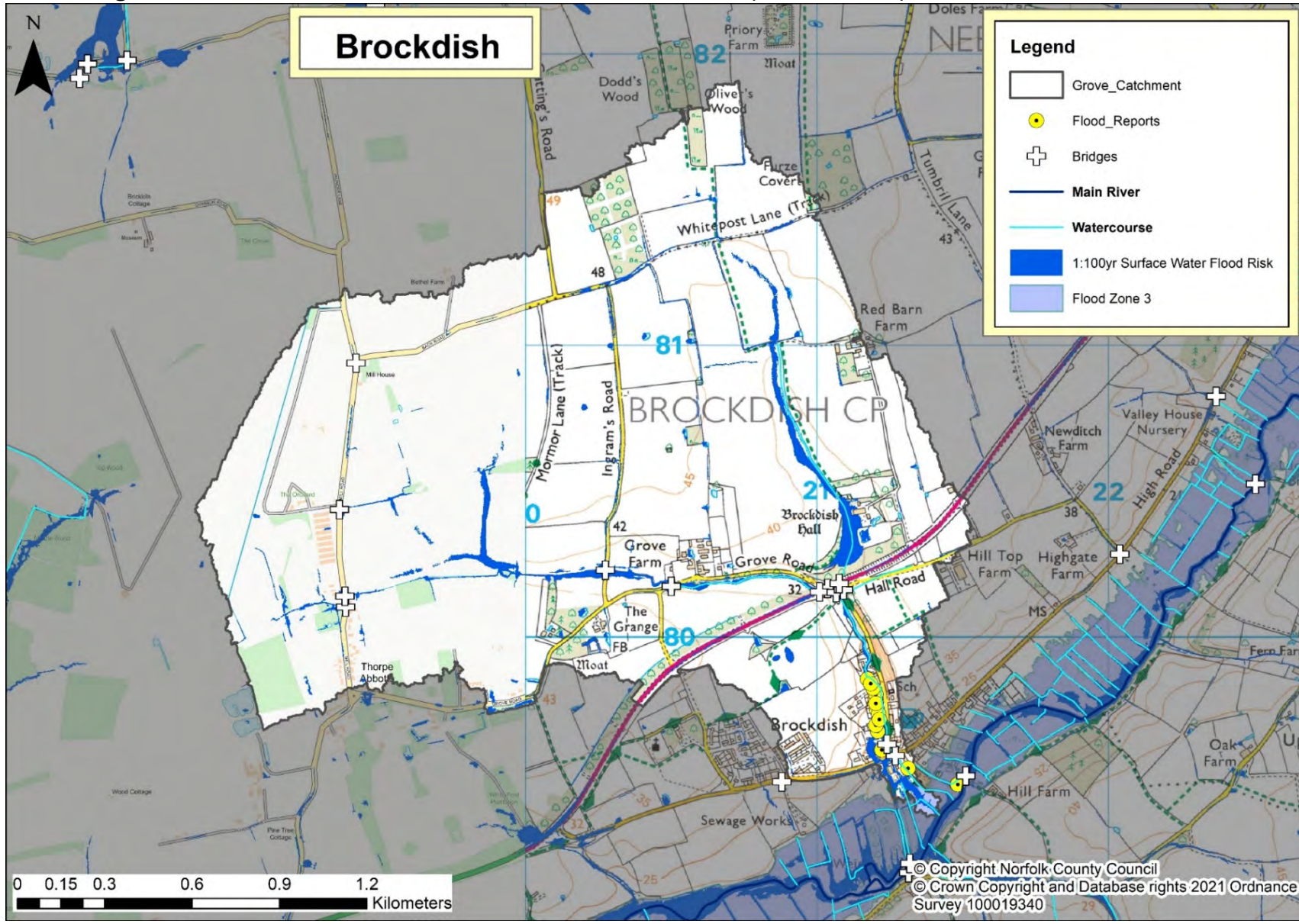
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the 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?
<p>Low Road Bressingham 22/12/2020</p>	<p>Surface run-off from rainfall was directed towards the land drainage system which was partially obstructed by debris and silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected property. The land drainage system flowed into an undersized pipe network. This overloaded the system and caused flood water to surcharge at the affected property. 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.</p>	<ul style="list-style-type: none"> The relevant riparian owner should instigate a regular regime of maintenance to ensure the system is free from obstruction at all times. They should also consider carrying out works to mitigate flood risk that arises from the undersized pipe. 	<p>Riparian owners</p>
<p>Algar Road Bressingham 22/12/2020</p>	<p>Surface run-off from rainfall was directed towards the land drainage system which was partially obstructed by debris and silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected property. 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.</p>	<ul style="list-style-type: none"> The relevant riparian owner should instigate a regular regime of maintenance to ensure the system is free from obstruction at all times. 	<p>Riparian owners</p>

Flooding and flood risk within the Grove catchment (Brockdish)



Description of catchment

The Grove catchment is a small tributary stream within the River Waveney watershed. The catchment is 3.8km² with a relatively steep gradient north to south falling from 50mAOD to 20mAOD where it meets the River Waveney. The land uses are generally open pastures and agricultural with only Brockdish being the main settlement within the catchment. The main risk areas within the catchment are Grove Rd and Common Lane, Brockdish.

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 30year event and the 1 in 100year 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	6	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	14	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	3	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 16 incidents of internal flooding have been assessed as part of this investigation. (NCC have been informed of 4 additional unverified reports). 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	<p>On the 24/12/2020 - 3 properties were internally flooded on Common Lane, Brockdish. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 8/03/2021, (FWF/21/4285) • a resident via an online flood report form on the 29/01/2021, (FWF/21/3999) • a resident via an online flood report form on the 30/01/2021, (FWF/21/4026) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 13 properties were internally flooded on Grove Road, Brockdish. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 31/01/2021, (FWF/21/4028) • a resident via an online flood report form on the 15/01/2021, (FWF/21/3793) • a resident via an online flood report form on the 12/01/2021, (FWF/21/3746) • a resident via an online flood report form on the 8/01/2021, (FWF/21/3694) • a resident via an online flood report form on the 9/01/2021, (FWF/21/3647) • a resident via an online flood report form on the 6/01/2021, (FWF/21/3619) • a resident via an online flood report form on the 6/01/2021, (FWF/21/3617) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Residents carried out measures to minimise the impact of flooding during the incident i.e. temporary barriers.</p> <p>The Fire and Rescue Service responded, offered advice and some minor flood defences. They also removed blockages from culverts.</p>

Date of Incident	Incident as reported	What was the response to the flood incident
	<ul style="list-style-type: none"> • a resident via an online flood report form on the 5/01/2021, (FWF/21/3614) • a resident via an online flood report form on the 5/01/2021, (FWF/21/3612) • a resident via an online flood report form on the 5/01/2021, (FWF/21/3611) • a resident via an online flood report form on the 5/01/2021, (FWF/21/3610) • a resident via an online flood report form on the 23/12/2020, (FWF/20/3739) <p>a resident via an online flood report form on the 5/01/2021, (FWF/20/3609)</p>	

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.

Data from rain gauges located in Harleston has been analysed to ascertain the intensity of the rainfall events experienced in the catchment.

The rainfall events recorded by gauges for this catchment are:

23 March 2021 - 3mm of rainfall was recorded as falling in 24 hours 0 minutes at the Harleston rainfall monitoring station. This intensity of rainfall for the total duration equates to a - year rainfall event. However an amateur gauge in Brockdish recorded 70mm over the day 23rd Dec.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Grove Road or Common Lane, Brockdish.

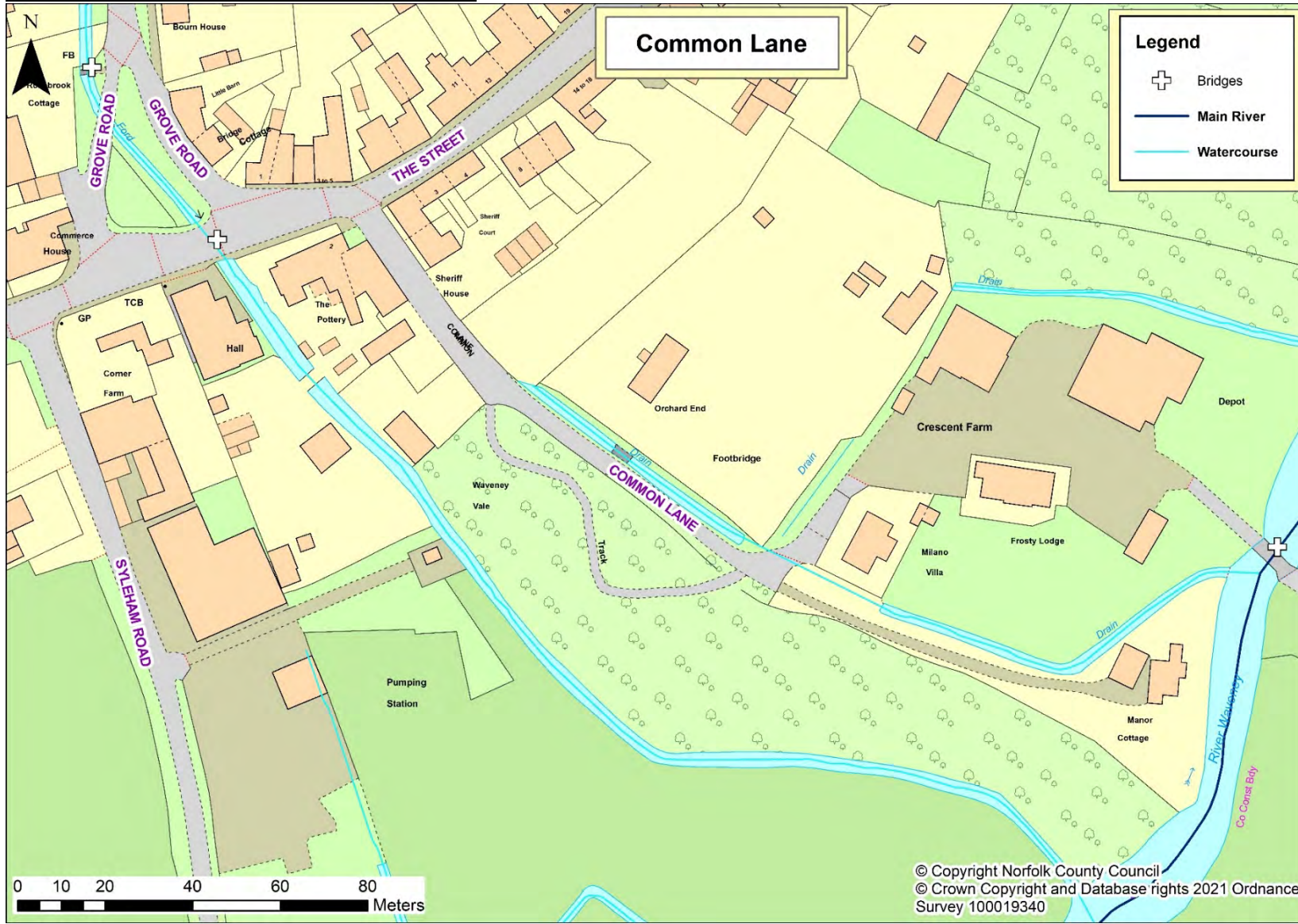
Causes of flooding within the catchment and recommendations

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.

Common Lane, Brockdish – 24/12/2020



Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>A substantial amount of rain fell on the 23rd Dec onto a catchment with prior high saturation levels. The catchment is 3.8km² upstream of Brockdish generating a flashy response to which local watercourses and drainage infrastructure could not cope.</p> <p>The close proximity of Common Lane to the Main River Waveney and its floodplain was also a source of flooding. Overall, there is some ambiguity as to a single source of flooding and its very likely an accumulation of both surface water and river flooding at this location.</p>	<p>Norfolk County Council: Highways - Public highway maintenance & asset owner</p> <p>Norfolk County Council: LLFA – Land Drainage Powers</p>
<p>Common Lane lies on the fringes of the Waveney floodplain and is very low lying. Flood water from both main river and ordinary watercourse from Grove Rd spread out over said floodplain which included the local common and led to the moderate flood depths witnessed during the event. Properties in the flood zone were affected more severely.</p> <p>It is unclear which flooded them first (ordinary watercourse or Waveney) as each system would have a highly different response time to rainfall (also called time to peak).</p> <p>Those further up Common Lane appear to have been affected by the ordinary watercourse only (different flood date) but it's likely the watercourse was still being fluvially locked by the high flows in the River Waveney too.</p>	<p>Norfolk County Council: LLFA Environment Agency</p>
<p>Blockages were identified at several locations along the ordinary watercourse post-event, associated with large in-channel trees and vegetation within the Common.</p>	<p>Norfolk County Council: LLFA – Land Drainage Powers</p>
<p>The surface water drainage (highway) system and outfall was partially obstructed by high water levels downstream too. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties too.</p>	<p>Norfolk County Council: Highways - Public highway maintenance & asset owner</p>

Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>Sewer flooding was reported on the night of the 23rd December large quantities of effluent was exiting the sewer through the inspection cover on Common Lane. Run-off from significant rainfall was likely directed towards the foul drainage network causing this to flood and releasing effluent into properties in Common Lane. These flows could not be accommodated as the system was already overloaded. This was due to the infiltration of surface water / groundwater into existing drainage networks.</p>	<p>Anglian Water- Public sewerage undertaker.</p>

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review and confirm ownership and maintenance responsibilities.	NCC (LLFA)/ NCC (Highways)/ EA/ IDB/ AW	6 months
<p>Review and confirm operational and maintenance response for flood events of this calibre and associated drainage infrastructure and implement to a wider action plan EA to confirm operation of Syleham Sluice</p> <p>The EA 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</p> <p>Maintenance of the main river channel must be reviewed, and action taken to ensure the water from the Grove Rd brook can get away from the Common without posing a flood risk to property along Common Lane. Works done to the river in the 1990's have been neglected and the main channel is now heavily silted and become over grown with in-channel trees.</p>	EA/IDB	6 months
<p>Advise residents of Property Level Resilience measures and funding opportunities.</p> <p>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.</p>	NCC (LLFA)	Ongoing

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>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 bridges and identify if have sufficient capacity for conveying 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.</p>	<p>NCC (LLFA and Highways) Homeowners</p>	<p>12 months</p>
<p>Riparian owners to clear watercourses (open and/or piped) through areas of concern particularly in the Common. Ensures sufficient capacity and reduces likelihood of blockage causing reduced conveyance and breaches.</p>	<p>Homeowners</p>	<p>6 months</p>
<p>Environment Agency will communicate with local residents of properties known to have flooded internally on Common Lane to investigate options for managing flood risk. This may need to be dependent on those property owners affected contributing towards a solution. Alternatively, property owners could carry out their own measures where funding is not forthcoming or residents are unwilling to wait.</p>	<p>EA and NCC</p>	<p>12-36 Months</p>
<p>Anglian Water to review the sewer function and its capacity to deal with any future flooding. This should include local pumping stations as well as the sewer network itself. AW should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.</p>	<p>AW</p>	<p>12 months</p>
<p>RMA's to see if funding is available for more verified rain gauges within the central area of South Norfolk – a gauge for the Grove Catchment would be useful.</p>	<p>EA/NCC</p>	<p>12 months</p>
<p>EA to confirm flood forecasting capability for this area and explore adding Brockdish to Flood Warning system. Educate homeowners about risk in the area and how they can get more localised early warning systems and how to prepare.</p>	<p>EA</p>	<p>6 months</p>

Grove Road, Brockdish - 23/12/2020



Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>A substantial amount of rain fell on the 23rd Dec onto a catchment with prior high saturation levels. The catchment is 3.8km² upstream of Brockdish generating a flashy response to which local ordinary watercourses and drainage infrastructure could not cope.</p> <p>Grove Rd watercourse was high all night but not out of bank at 7.30pm however in space of 30 minutes overtopped its bank(s) adjacent to properties south of A143. Locals describe a large surge that lasted just a few hours for some properties. For others water levels remained high until around 2am. . Water started receding at about 10pm.</p> <p>Likely causes are flashy runoff from the upstream catchment, of which is split into two main flow paths that converge underneath the A143. Site visits have confirmed there are two large 1.2m dia culverts under bridge that convey flows from watercourses north of Brockdish Hall and west of Grove Rd.</p> <p>Its unconfirmed but a large pool of flooding on the A143 bridge was released into the Brook following local observations of emergency maintenance works to clear two 750mm outfalls underneath the A143 bridge hence causing a sudden surge downstream which led to overtopping.</p> <p>Watercourse is naturally constrained in a valley bounded by high ground to the west and Grove Rd immediately east. The inability of the river to spread out over a wider floodplain led to the severe depths witnessed and properties are situated within the centre of the flow corridor.</p> <p>Flood water entered the properties through front and rear entrances via low thresholds/ the air bricks / the electricity conduits. Wrack marks on garages indicate 400mm deep in places.</p>	<p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/surface water</p> <p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p> <p>Highways England: Trunk Road infrastructure</p>

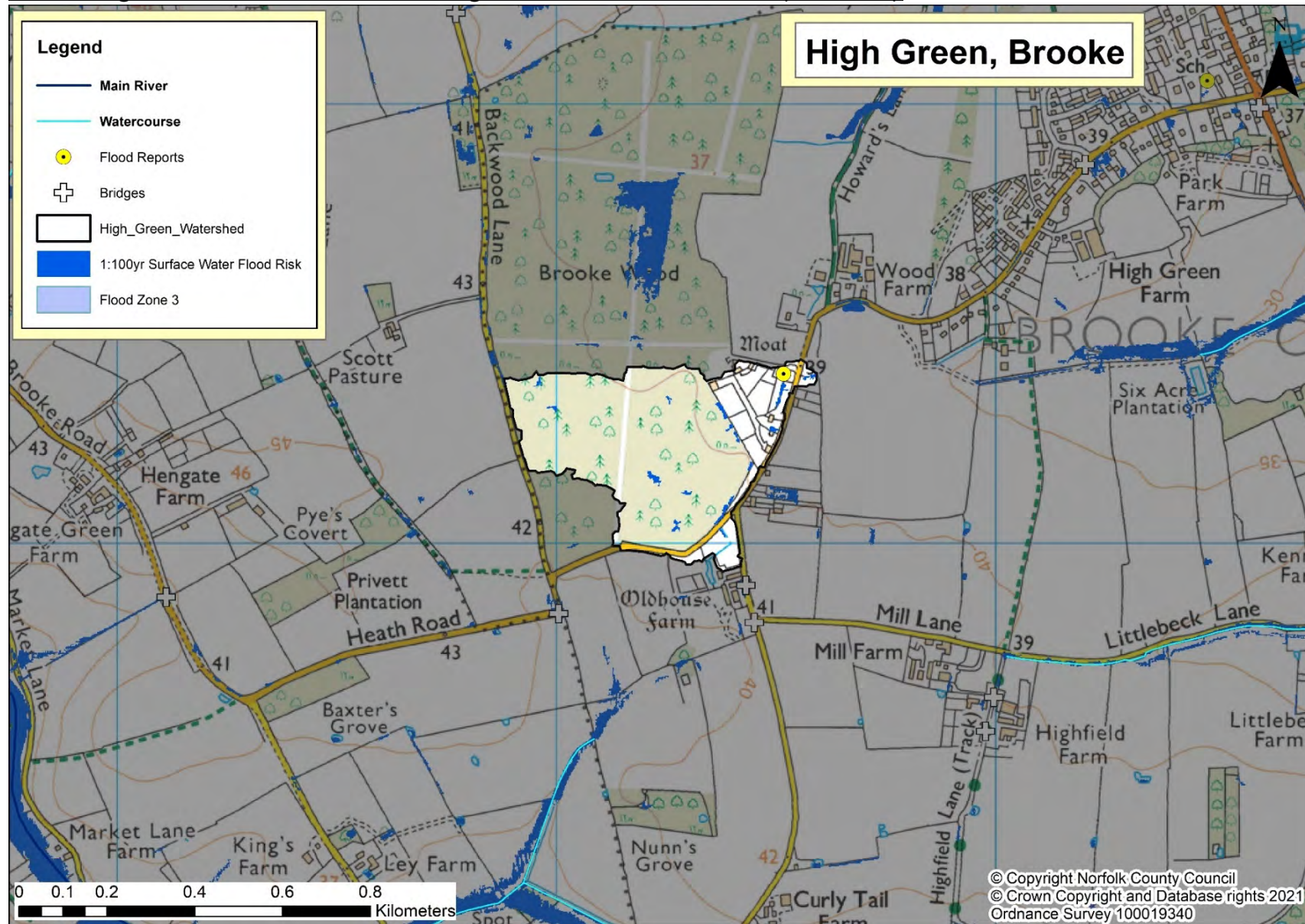
Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>Constrictions and blockages were identified at several locations along this stretch of watercourse associated with private access structures and pedestrian footbridges. These structures also trapped massive accumulations of debris including large household waste – hay bales, sleepers, fencing material and a 5m long roll of agricultural membrane were removed by Fire service.</p> <p>A small rectangular culvert/bridge structure over the Brook, acts as a pinch point just upstream of the Ford crossing at the village Green, this structure is much older and much smaller than most vehicular accesses culverts in the general location.</p> <p>Worth noting that two private access roads off Grove Rd, orientated perpendicular to main flow path acted as a retaining structure, holding back flooding until the wall failed structurally.</p>	
<p>Surface water runoff across saturated land also added to the problem, this was observed coming off fields to the west of Grove Rd and entering private drives. The poor siting of road gullies in Grove Rd also meant that runoff was not being intercepted and drained off into the watercourse but instead flow overland via private drives towards property thresholds.</p>	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review maintenance responsibilities for the Grove 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 and A143. Update records to include all local drainage infrastructure, if information is missing on assets these should be located and surveyed. Area includes from Rushall and Brockdish hall to Hall Rd/ Grove Road junction. This was changed by the construction of the A143 and should be reviewed against modern design guidelines.	NCC (Highways)	6 months
NCC Highway to put consideration to flow attenuation from the A143 system and the two 750mm large culverts that drain the A143 to outfall.	NCC (Highways)	12 – 24 months
Same existing twin 750mm outfall structure at the Grove Road/Hall Rd junction, that was partially blocked on the night, is unsafe for clearance and recommend a new pre-cast unit with headwall and wingwalls. Safety railing (or chain links) and work area to be added to allow for safe clearance works and protection of the riverbanks from erosion (via wingwalls).	NCC (Highways)	12 – 24 months
Review access arrangements for inspection and maintenance along the Brook through private property. Riparian owners to consider a two-stage channel which would add flood flow capacity and a shelf to improve maintenance access, some reduction in flood risk due to additional storage but would require space.	NCC (LLFA) and Landowners	6 months
Riparian owners to clear watercourses (open and/or piped) through areas of concern particularly downstream of A143 Bridge Crossing in Grove Rd. Ensures sufficient capacity and reduction of blockage potential likely to cause reduced conveyance and breaches.	Landowners	6 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>Advise residents of Property Level Resilience measures and funding opportunities.</p> <p>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.</p>	NCC (LLFA)	Ongoing
<p>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.</p> <p>Riparian owners to consider increasing size of piped watercourses and/or providing additional surface water storage that may currently act as a constriction. This only works if done end to end and that involves highways asset as the culvert under Scole Road and the Ford is their responsibility.</p>	<p>NCC (LLFA and Highways)</p> <p>NCC (LLFA and Highways) and Homeowners.</p>	12 months
<p>NCC to investigate and seek opportunities for partnership funding to deliver a capital scheme which aims to increase standard of protection in Grove Rd. Works recommended include: -</p> <ol style="list-style-type: none"> 1) Natural Flood Management Scheme to harness in-channel storage upstream of Grove Rd. 2) Improve conveyance of channels through widening, straightening and regrading – section through the Green to Scole Rd culvert needs attention. 3) Retrofit SuDS (attenuation) on the A143 drainage system that outfalls into the Brook at Hall Rd Junction. 	<p>NCC (LLFA)</p> <p>NCC (Highways)</p>	12- 24 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
NCC to work with Natural England's Catchment Sensitive Farming Officer for the area to educate farmers and land owners about water management on their field and provide advice and grant support to reduce water and air pollution from agriculture.	Natural England/NCC	12 months

Flooding and flood risk in the High Green Catchment (Brooke)



Description of catchment

This very small rural catchment flows north east and then east into a watercourse south of the village of Brooke before outfalling into the River Chet.

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 30year event and the 1 in 100year 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
[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 Brooke

Within Brooke 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 High Green, Brooke. This incident was reported by <ul style="list-style-type: none"> • a resident via an online flood report form on the 19/01/2021, (FWF/21/3822) 	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 Lead Local Flood Authority has no previous reports of internal flooding on High Green, Brooke.

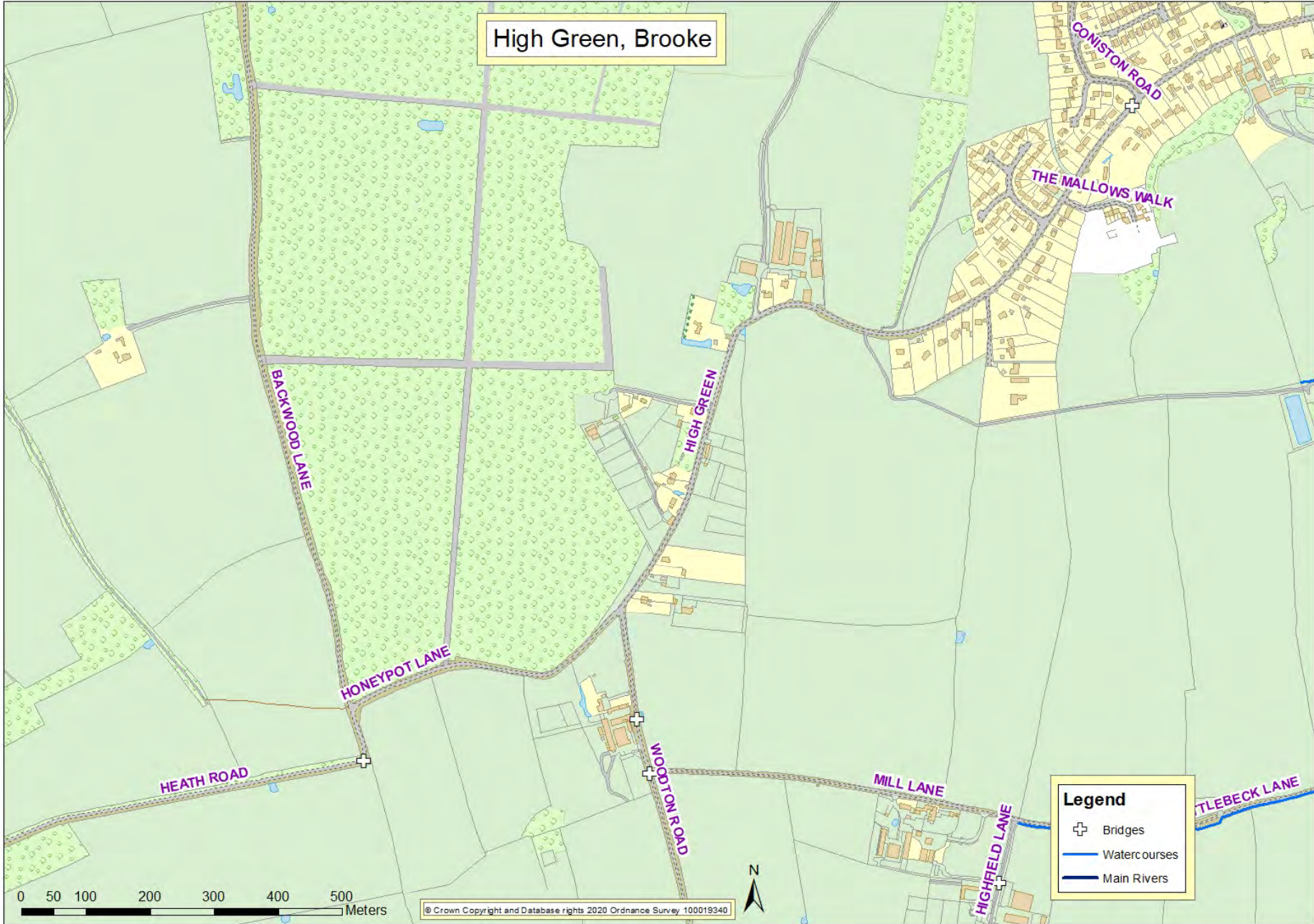
Causes of flooding within the catchment and recommendations

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.



High Green, Brooke

Legend

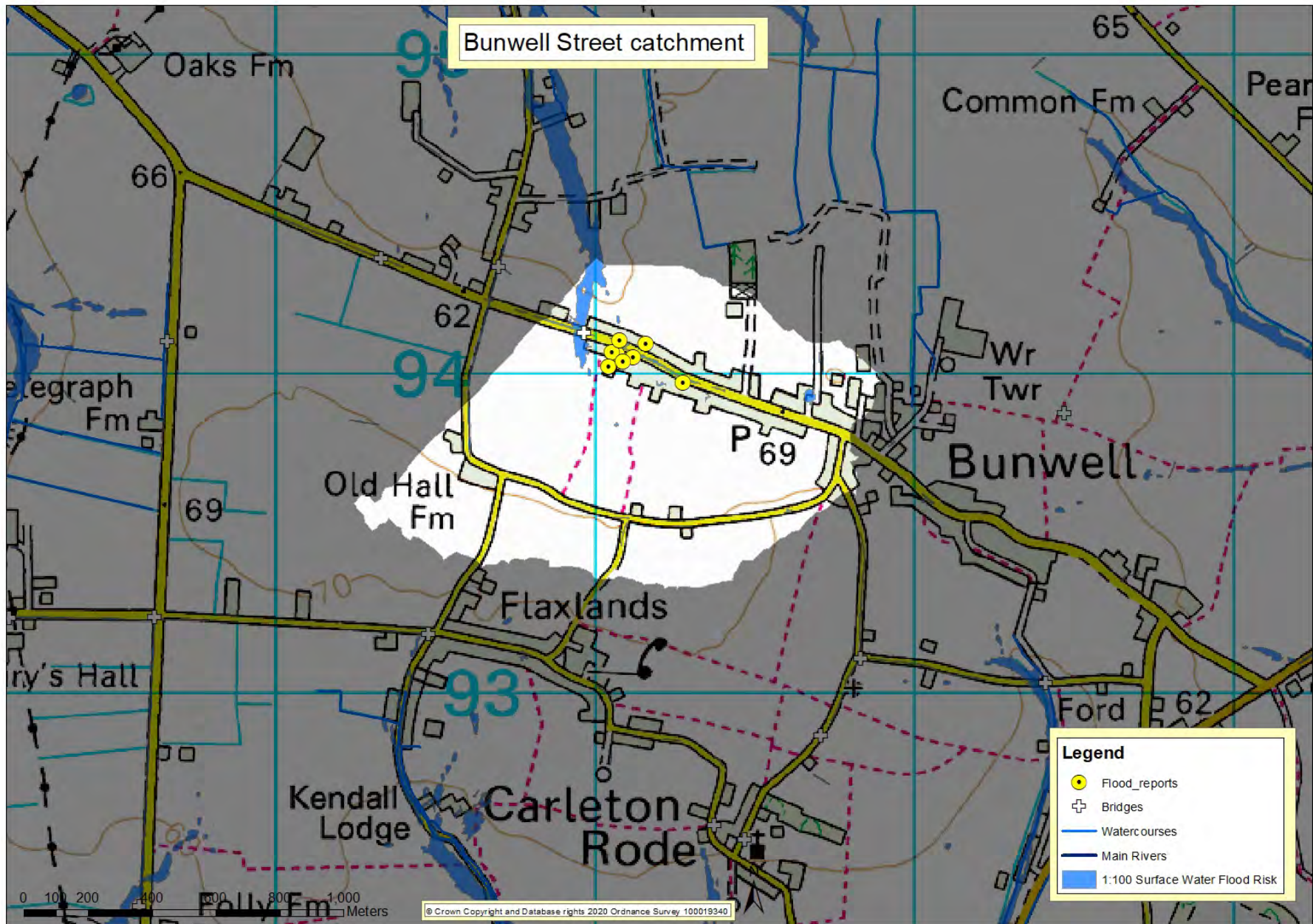
- ⊕ Bridges
- Watercourses
- Main Rivers

0 50 100 200 300 400 500 Meters

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Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels (See Figure 1 for catchment area).</p> <p>Due to the saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the local watercourses</p> <p>Surface run-off from rainfall flowed off adjacent fields and towards natural lows/areas of flooding.</p>	
<p>Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned on/adjacent to.</p>	<p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water</p> <p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>
<p>The volume of flooding into High Green and surrounding areas may have been exacerbated by the road culvert restricting flow under the highway where the watercourse flows west to east from private access road.</p>	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>
<p>The flood water entered the properties through low thresholds at entrances/the air bricks.</p>	
<p>Partial blockages were identified at several locations along Watercourse, especially downstream of Upper Street. 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.</p>	<p>NCC (LLFA) and Landowners</p>

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
Review access arrangements for inspection and maintenance of watercourses.	NCC (LLFA)	6 months
<p>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.</p> <p>Asset owner or Riparian owners to consider reinstating and/or increasing size of piped watercourses and/or providing additional surface water storage that may currently offset constrictions.</p>	<p>NCC (LLFA) NCC (Highways)</p>	12 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.	<p>Riparian Landowners NCC (Highways)</p>	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



Bunwell & Carleton Rode

Description of catchment

This section of the upper Tiffey catchment is largely rural with small scattered settlements. Flows emanate from open land south of Bunwell and pass through ditches, culverts and watercourses in a northerly direction to Spooner Row and the main River Tiffey.

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 event and the 1 in 100 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 event:	0	0	0
[b] Number of properties subject to surface water flood risk at 1 in 100 event:	0	10	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 event:	0	0	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 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 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 event:	0	0	0

Flood incidents within this catchment

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

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	<p>On the 23/12/2020 - 4 properties were internally flooded on Bunwell Street, Bunwell. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via email correspondence on the 22/01/2021, (FWF/21/3899) • a resident via an electronic report on the 24/01/2021, (FWF/21/3884) • a resident via email correspondence on the 22/01/2021, (FWF/21/3906) • a resident via an electronic report on the 22/01/2021, (FWF/21/3881) 	<p>Residents carried out measures to minimise the impact of flooding during the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.</p>
	<p>On the 23/12/2020 - 4 properties were internally flooded on Bunwell Street, Carleton Rode. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via email correspondence on the 18/01/2021, (FWF/21/3905) • a resident via email correspondence on the 22/01/2021, (FWF/21/3903) • a resident via email correspondence on the 22/01/2021, (FWF/21/3902) • a resident via email correspondence on the 22/01/2021, (FWF/21/3900) 	<p>Residents carried out measures to minimise the impact of flooding during the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.</p>

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Bunwell or Carleton Rode.

Causes of flooding within the catchment and recommendations

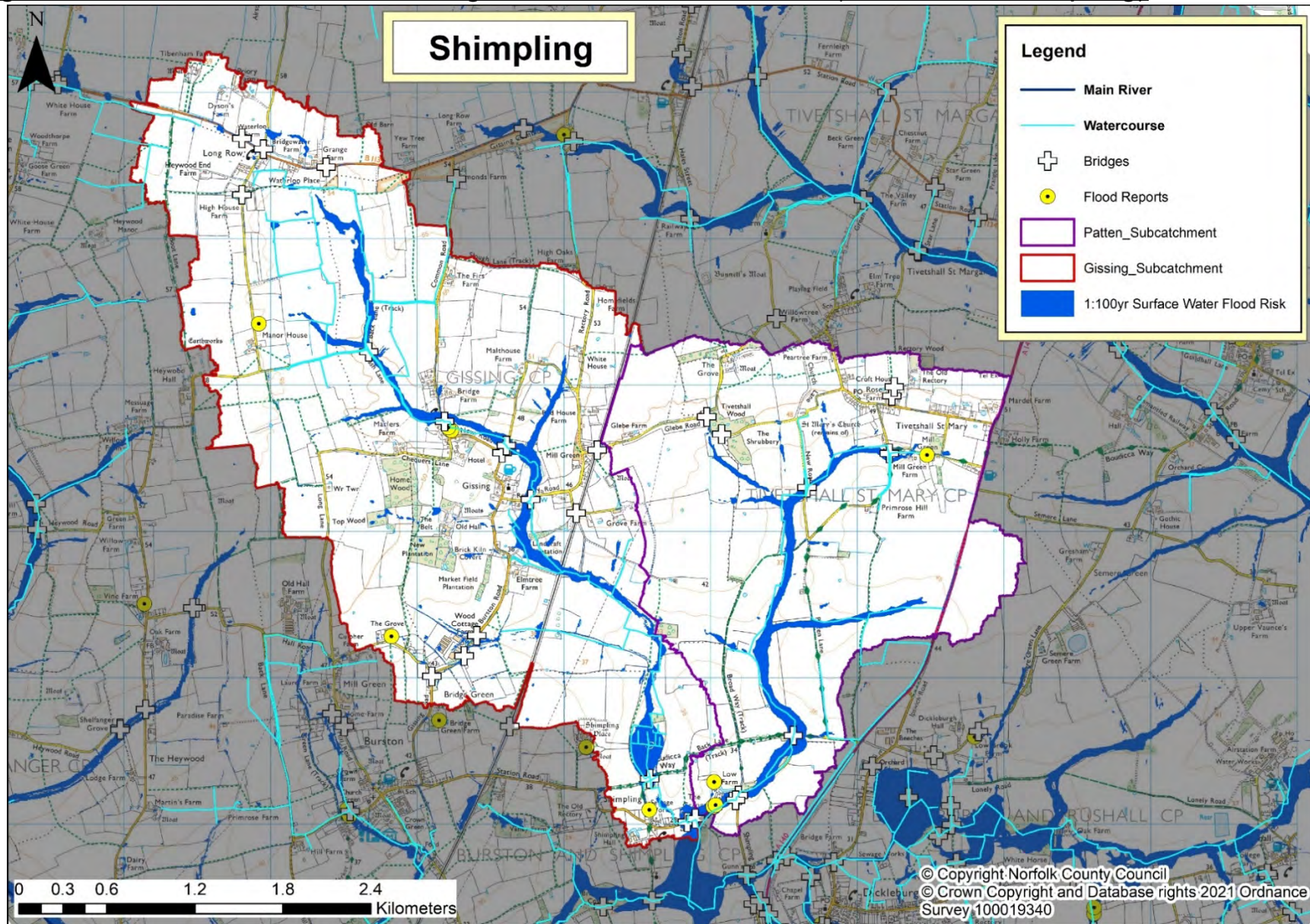
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the 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?
<p>Bunwell Street</p> <p>Bunwell and Carleton Rode</p> <p>23/12/2020</p>	<p>Surface run-off from prolonged rainfall flowed off adjacent fields towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded and requiring maintenance. This caused the watercourse to overtop and directed water towards the affected properties.</p> <p>The culverting of pre-existing drainage features (watercourses and ditches) within the catchment exacerbated the flooding.</p> <p>Run-off from prolonged rainfall was directed towards individual property drainage. These flows could not be accommodated as the system is of insufficient capacity to deal with this amount of water. This directed flood water towards the affected properties.</p> <p>The flood water entered the properties through low thresholds at entrances and/or the air bricks.</p> <p>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.</p>	<p>Norfolk County Council and property owners could confirm, where possible, the existence of any connections to a wider drainage network. This work should seek to confirm where the drainage network conveys flows to.</p> <p>The property owners should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency.</p> <p>Norfolk County Council will review the capacity & level of maintenance required to sustain the design efficiency of their drainage systems that serve the location in line with the risk identified.</p> <p>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.</p>	<p>Landowners (Riparian)</p> <p>Norfolk County Council</p>

Flooding and flood risk within the Gissing and Patten catchments (Burston & Shimpling)



Description of Gissing sub- catchment

Small headwater catchment (10km²) that flows North West to South East from Gissing. This watershed joins up with the Patten subcatchment in Shimpling before heading towards Frenze. The catchment is largely rural except for settlements of Gissing and Bridge Green. Main risk areas are Upper Street, Gissing and Dickleburgh Rd in Shimpling.

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	2	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	2	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 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 - 1 property was internally flooded on Burston Road, Burston and Shimpling. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 14/01/2021, (FWF/21/3752)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

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 Hall Lane, Burston and Shimpling. These incidents were reported by <ul style="list-style-type: none"> • a resident via an online flood report form on the 23/12/2020, (FWF/20/3741) • a resident via an online flood report form on the 21/07/2021, (FWF/2) 	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.
24/12/2020	On the 24/12/2020 - 1 property was internally flooded on Heywood End, Burston and Shimpling. This incident was reported by <ul style="list-style-type: none"> • South Norfolk District Council via an email communication on the 09/02/2021, (FWF/21/4181) 	

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

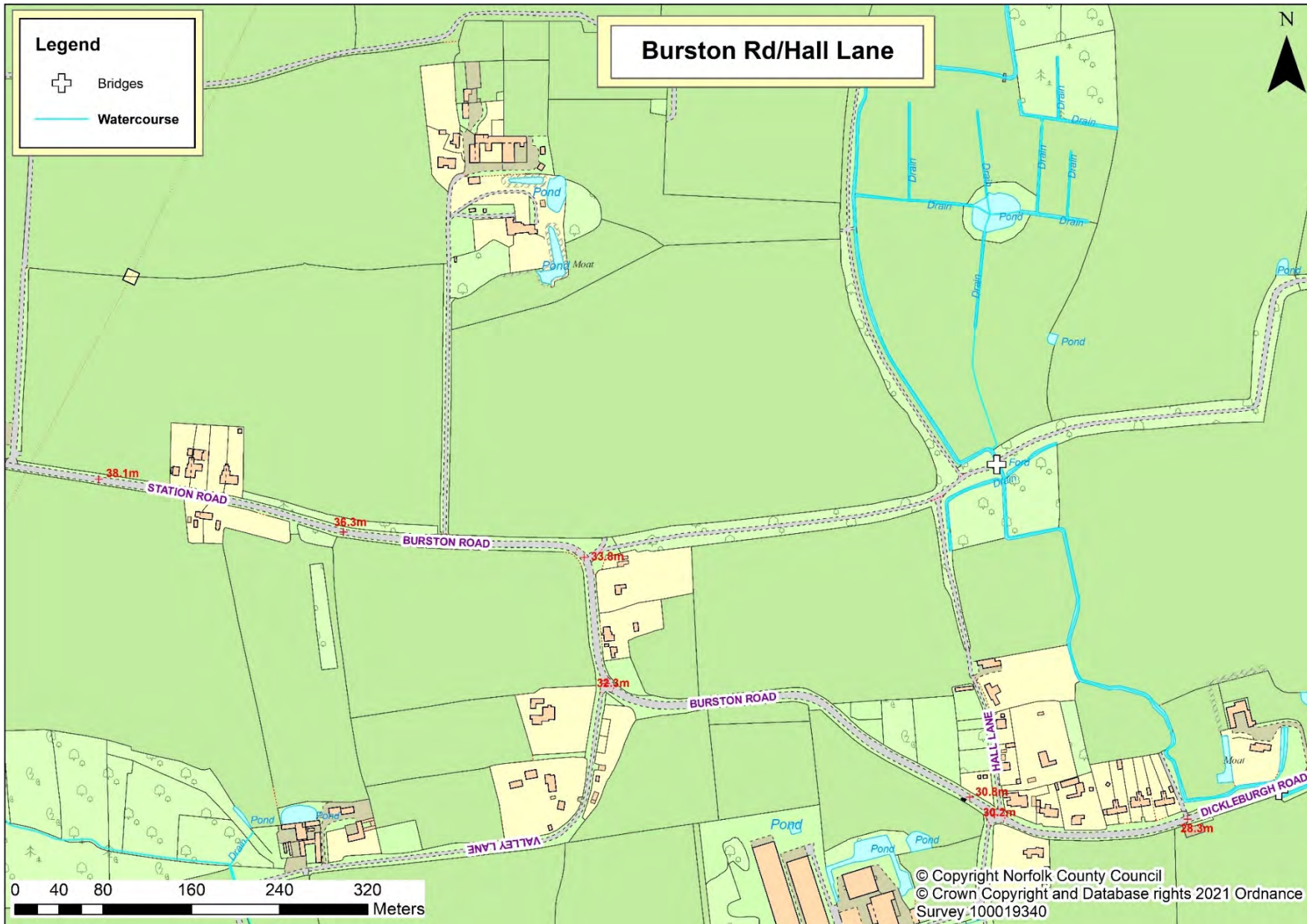
The Lead Local Flood Authority has no previous reports of internal flooding on Hall Lane or Burston Road, Burston and Shimpling.

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.



Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels (See Figure 1 for catchment area).</p> <p>Due to the saturation of soils localised ground conditions caused rainfall to generate large volumes of surface run-off. This flowed off adjacent fields and onto private tracks and f directed quickly towards natural lows/areas of flooding.</p>	
<p>Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned on/adjacent to.</p>	<p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water</p> <p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>
<p>The flood water entered the properties through low thresholds at entrances/the air bricks.</p>	

Recommendation	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 access arrangements for inspection and maintenance of watercourses.	NCC (LLFA)	6 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 NCC (Highways)	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

Recommendation	Who has responsibility to follow up the recommendation?	Timescales
<p>Norfolk County Council will investigate with third parties on developing a partnership funding solution to mitigate the risk experienced at this location.</p> <p>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.</p> <p>Works recommended include:-</p> <ol style="list-style-type: none"> 1) Improve conveyance of watercourses through widening, straightening and regrading – possibly even reconnecting with natural floodplain by allowing fields on the southern side of Patten Watercourse to flood more widely. 2) New areas of Storage upstream towards Gissing (additional areas of floodplain) that have multifunctional benefits (i.e. wetland) <p>Seek small scale works like NFM measures along main flow paths to restrict or deflect runoff volumes from key receptors. Measures like field corner bunds or RAFs (Runoff Attenuation Features) are worth exploring with local landowners.</p>	<p>NCC (LLFA) NCC (Highways) Riparian Landowners</p>	<p>12- 36 months</p>

Description of Patten sub- catchment

Small headwater catchment (6km²) that flows North to South from Tivetshall. This watershed joins up with the Gissing Catchment in Shimpling before heading towards Frenze. The catchment is largely rural. Main risk areas are Dickleburgh Rd in Shimpling.

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	4	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 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
23/12/2020	<p>On the 23/12/2020 - 2 properties were internally flooded on Low Common, Burston and Shimpling. These incidents were reported by:</p> <ul style="list-style-type: none">• a resident via an online flood report form on the 15/01/2021, (FWF/21/3769)• a resident via an online flood report form on the 16/01/2021, (FWF/21/3802)	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>

Date of Incident	Incident as reported	What was the response to the flood incident
	<p>On the 23/12/2020 - 4 properties were internally flooded on Pug Street, Burston and Shimpling. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 23/12/2020, (FWF/20/3726) • a resident via an online flood report form on the 21/07/2021, (FWF/21/5326) • a resident via an online flood report form on the 21/07/2021, (FWF/21/5316) • a resident via an online flood report form on the 28/07/2021, (FWF/21/5322) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>

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 Lead Local Flood Authority has no previous reports of internal flooding on Low Common or Pug Street, Shimpling.

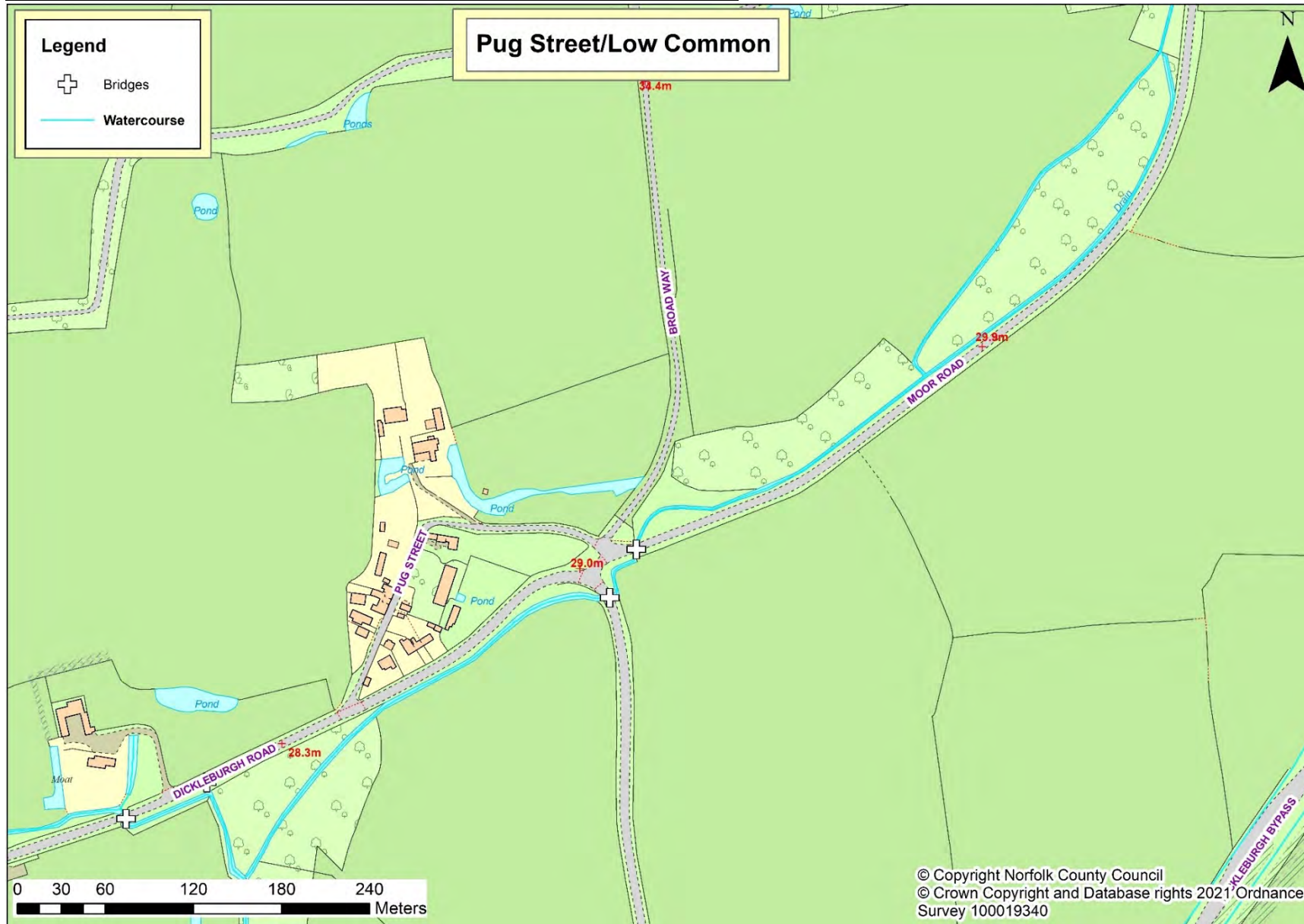
Causes of flooding within the catchment and recommendations

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.

Pug Street/Low Common – Burston and Shimpling – 23/12/2020



Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels (See Figure 1 for catchment area).</p> <p>Due to the saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the local watercourses</p> <p>Surface run-off from rainfall flowed off adjacent fields and towards natural lows/areas of flooding.</p>	
<p>Local observations witnessed local watercourses breaching and leading to the flooding observed in Pug Street/Low Common during the event on the 23rd Dec.</p> <p>1) The Patten Watercourse was overtopping its bank(s) alongside Dickleburgh Rd and Moor Rd leading to fast moving flood water in the road and private land flowing SE through Shimpling. The road acted as conduit and essentially became the Patten watercourse.</p> <p>2) Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned on/adjacent to.</p> <p>3) Significant rainfall and flooding from ordinary watercourses was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties.</p>	<p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water</p> <p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>
<p>The volume of flooding into Dickleburgh Rd and surrounding areas may have been exacerbated by the Dickleburgh road culvert restricting flow through this section of the Patten watercourse near Pug Street.</p>	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>

Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>The surface water drainage system network was likely hydraulically obstructed by high flood flows in the Patten watercourse. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties. Road gullies were also noted to be heavily silted however this was observed post event.</p>	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p> <p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water.</p>
<p>The flood water entered the properties through low thresholds at entrances/the air bricks.</p>	
<p>Partial blockages were identified at several locations along Patten Watercourse, especially downstream of Upper Street. 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.</p>	<p>NCC (LLFA) and Landowners</p>

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
Review access arrangements for inspection and maintenance of watercourses.	NCC (LLFA)	6 months
<p>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.</p> <p>Asset owner or Riparian owners to consider reinstating and/or increasing size of piped watercourses and/or providing additional surface water storage that may currently offset constrictions.</p>	<p>NCC (LLFA) NCC (Highways)</p>	12 months
<p>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.</p>	NCC (LLFA)	6 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>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.</p>	<p>Riparian Landowners NCC (Highways)</p>	<p>12 months</p>
<p>Norfolk County Council will investigate with third parties on developing a partnership funding solution to mitigate the risk experienced at this location.</p> <p>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.</p> <p>Works recommended include:-</p> <ol style="list-style-type: none"> 3) Improve conveyance of watercourses through widening, straightening and regrading – possibly even reconnecting with natural floodplain by allowing fields on the southern side of Patten Watercourse to flood more widely. 4) New areas of Storage upstream towards Gissing (additional areas of floodplain) that have multifunctional benefits (i.e. wetland) 5) Assess whether Dickleburgh Rd culvert is fit for purpose. 	<p>NCC (LLFA) NCC (Highways) Riparian Landowners</p>	<p>12- 24 months</p>

Flood incidents within Burston & Shimpling outside of catchments

Within Burston and Shimpling 3 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	On the 23/12/2020 - 2 properties were internally flooded on Diss Road, Burston and Shimpling. These incidents were reported by <ul style="list-style-type: none">• a resident via an email communication on the 01/02/2021, (FWF/21/4040)• a resident via an online flood report form on the 31/12/2020, (FWF/20/3608)	<ul style="list-style-type: none">• Norfolk County Council assessed the validity and impacts of the flood report.• A resident carried out measures to minimise the impact of flooding after the incident.
03/02/2021	On the 03/02/2021 - 1 property was internally flooded on Gissing Road, Burston. This incident was reported by <ul style="list-style-type: none">• a resident via an online flood report form on the 08/02/2021, (FWF/21/4069)	<ul style="list-style-type: none">• Norfolk County Council assessed the validity and impacts of the flood report.• A resident carried out measures to minimise the impact of flooding after the incident.

Recent rainfall within the catchment

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

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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 Lead Local Flood Authority has no previous reports of internal flooding in Dickleburgh and Rushall.

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?
<p>Diss Road Burston and Shimpling 23/12/2020</p>	<p>Surface run-off from rainfall flowed off adjacent fields into the ordinary watercourse. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected properties.</p> <p>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.</p>	<p>Local landowners and 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.</p> <p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them 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.</p>	<p>Local landowners Riparian owners Property owners Norfolk County Council (LLFA)</p>
<p>Gissing Road Burston and Shimpling 03/02/2021</p>	<p>Run-off from rainfall pooled at a low point within the catchment affecting property. Water was unable to escape due to overwhelmed drainage ditches and ponds.</p> <p>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.</p>	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them 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.</p>	<p>Property owners Norfolk County Council (LLFA)</p>

Flooding and flood risk within Dickleburgh and Rushall



Flood incidents within Dickleburgh and Rushall

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	<p>On the 23/12/2020 - 1 property was internally flooded on Langmere Road, Dickleburgh and Rushall. This incident was reported by</p> <ul style="list-style-type: none"> a resident via an online flood report form on the 11/03/2021, (FWF/21/4325) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on Semere Green Lane, Dickleburgh and Rushall. This incident was reported by</p> <ul style="list-style-type: none"> a resident via email correspondence on the 1/02/2021, (FWF/21/4100) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on The Street, Dickleburgh and Rushall. This incident was reported by</p> <ul style="list-style-type: none"> a resident via email correspondence on the 19/01/2021, (FWF/21/3843) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on Harleston Road, Dickleburgh and Rushall. This incident was reported by</p> <ul style="list-style-type: none"> a resident via an online flood report form on the 8/01/2021, (FWF/21/3634) 	<p>Norfolk County Council (Highways) identified the need to renew [or replace] the existing drainage scheme that serves the flooding location after the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	<p>On the 23/12/2020 - 2 properties were internally flooded on Lakes Road, Dickleburgh and Rushall. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 7/01/2021, (FWF/21/3630) • a resident via personal communication on the 29/12/2020, (FWF/20/3336) 	<p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.</p> <p>The landowner identified the need to renew [or replace] the existing drainage scheme that serves the flooding location after the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>

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 Lead Local Flood Authority has no previous reports of internal flooding in Dickleburgh and Rushall.

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.

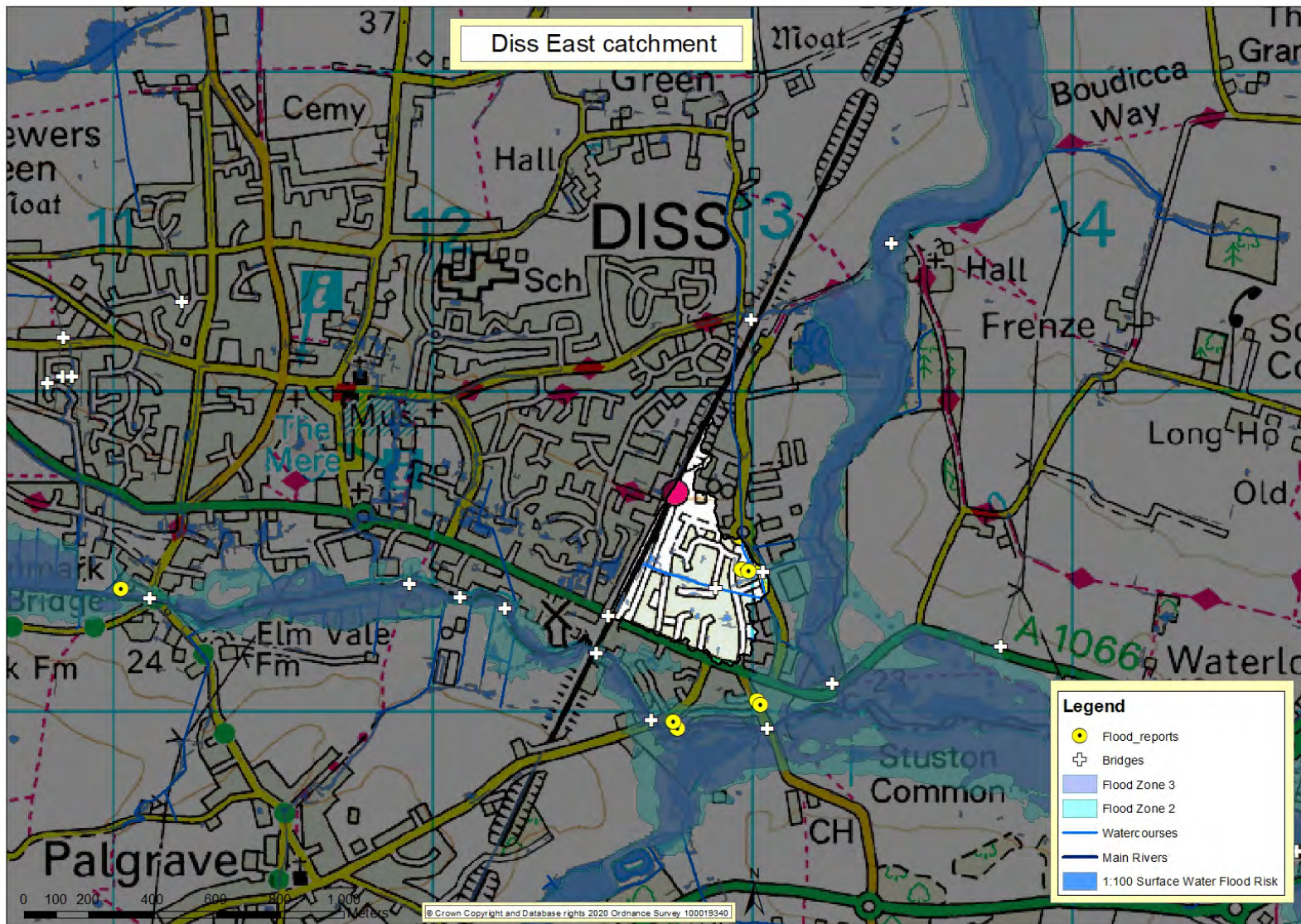
- NCC should
 - incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment (“PFRA”).
 - review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Langmere Road Semere Green Lane The Street Harleston Road Lakes Road Dickleburgh and Rushall, 23/12/2020	<p>Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned on.</p> <p>The flood water entered properties both through external doors and from seepage through the ground. Some of the properties have low thresholds and water entered via this route.</p>	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 (LLFA) and Property Owners
Harleston Road Lakes Road Dickleburgh and Rushall, 23/12/2020	<p>Run-off from significant rainfall was obstructed by debris and silt which directed flood water towards the affected properties.</p> <p>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.</p>	Norfolk County Council should advise the riparian owners of their responsibilities and ensure they carry out a maintenance regime in line with the risk identified and communicate with affected parties.	Norfolk County Council (LLFA)

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
<p>The Street</p> <p>Harleston Road</p> <p>Lakes Road</p> <p>Dickleburgh and Rushall, 23/12/2020</p>	<p>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.</p>	<p>Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.</p>	<p>Norfolk County Council (Highways)</p>
<p>Langmere Road</p> <p>Semere Green Lane</p> <p>Lakes Road</p> <p>Dickleburgh and Rushall, 23/12/2020</p>	<p>The watercourse drainage network was partially obstructed by debris or silt and high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p>	<p>Norfolk County Council will identify and communicate with the landowner/riparian owners to instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves/roots) at all times.</p>	<p>Norfolk County Council (LLFA)</p>
<p>Langmere Road</p> <p>Semere Green Lane</p> <p>The Street</p> <p>Lakes Road,</p> <p>Dickleburgh and Rushall, 23/12/2020</p>	<p>Surface run-off from significant rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features.</p> <p>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.</p>	<p>Norfolk County Council will investigate with third parties the potential for retrofitting permeable areas and other methods of small scale sustainable drainage systems</p>	<p>Norfolk County Council (LLFA)</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Langmere Road Dickleburgh and Rushall, 23/12/2020	The loss of pre-existing drainage features (such as drains, dykes, ditches, ponds, culverts) within the catchment exacerbated the flooding.	Landowners/property owners could confirm, where possible, the existence of any connections to a wider drainage network. This work should seek to confirm where the drainage network conveys flows to.	Landowners Property owners

Flooding and flood risk within the Diss East catchment



Description of catchment

The urban catchment flows east via a network of surface water sewers and open watercourses, before connecting to Frenze Beck. The area has been recently re-developed with residential buildings.

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	3	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	15	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
[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 9 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	<p>On the 24/12/2020 - 4 properties were internally flooded on Stuston Road, Diss. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 21/01/2021, (3722) • a resident via an online flood report form on the 23/03/2021, (4240) • a resident via an online flood report form on the 18/01/2021, (3815) • a resident via an online flood report form on the 9/01/2021, (3698) 	<p>The Fire and Rescue Service visited affected residents to offer advice and to gather information during the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
24/12/2020	<p>On the 24/12/2020 - 1 property was internally flooded on Riverside, Diss. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 22/03/2021, (4387) 	<p>Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report after the incident.</p>
24/12/2020	<p>On the 24/12/2020 - 3 properties were internally flooded on Mission Court, Diss. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 23/05/2021, (4769) • a resident via an online flood report form on the 19/01/2021, (3831) • a resident via an online flood report form on the 21/01/2021, (3803) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on Mission Court, Diss. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 24/05/2021, (4768) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>

Recent rainfall within the catchment

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

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Stuston Road, Rivendale or Mission Court, Diss.

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.

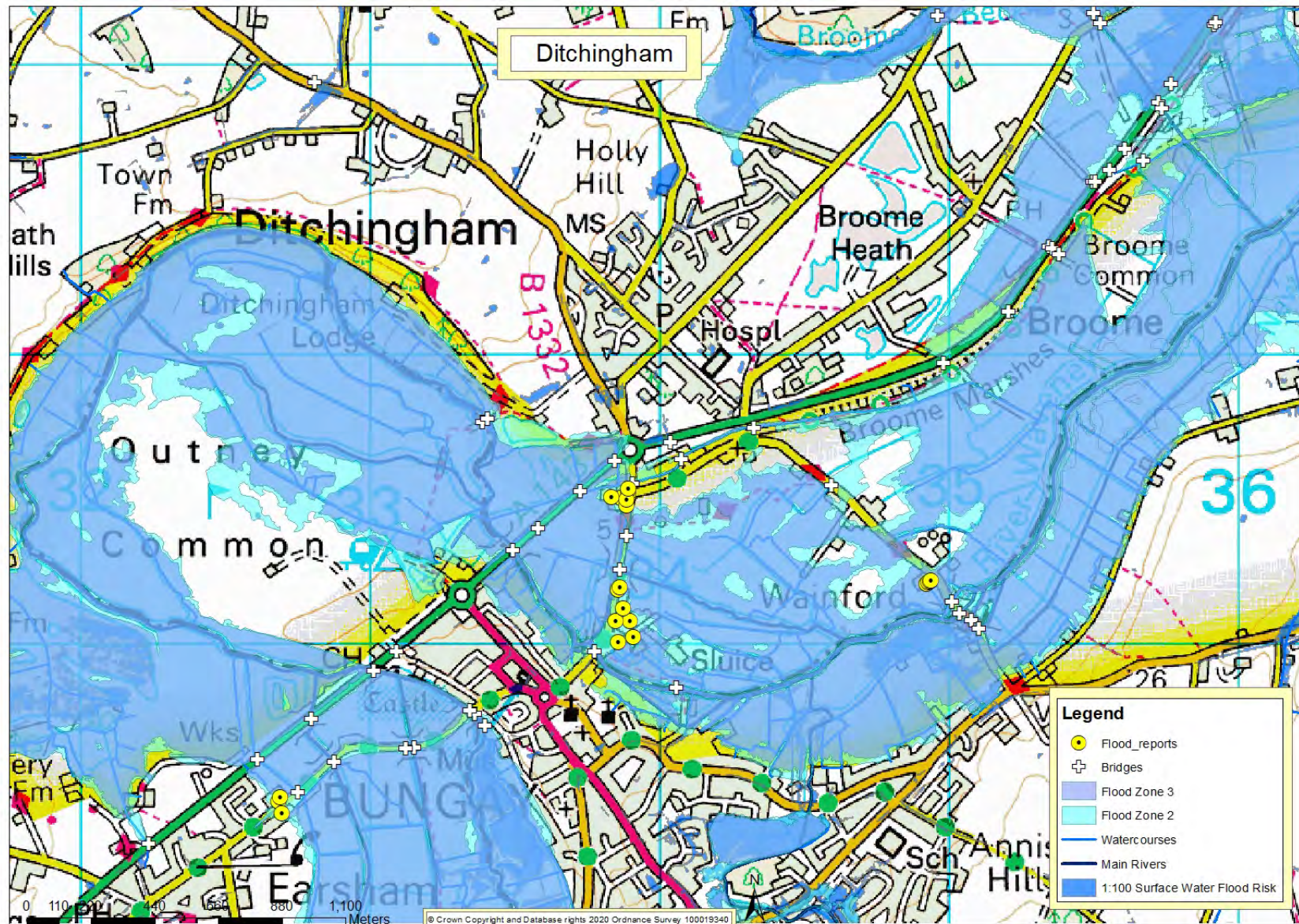
Following flooding to people, property and infrastructure

- 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?
<p>Mission Court</p> <p>Diss</p> <p>24/12/2020 & 23/12/2020</p>	<p>Surface run-off from rainfall made its way onto highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features.</p> <p>Water was directed from a neighbouring property by their car park towards the affected properties.</p> <p>Run-off from rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected properties.</p> <p>The flood water entered the properties through the air bricks.</p> <p>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.</p>	<p>Amendments should be made to neighbouring properties to ensure water is not directed to other properties. Owners should consider the potential to retrofit permeable areas and other methods of small scale sustainable drainage systems.</p> <p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them how they may apply for grants available. These grants are subject to a funding application.</p> <p>Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.</p>	<p>Property owners</p> <p>Neighbouring property owners</p> <p>Norfolk County Council</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
<p>Stuston Road</p> <p>Riverside</p> <p>Diss</p> <p>24/12/2020</p>	<p>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 high levels of debris. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>The flooding may have been exacerbated by high-water levels (flood flows) in the watercourse which was especially high. This may have caused the performance of other systems to decrease.</p> <p>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.</p>	<p>Environment Agency will communicate with local residents of properties known to have flooded internally to investigate options for managing flood risk. This may need to be dependent on those property owners affected contributing towards a solution. Alternatively property owners could carry out their own measures where funding is not forthcoming or residents are unwilling to wait.</p> <p>The EA will use their updated flood risk model of the River Waveney to help improve their understanding of flood risk in Diss</p>	<p>Environment Agency</p> <p>Property owners</p>

Flooding and flood risk within the Ditchingham catchment



Flood incidents within Ditchingham

Within this catchment 20 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
	<p>On the 24/12/2020 - 4 properties were internally flooded on Pirnhow Street, Ditchingham. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 2/02/ 2021, (/FWF/203746) • a resident via an online flood report form on the 2/02/2021, (FWF/20/3745) • a resident via an online flood report form on the 2/02/2021, (FWF/20/3744) • a resident via an online flood report form on the 2/02/2021, (FWF/21/3743) 	<p>The Fire and Rescue Service responded and pumped out during the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p> <p>The Fire and Rescue Service responded and pumped out during the incident.</p>
24/12/2020	<p>On the 24/12/2020 - 3 properties were internally flooded on Falcon Lane, Ditchingham. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 1/03/2021, (FWF/21/4249) • a resident via an online flood report form on the 1/042021, (FWF/21/4429) • a resident via an online flood report form on the 1/04/2021, (FWF/21/4413) 	<p>A resident carried out measures to minimise the impact of flooding after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p> <p>The Fire and Rescue Service responded and pumped out during the incident.</p>

Date of Incident	Incident as reported	What was the response to the flood incident
	<p>On the 24/12/2020 - 13 properties were internally flooded on Ditchingham Dam, Ditchingham. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via email correspondence on the 10/03/2021, (FWF/21/4315) • a resident via an online flood report form on the 3/03/2021, (FWF/21/4269) • a resident via an online flood report form on the 2/03/2021, (FWF/21/4267) • a resident via an online flood report form on the 1/03/2021, (FWF/21/4266) • a resident via an online flood report form on the 1/03/2021, (FWF/21/4260) • a resident via an online flood report form on the 28/02/2021, (FWF/21/4259) • a resident via an online flood report form on the 26/02/2021, (FWF/21/4258) • a resident via an online flood report form on the 26/02/2021, (FWF/21/4257) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p> <p>A resident visited affected residents to offer advice and to gather information after the incident.</p> <p>The Fire and Rescue Service responded and pumped out during the incident.</p>

Date of Incident	Incident as reported	What was the response to the flood incident
	<ul style="list-style-type: none"> • a resident via an online flood report form on the 2/02/2021, (FWF/21/4201) • a resident via an online flood report form on the 15/02/2021, (FWF/21/4176) • a resident via an online flood report form on the 15/02/2021, (FWF/21/4374) • a resident via an online flood report form on the 1/04/2021, (FWF/21/4421) <p>a resident via an online flood report form on the 1/04/2021, (FWF/21/4418)</p>	

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

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

Date of incident	Impact	Rainfall intensity
2014	Ditchingham Dam	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

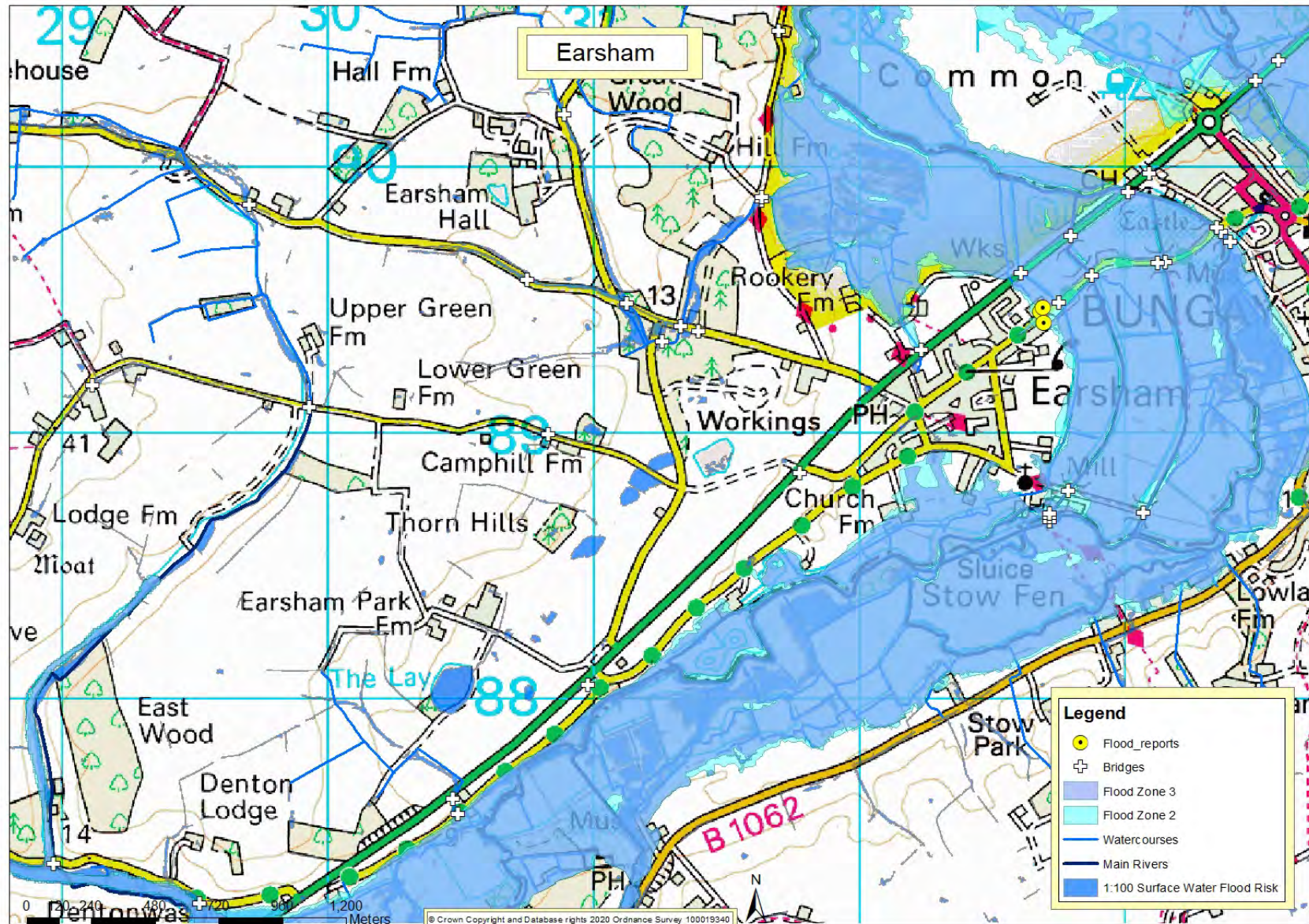
- Risk Management Authorities should
 - communicate with affected residents where their assets have given rise to the flooding of properties.
 - review the appropriateness of their response to flooding.
 - determine the integrity and/or capacity of their assets where they have contributed to the flooding 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?
Prinhow Street Ditchingham Dam Falcon Lane Ditchingham 24/12/2020	<p>A substantial amount of rain fell on the 23rd and 24th of Dec onto a catchment with prior high saturation levels.</p> <p>Ditchingham Dam and Falcon Lane are within either Flood Zone 2 or 3.</p> <p>Residents reported that over the course of the 24th December the water level within the floodplain opposite the houses kept on rising due to the prolonged rainfall event.</p> <p>Local observations reported that sluice gates were closed downstream or did not operate and this caused flood water from the River Waveney to 'back up' and flood properties at this location.</p>	<p>Review and confirm operational response for flood events of this calibre and associated drainage infrastructure and implement to a wider action plan.</p> <p>The EA will use their updated flood risk model of the River Waveney to help improve their understanding of flood risk in Ditchingham and the surrounding area. This modelling will help inform an 'Initial Assessment' to explore options to manage the flood risk, working with the community and our partners. Environment Agency will communicate with local residents of properties known to have flooded internally to investigate options for managing flood risk. This may need to be dependent on those property owners affected contributing towards a solution.</p>	Environment Agency

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
	<p>The Environment Agency have stated that ‘The cause of the flooding was the high water levels (flood flows) in the River Waveney. The transducer (that dictates when the Ditchingham sluice gates should move) was water damaged, which resulted in the gate closing. However water was already out of bank and bypassing the sluice structure at the time of the false closure due to the flood flows. As a result of water already bypassing the sluice and having inundated the floodplains, there will have been limited impact elsewhere, even with the gate closed.</p> <p>EA flood warning / alert systems were not issued in time.</p>	<p>Alternatively property owners could carry out their own measures where funding is not forthcoming or residents are unwilling to wait.”</p>	

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
<p>Ditchingham Dam</p> <p>Falcon Lane</p> <p>Ditchingham</p> <p>24/12/2020</p>	<p>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.</p>	<p>Review and improve partnership working between agencies to improve the response to flood events</p> <p>Support the development of flood groups/community groups which could include:</p> <ul style="list-style-type: none"> * having an emergency flood plan, * understanding surface water movement and riparian rights and responsibilities, * understanding the local drainage network and the ownership of different structures along the flowpath, * additional flood protection measures property owners could install and maintain * potential community action and parish support structures to help with the local management of informal flowpaths and * the wider issues of the causes and various ways of managing flooding. 	<p>Norfolk Resilience Forum,</p> <p>Norfolk County Council (LLFA)</p> <p>Environment Agency</p> <p>South Norfolk District Council</p>

Flooding and flood risk within the Earsham



Flood incidents in Earsham

Within Earsham 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	<p>On the 24/12/2020 - 4 properties were internally flooded on The Street, Earsham. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 19/04/2021, (4457) • a resident via an online flood report form on the 14/04/2021, (4453) • a resident via an online flood report form on the 28/04/2021, (4536) • a resident via an online flood report form on the 16/04/2021, (4455) 	<p>A resident carried out measures to minimise the impact of flooding during the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
24/12/2020	<p>On the 24/12/2020 - 1 property was internally flooded on Temple Bar, Earsham. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 25/12/2020, (3274) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p>

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Earsham.

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.

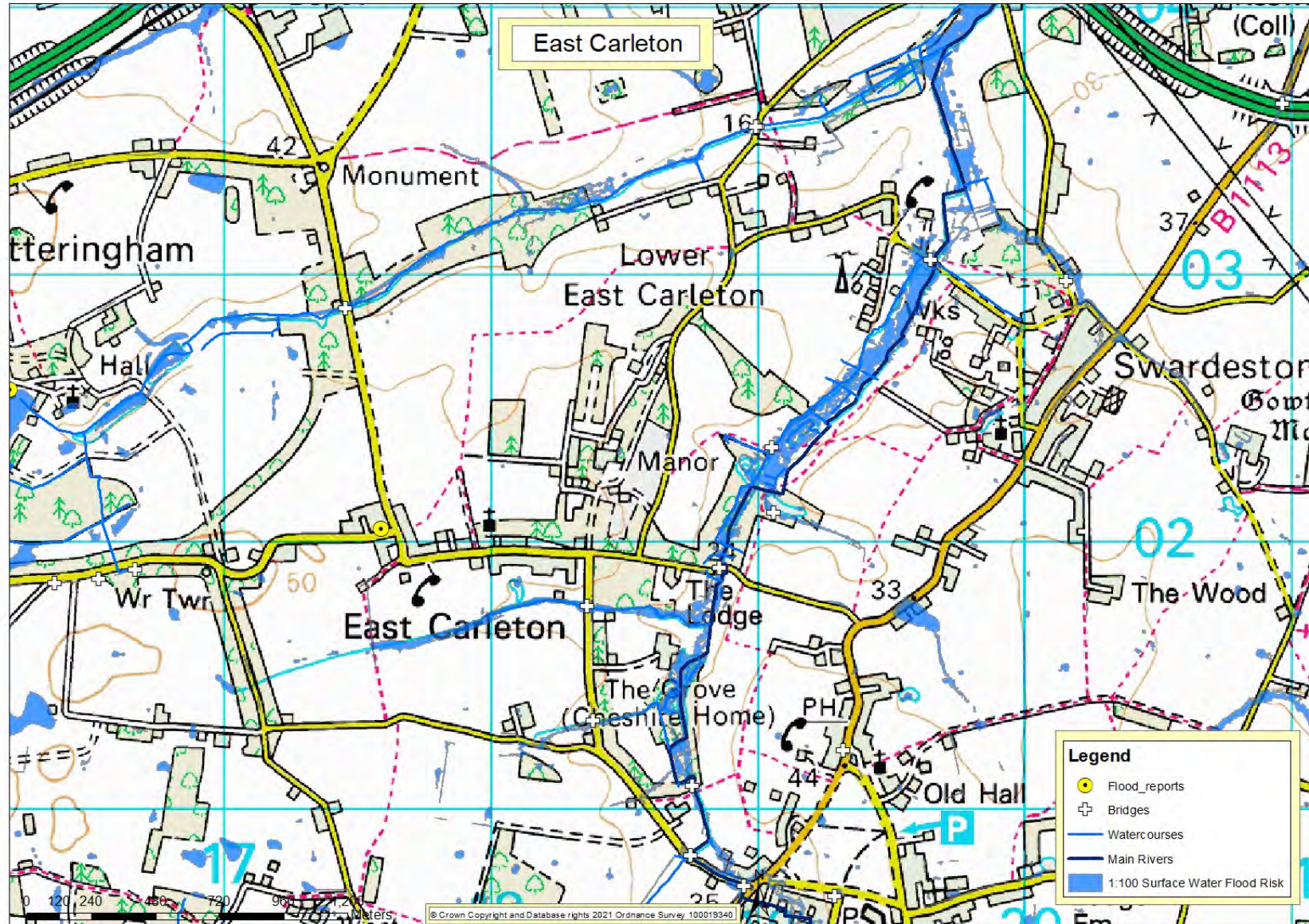
Following flooding to people, property and infrastructure

- 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?
<p>The Street 24/12/2020</p> <p>Temple Bar 24/12/2020</p> <p>Earsham</p>	<p>Surface run-off from rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features. Vehicles using the highway passed through the flood water further exacerbating the flooding. The watercourse was partially obstructed by debris and silt. This reduced the efficiency of the upstream drainage contributing to flooding at the affected properties.</p> <p>Run-off from rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was overloaded. This directed flood water towards the affected properties.</p> <p>Local observations witnessed a potential issue with water draining through a culvert under the A143.</p> <p>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.</p>	<p>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.”</p> <p>The EA will use their updated flood risk model of the River Waveney to help improve their understanding of flood risk in Earsham and the surrounding area. This modelling will help inform an ‘Initial Assessment’ to explore options to manage the flood risk, working with the community and our partners. The Environment Agency will communicate with local residents of properties known to have flooded internally to investigate options for managing flood risk. It may be dependent on those property owners affected contributing towards a solution</p>	<p>Norfolk County Council (Highways)</p> <p>Environment Agency</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
		<p>Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.</p> <p>Norfolk County Council will 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.</p> <p>Norfolk County Council should review the capacity & level of maintenance required for the culvert under the A143.</p>	

Flooding and flood risk within East Carleton



Flood incidents within this area

Within this area 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
	On the 23/12/2020 - 1 property was internally flooded on Wymondham Road, East Carleton. This incident was reported by <ul style="list-style-type: none">• a councillor via an email correspondence on the 05/01/2021, (3618)	The Fire and Rescue Service responded and pumped out 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 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated. There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Wymondham Road, East Carleton.

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.

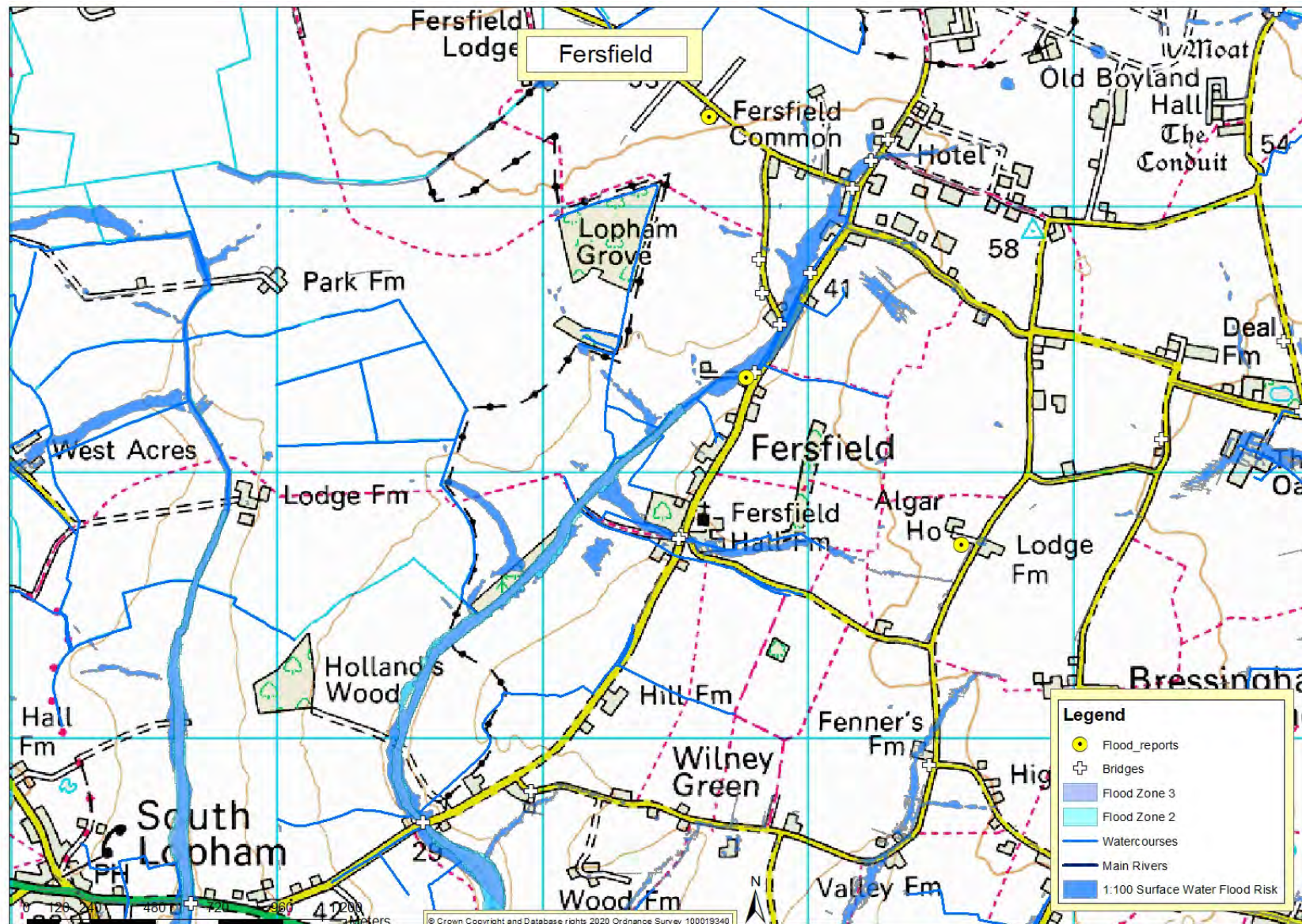
Following flooding to people, property and infrastructure

- 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?
<p>Wymondham Road East Carleton 23/12/2020</p>	<p>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. The surface water drainage system could not accommodate high flows as the system is of insufficient capacity to deal with this amount of water. This directed flood water towards the affected property.</p> <p>The surface water drainage system was partially obstructed by unconsented works downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected property.</p> <p>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.</p>	<p>Norfolk County Council should review the capacity of the drainage systems that they are discharging into. Norfolk County Council should consider opportunities to route flood water away from affected properties and undersized watercourses to alternative points of discharge, or other solutions as practicable. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.</p> <p>The downstream landowner should carry out works to allow free flow of water through their property.</p>	<p>Norfolk County Council Highways Local landowner</p>

Flooding and flood risk within Fersfield



Flood incidents within this area

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

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on The Common, Fersfield. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 09/02/2021, (3748)	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 The Street, Fersfield. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 15/02/2021, (4171)	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 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated. There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Fersfield.

Causes of flooding within the catchment and recommendations

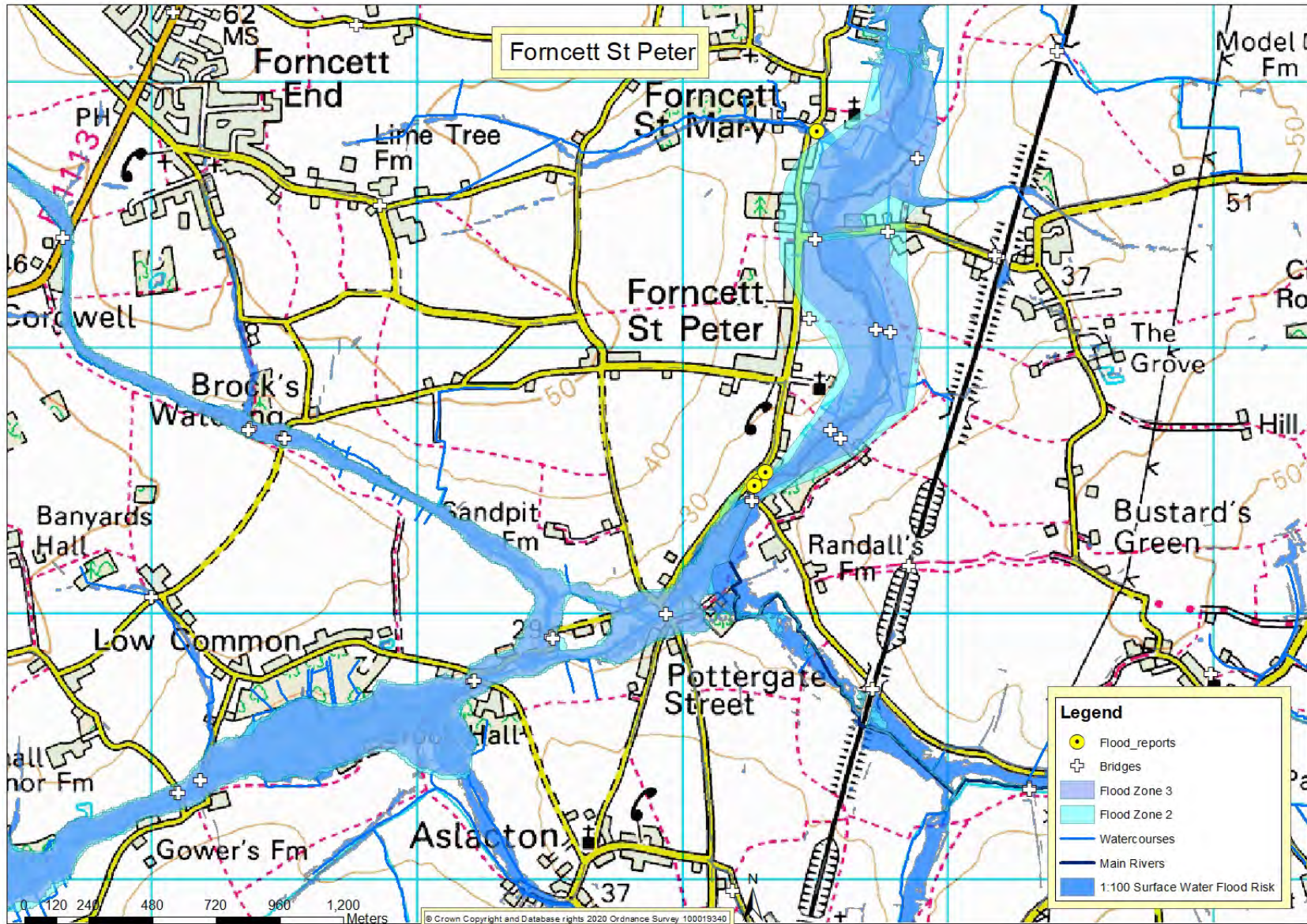
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the 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?
<p>The Street Fersfield 23/12/2020</p>	<p>Surface run-off from rainfall flowed off adjacent fields and made its way onto the highway then flowed along the road network into the surface water drainage network. These flows could not be accommodated as it was overloaded and partially obstructed by debris. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>The watercourse was partially obstructed by high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p>	<p>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</p>	<p>Norfolk County Council (Highways)</p>
<p>The Common Fersfield 23/12/2020</p>	<p>Surface run-off from rainfall flowed off adjacent fields and made its way onto the highway and flowed along the road network, through a highway drainage feature (Grip) which directed towards the access of affected property.</p>	<p>Norfolk County Council will determine if works are needed to remove the risk posed by drainage features that direct the flow towards property.</p>	<p>Norfolk County Council (Highways)</p>

Flooding and flood risk within Forncett St Peter



Flood incidents within Forncett St Peter

Within Forncett St Peter 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	<p>On the 23/12/2020 - 1 property was internally flooded on Low Road, Forncett. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 16/01/2021, (3805) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p>
	<p>On the 23/12/2020 - 4 properties were internally flooded on Aslacton Road, Forncett. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 21/01/2021, (3874) • a resident via email correspondence on the 21/01/2021, (3818) • a resident via an online flood report form on the 20/01/2021, (3771) • Norfolk County Council (Highways) via email correspondence on the 15/01/2021, (3767) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Norfolk County Council (Highways) carried out works on a bridge to remove railings that contributed to obstructing flow during the flood event.</p>

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.

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

Data from rain gauges located in Forncett has been analysed to ascertain the intensity of the rainfall events experienced in the catchment.

The rainfall events recorded by gauges for this catchment are:

23 December 2020 - 22mm of rainfall was recorded as falling in 7 hours 0 minutes at the Forncett End rainfall monitoring station. This intensity of rainfall for the total duration equates to a 2 year rainfall event.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Forncett.

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

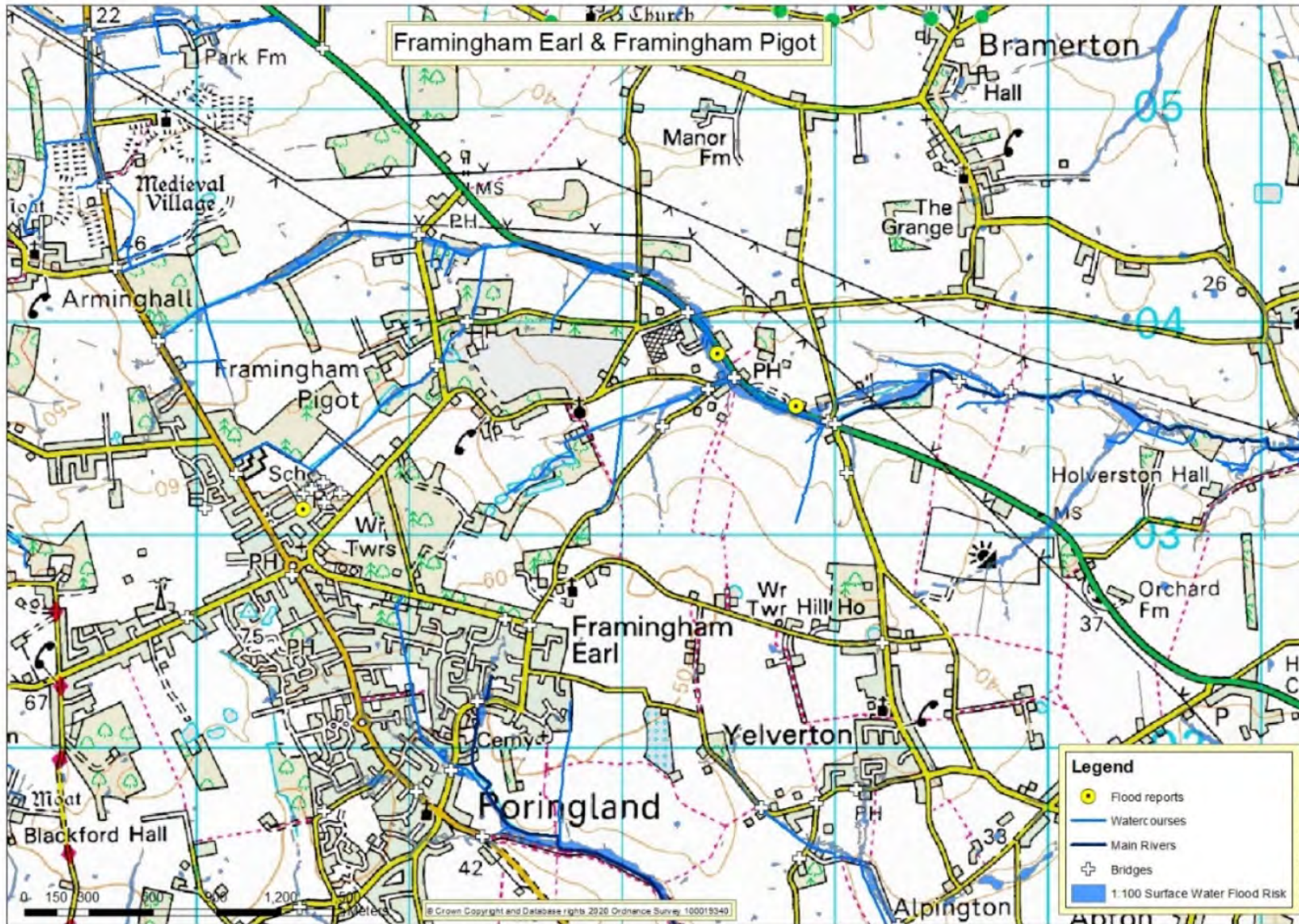
- Risk Management Authorities should
 - communicate with affected residents where their assets have given rise to the flooding of properties.
 - review the appropriateness of their response to flooding.
 - determine the integrity and/or capacity of their assets where they have contributed to the flooding 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?
<p>Low Road Aslacton Road, Forncett 23/12/2020</p>	<p>The river was partially obstructed by high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>There are multiple bridges and access points along the river that create pinch points for river flow during flood events.</p> <p>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.</p>	<p>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 obtain Flood Risk Activity Permits to maintain watercourses and EA to continue to take a risk based approach to its maintenance program.</p> <p>Norfolk County Council and the Internal Drainage Board should work with property owners to determine if works are needed to remove the risk posed by structures that form obstructions to flows.</p>	<p>Environment Agency</p> <p>Norfolk County Council (Highways)</p> <p>Internal Drainage Board</p> <p>Property owners</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
		<p>Works by riparian landowners to maintain a watercourse need to be carried out in a sensitive way so as to avoid harming the channel. De-silting and weed-cutting work needs to be well planned and carefully executed, and may require a permit from the Environment Agency or Internal Drainage Board. Works should avoid:</p> <ul style="list-style-type: none"> • Bed and bank material (e.g. gravel) being removed and deposited on the banks • Fish and other aquatic organisms being removed from the water (e.g. freshwater mussels) • Channels being stripped of all their in-stream vegetation 	

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
		<ul style="list-style-type: none"> • All woody debris being removed (e.g. fallen trees and branches) • Bare, steep earth banks that provide little wildlife habitat” <p>Environment Agency will communicate with local residents of properties known to have flooded internally to investigate options for managing flood risk. This may need to be dependent on those property owners affected contributing towards a solution. Alternatively property owners could carry out their own measures where funding is not forthcoming or residents are unwilling to wait.”</p>	

Flooding and flood risk within the Framingham catchment



Framingham Earl & Pigot

Flood incidents within this area

Within this area 3 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
24/12/2020	On the 24/12/2020 - 1 property was internally flooded on Oaklands, Framingham Earl. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 23/01/2021, (3977)	<ul style="list-style-type: none">A resident carried out measures to minimise the impact of flooding after the incident.Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.
24/12/2020	On the 24/12/2020 - 1 property was internally flooded on Loddon Road, Framingham Pigot. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 15/01/2021, (3740)	<ul style="list-style-type: none">Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Loddon Road, Framingham Pigot. This incident was reported by <ul style="list-style-type: none">a resident via email correspondence on the 4/03/2021, (4304)	<ul style="list-style-type: none">The Fire and Rescue Service responded and pumped out during the incident.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 2.5 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.

Whilst there is a rain gauge at this location the station only provides a daily total and not a 15 minute recording. The nearest rain gauge that complies with the British standard is at Poringland and the return period for this event was 1:7 year.

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
2016	Oaklands	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.

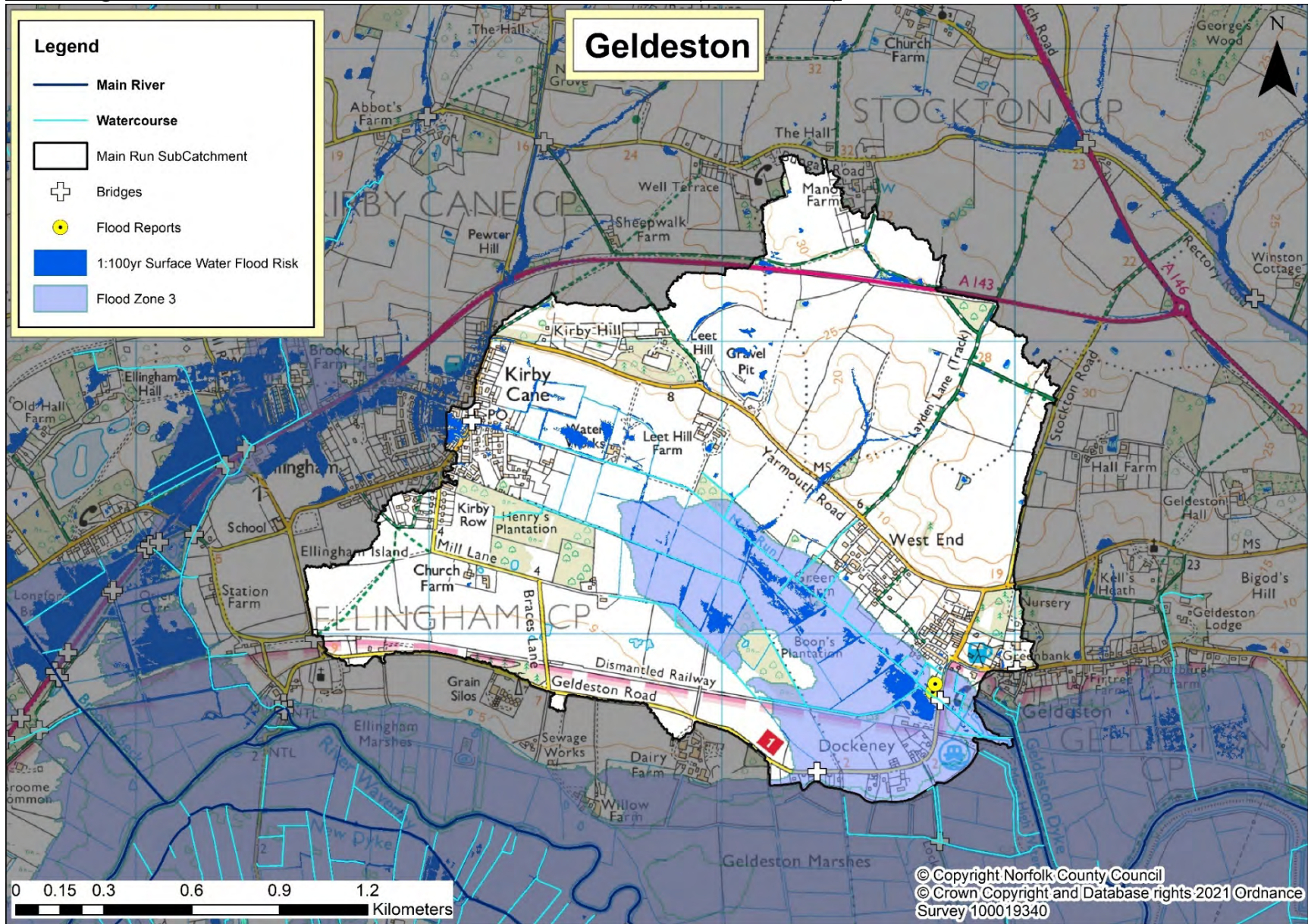
Following flooding to people, property and infrastructure

- 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?
<p>Oaklands Framingham Earl 24/12/2020</p>	<p>Water was directed from a neighbouring property via the garden towards the affected property.</p> <p>The loss of pre-existing drainage features (ditches) within the neighbouring property exacerbated the flooding.</p> <p>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.</p>	<p>Amendments should be made to neighbouring properties to ensure water is not directed to other properties.</p> <p>Norfolk County Council to work with property owners to confirm, where possible, the existence of any connections to a wider drainage network. This work should seek to confirm where the drainage network conveys flows to.</p>	<p>Norfolk County Council (LLFA) Property owners</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
<p>Loddon Road Framingham Pigot 24/12/2020</p>	<p>Run-off from rainfall was concentrated along overland flowpaths on which the affected properties are positioned.</p> <p>Run-off from rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This caused the system to surcharge and directed flood water towards the affected properties.</p> <p>Local observations witnessed the stream overtopped its banks leading to flood water ingress into the properties.</p> <p>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.</p>	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them 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.</p>	<p>Norfolk County Council (LLFA) Property owners</p>

Flooding and flood risk within the Main Run catchment (Geldeston)



Description of catchment

The Main Run is lowland area to the west of Geldeston (<5mAOD). The catchment drains roughly 3km² of broad and water meadows. Station Rd, Geldeston marks point where the Main Run becomes tidal as it heads towards Geldeston Dyke. tidal flaps on the east side of Station Road prevent tidal water from Geldeston Dyke and the Waveney system flowing west into the Main Run catchment. The area is functional floodplain and linked to flooding from both fluvial and high tides sources. Both sides of Station Rd benefit from defences as river flows from Kirby/Ellingham head towards Geldeston Dyke to the South East of Geldeston.

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	11	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	18	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	31	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
25/12/2020	<p>On the 25/12/2020 - 2 properties were internally flooded on Station Road, Geldeston. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 15/01/2021, (FWF/21/3768) • a resident via an online flood report form on the 5/01/2021, (FWF/21/3615) 	<p>The Environment Agency responded and pumped out during the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Anglian Water Services Ltd visited to investigate a pollution issue linked to the flooding incident after the incident.</p> <p>Anglian Water Services Ltd carried out measures to minimise the impact of flooding after the incident</p> <p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.</p> <p>Several RMAs and Residents identified the need to renew [or replace] the existing drainage asset that serves the flooding location after the incident.</p>

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.

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
2013	Flooding to properties on Station Rd	n/a

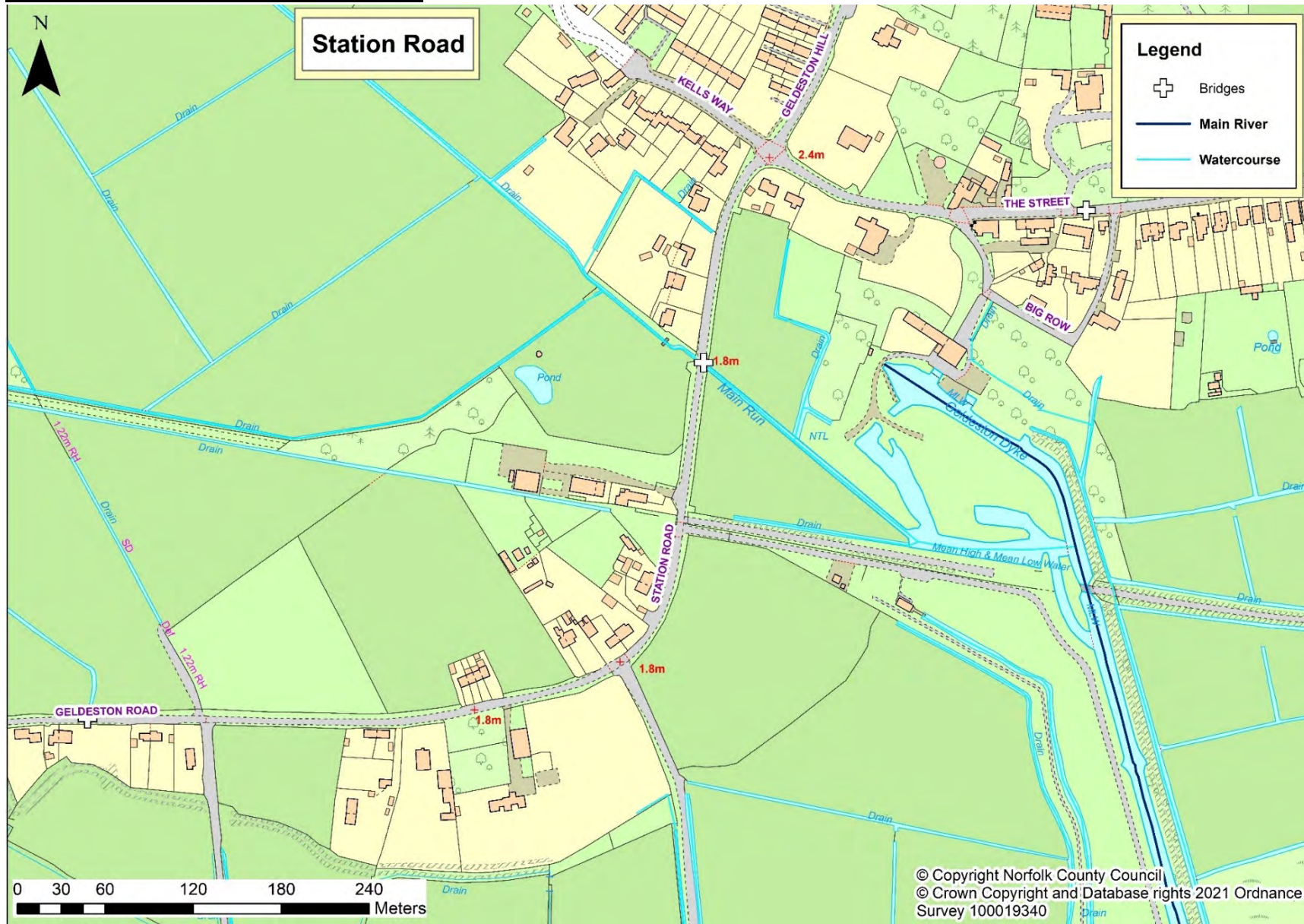
Causes of flooding within the catchment and recommendations

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 report

Station Road, Geldeston, 24/12/2020



Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>A substantial amount of rain fell on the 23rd and 24th December onto a catchment with prior high saturation levels. The catchment is 3.3km² upstream of Station Rd, Geldeston generating a flashy response to which local watercourses and drainage infrastructure could not cope.</p>	<p>No DATA</p>
<p>Flood extents in the functional floodplain area of Main Run and Geldeston Dyke were exacerbated by fluvial flows and high tides in the River Waveney over the 24-25th Dec 2020, hence there is some ambiguity to the main flood source.</p> <p>The EA mobilised two large pumps on 24th Dec to move flood water from the properties west of Station road over the flood wall to the marshes on the east side of Station Road. The EA mobilised another pump on 26th Dec to pump water from Station Road over the Defence into the Main Run on the east side of Station Road. However it is unknown how the operation of other sluices locally was influencing flooding in the wider catchment, if any.</p> <p>The area surrounding Station Rd is within IDB District (Waveney, Lower Yare and Lothingland) but is not main river.</p>	<p>EA and IDB</p>

Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>The surface water drainage system outfall on the eastern side of Station Rd was fluvially locked (submerged) by high water levels in the marshes, furthermore a structural failure of small tidal flaps also allowed floodwater to reverse flow back towards the highway drainage. This caused the failure of the upstream drainage system contributing to flooding at the affected properties. Officers/Residents reported spouting of water from highway manholes during event. In addition the Environment Agency have stated that's <i>'As levels in the River Waveney and tidal end of the Main Run rose significantly and flooded the marshes on the east side of Station Road surface water discharge from the highways drains will have become restricted causing surface water to back up and flow onto Station Road and to the properties who's driveways slope down from the lowest point of Station Road. It is likely that debris may have prevented some flaps on the drain outfalls from fully closing, allowing rising flood water on the east side of Station Road to enter the highways drains and add to the back flow onto Station Road.'</i></p> <p>Station Rd is benefiting from fluvial flood defences. This structure consists of concrete cut-off flood wall and several flap valves along the Kirby Run and Station Rd. Assets were constructed in 1990s by the Environment Agency.</p> <p>On 24th Dec the flood walls were not breached but the flap valves failed to close sufficiently which allowed floodwater to reverse flow into Station Rd via the highway drainage system. These flap valves are situated on highway drainage outfalls at the base of the wall.</p>	<p>EA and NCC (Highways)</p>
<p>Mixture of floodwater and surface water run-off from rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features.</p> <p>Vehicles using the highway passed through the flood water causing it to wash towards the affected properties.</p>	<p>EA/IDB and NCC Highways</p>

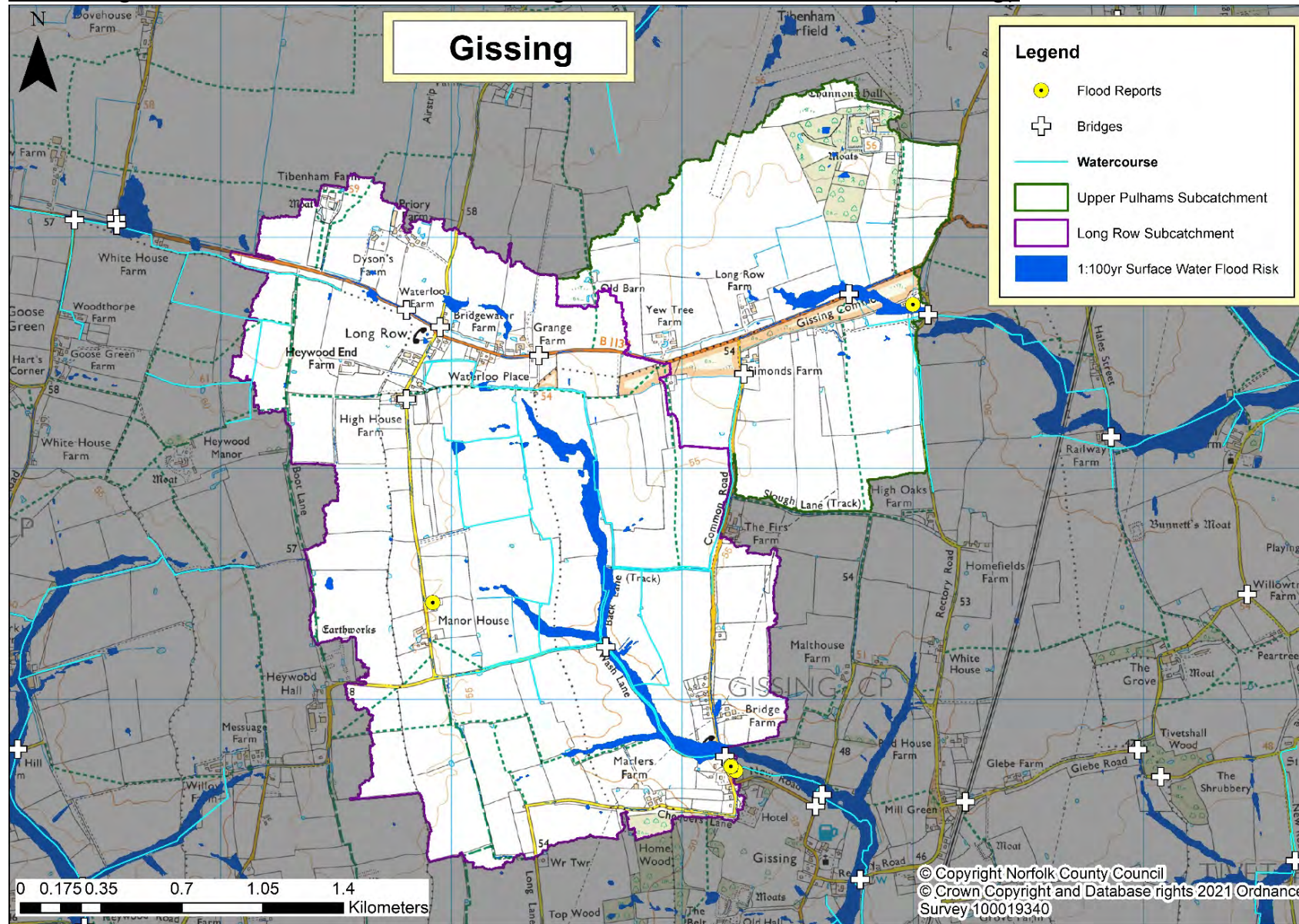
Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
The flood water entered the properties through low thresholds at entrances/the air bricks/the electricity conduits/porous brickwork.	All RMAs
<p>Rainfall was directed into the foul system causing it to surcharge elsewhere. This surcharging contributed to the flooding at the affected properties.</p> <p>2x pumping stations in the area for the foul sewer. Dockney pump and Kells Way. Kells Way was allegedly non-operational during the event according to AW dialogue with residents.</p>	Anglian Water
Indirect issue was lack of timely flood forecasting - no Flood Warnings were issued within national best practice timelines only an alert for this area. Residents have evidence of no warning issued until after 8.30pm on the 25 th Dec which by then it was too late.	EA/IDB

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review and confirm ownership and maintenance responsibilities for all flood defences and associated drainage infrastructure and implement to a wider action plan.	NCC (LLFA)/ NCC (Highways)/ EA/ IDB/ AW	6 months
Review and confirm operational response for flood events of this calibre and associated drainage infrastructure and implement to a wider action plan. EA to confirm operation of Ellingham Sluice and whether it links to the Main Run watercourse.	EA / IDB	6 months
Review and confirm operational response for foul sewer flooding and associated drainage infrastructure. Implement to a wider action plan.	AW	6 months
Review the inspection and maintenance schedule of all surface water drainage assets within the adopted Highway. Particularly confirmation of where ownership stops in respect of the fluvial/tidal flood defences.	NCC (Highways)	Complete June 2021
Review access arrangements for inspection and maintenance of floods defences in Station Rd. Particularly all Flap Valves along the flood walls in Kirby Run and Station Rd.	NCC (Highways) and EA	6 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Once all flood defence assets are confirmed fit for purpose and on full maintenance rota, Norfolk County Council will consider opportunities to route residual surface water ponding on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.	NCC (Highways) and EA	6 -12 months
<p>Advise residents of Property Level Resilience measures and funding opportunities.</p> <p>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.</p>	NCC (LLFA)	Complete
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 identify if have capacity for flood flows.	EA and IDB	12 months
EA to investigate upgrading the warning system in the area and/or improve service accordingly.	EA	12 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>Anglian Water 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.</p> <p>Anglian Water should assess whether the capacity of the current foul system is able to provide protection that aligns with British standards. This may require a survey of the system being undertaken to investigate the network and establish whether system is in fact a combined system, is blocked or has insufficient capacity.</p> <p>Anglian Water to investigate sealing manholes or using low-leak lids where safe to do so. Checks should be undertaken that no residual flooding elsewhere in the system by sealing problem manholes.</p> <p>Anglian Water to investigate foul sewer and private connections and consider non return valves where practical and where they do not increase risk elsewhere.</p>	AW	12-24 Months

Flooding and flood risk within the Long Row Sub Catchment (Gissing)



Description of catchment

4.5km² headwater catchment that resides north of Gissing and encompasses largely woodland and arable land surrounding Long Row. Next nearest settlement downstream is Shimpling to the South. The topography gently falls from 60m at the top of catchment to 45m where the flooding was experienced in Upper Street.

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	1	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 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	<p>On the 23/12/2020 - 4 properties were internally flooded on Upper Street, Gissing. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 14/01/2021, (FWF/21/3739) • a resident via an online flood report form on the 14/01/2021, (FWF/21/3794) • a resident via an online flood report form on the 14/01/2021, (FWF/21/3763) • a resident via an online flood report form on the 18/01/2021, (FWF/21/3751) • a resident via an email communication on the 14/01/2021, (FWF/21/3792) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A local community group carried out measures to minimise the impact of flooding during the incident.</p> <p>Elected representative visited affected residents to offer advice and to gather information during the incident.</p>
24/12/2020	<p>On the 24/12/2020 - 2 properties was internally flooded on Rectory Road, Gissing. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 14/01/2021, (FWF/21/3739) • a resident via an email communication on the 14/01/2021, (FWF/21/3798) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A local community group carried out measures to minimise the impact of flooding during the incident.</p> <p>Elected representative visited affected residents to offer advice and to gather information during the incident.</p>

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 however for reference a gauge was located at xxxxx some within xx proximity of effected catchment.

The rainfall events recorded by gauges for this catchment are:

Dec 2020 - 0mm of rainfall was recorded as falling in 0 hours 0 minutes at the 0 rainfall monitoring station. This intensity of rainfall for the total duration equates to a 0 year rainfall event.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Upper Street, Gissing.

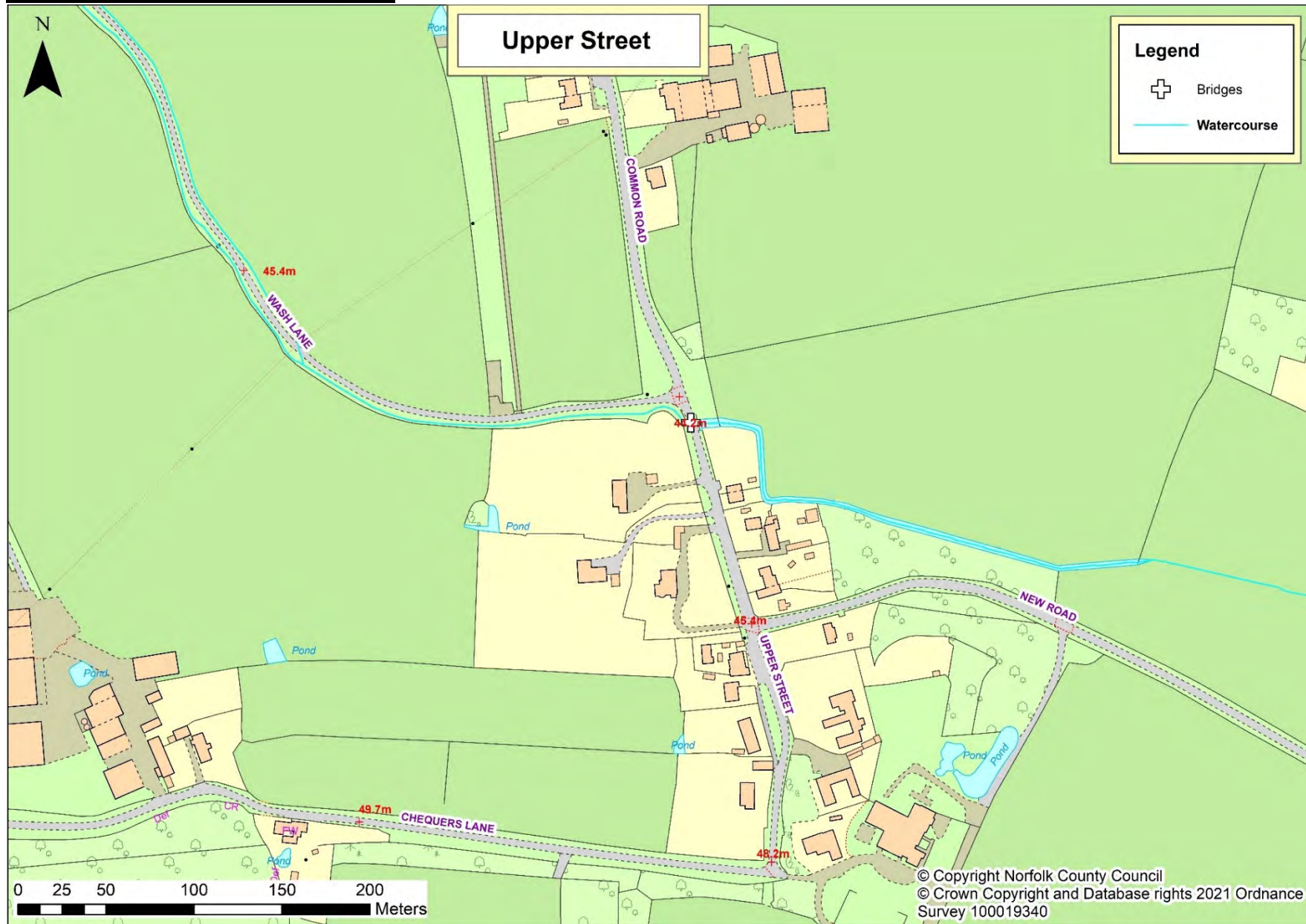
Causes of flooding within the catchment and recommendations

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.

Upper Street, Gissing – 23/12/2020



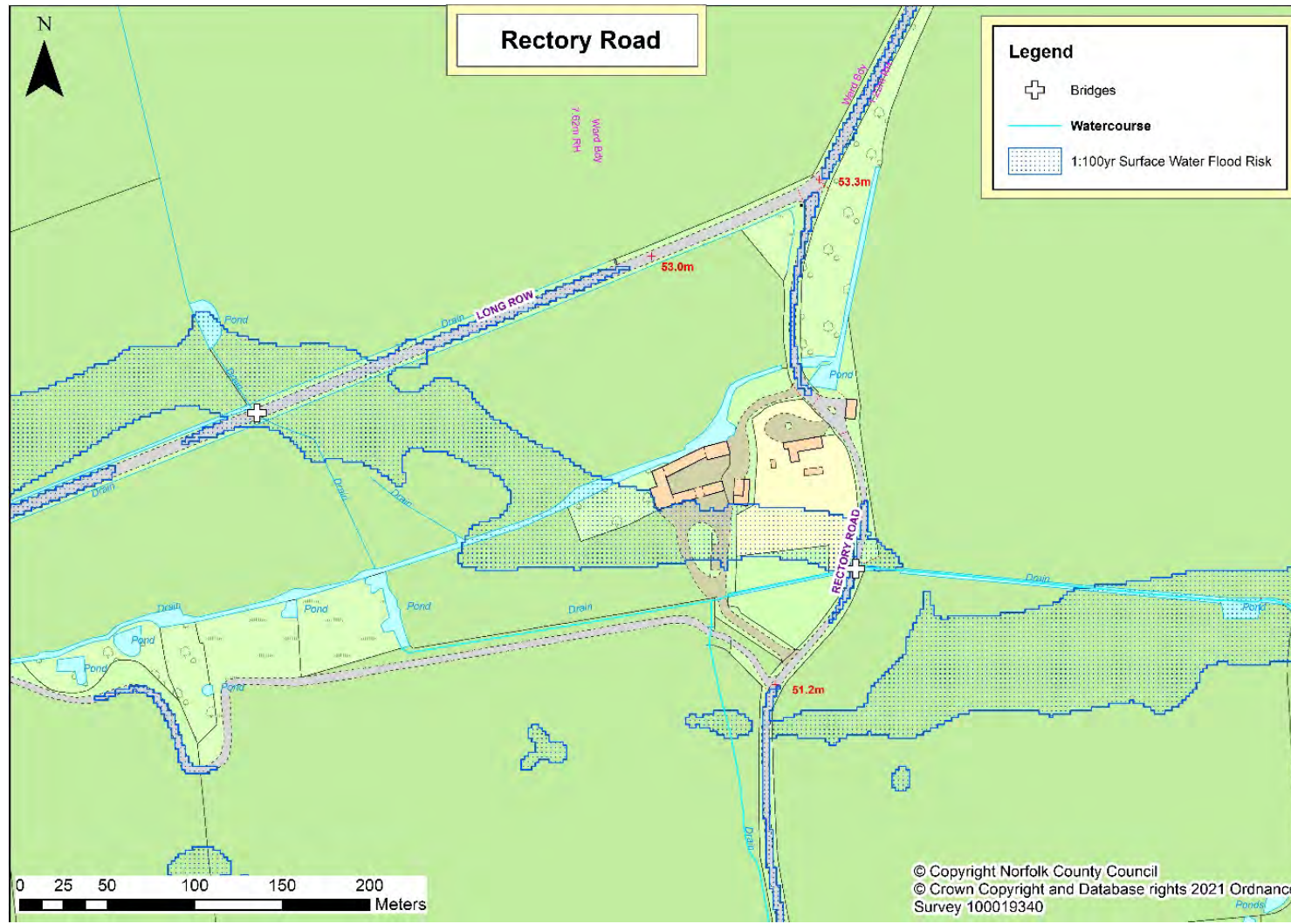
Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
A substantial amount of rainfall fell on the 23 rd Dec onto a catchment with preceding high saturation levels (See Figure 1 for catchment area).	
<p>Local observations witnessed two watercourses flooding out of bank leading to the flooding observed in Upper Street during the event on the 23rd Dec</p> <p>1) The Long Row/Wash Lane drain was overtopping its bank(s) alongside Wash Lane leading to fast moving flood water in the road and private land flowing SE through Upper Street. Wash Lane was inundated post event for several weeks.</p> <p>2) A small section of piped ditch on the western side of Upper Street South was also reverse flowing back out of kerb offlets into Upper Street and flowing down to the Upper Street culvert. This system is open channel towards Chequers Lane end of Upper Street (South) and at its confluence with the Long Row drain. Likely this ditch line was full open along Upper Street historically and thus now has reduced flow capacity.</p>	<p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water</p> <p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>
The volume of flooding into Upper Street and surrounding areas may have been exacerbated by the Upper Street road culvert restricting flow through this section of the Long Row watercourse. Also noted on the U/S face of the culvert was large utility ducting crossing the culvert at soffit level.	Norfolk County Council (Highways): Public highway maintenance, land & asset owner
The loss of pre-existing drainage features (such as drains, dykes, ditches, ponds, culverts) within the catchment exacerbated the flooding. Evidence on historic maps that the Long Row watercourse downstream of Upper Street culvert took a different path historically. Appears alignment has been altered for land gain and can be seen by 1:100yr flood maps in Figure 2.	Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water
The surface water drainage system network was likely hydraulically obstructed by high flood flows in the Long Row watercourse. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties. Road gullies were also noted to be heavily silted however this was observed post event.	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p> <p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water.</p>
The flood water entered the properties through low thresholds at entrances/the air bricks.	

Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>Partial blockages were identified at several locations along Long Row Drain, especially downstream of Upper Street. 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.</p>	<p>NCC (LLFA) and Landowners</p>

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
Review access arrangements for inspection and maintenance of watercourses.	NCC (LLFA)	6 months
<p>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.</p> <p>Asset owner or Riparian owners to consider reinstating and/or increasing size of piped watercourses and/or providing additional surface water storage that may currently offset constrictions.</p>	<p>NCC (LLFA)</p> <p>NCC (Highways)</p>	12 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.	<p>Riparian Landowners</p> <p>NCC (Highways)</p>	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

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>RMA's to seek opportunities for small scale works and funding for this which aims to increase standard of protection in Upper Street. Works recommended include: -</p> <ul style="list-style-type: none"> • Improve conveyance of watercourses through widening, straightening and regrading – possibly even reconnecting natural floodplain, as per historic alignment shown on national surface water flood mapping on land belonging to Bridge Farm, Common Rd. • New areas of Storage (additional areas of floodplain) that have multifunctional benefits (i.e. wetland). Potential opportunity to revert to the ancient holding areas on the water meadows along New Rd and Burston Rd. • Assess whether Upper Street Culvert is fit for purpose, potential to add a second conduit under the road or a safe overspill (i.e. ford like feature). • New relief channel around ancient tree that sits within the channel in Moat Meadow Farms land. Likely was a contributing factor to levels upstream. 	<p>NCC (LLFA) NCC (Highways) Private Landowners Parish Council</p>	<p>12- 24 months</p>

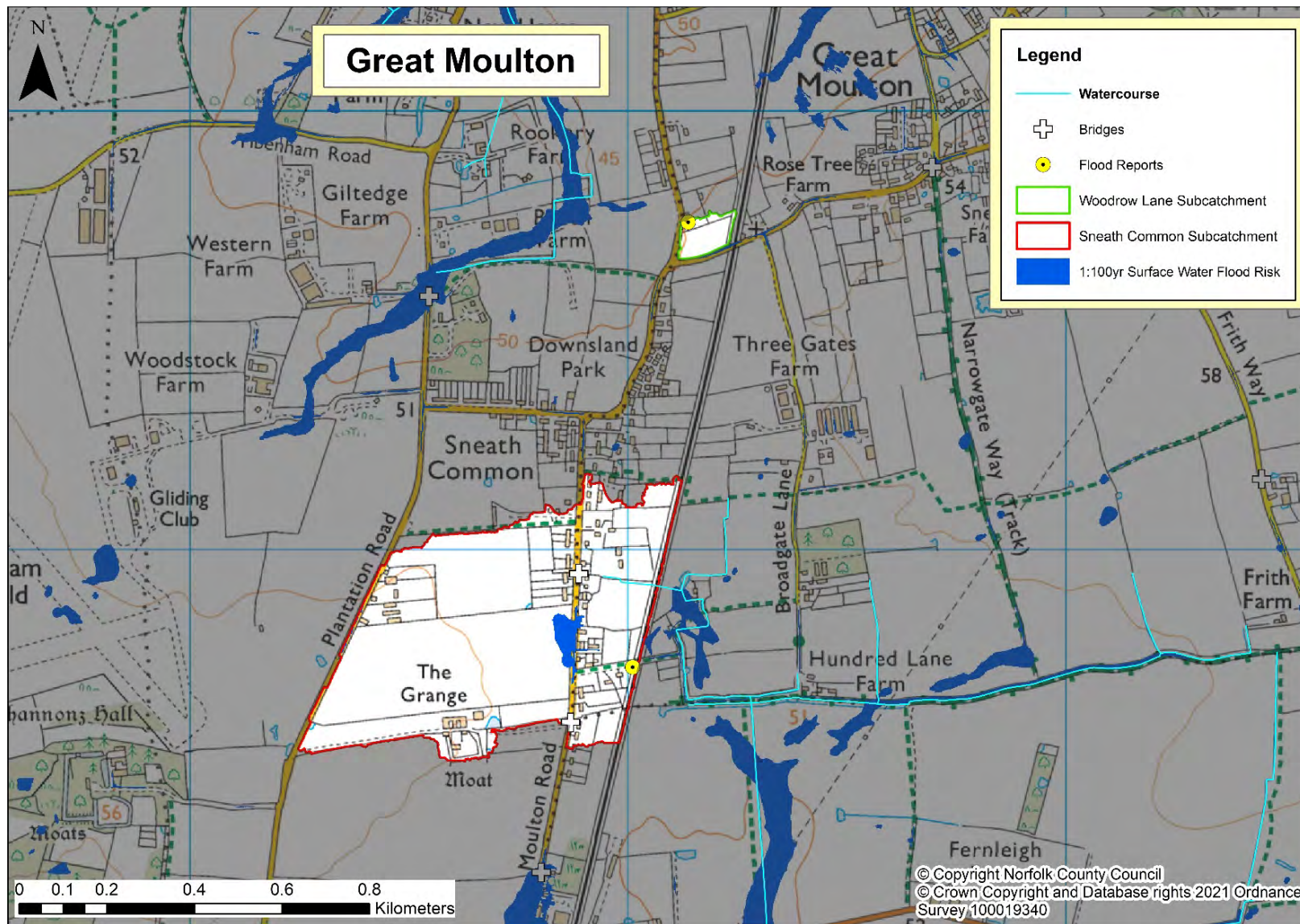
Rectory Rd, Gissing – 23.12.2020



Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
A substantial amount of rainfall fell on the 23 rd Dec onto a catchment with preceding high saturation levels (See Figure 1 for catchment area).	
High river flows and Surface Water Run-off from rainfall was concentrated along overland flowpaths on which the affected property is positioned adjacent to.	
<p>The volume of flooding may have been exacerbated by a highway culvert under Rectory Rd restricting flow through this section of the Beck watercourse.</p> <p>Furthermore, a 450mm diameter field crossing, 25m downstream (East) of Rectory Rd was also spotted to have partially collapsed or blocked by alternate water levels either of the structure. Likely that culvert has been consented.</p>	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p> <p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water</p> <p>(Complete as of August 21)</p>
<p>Individual property drainage and private access culverts were partially obstructed by debris or silt/unconsented works. This reduced the efficiency of the upstream drainage system contributing to the accumulation of flood water at the affected property.</p> <p>Ability to quickly clear any vehicular crossings severely affected by property owners fencing off the inlet/outlet sides of the culvert thus restricting access.</p>	Homeowners
The surface water drainage system network was likely hydraulically obstructed by high flood flows in the Long Row watercourse. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties. Road gullies were also noted to be heavily silted however this was observed post event.	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p> <p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water.</p>
The flood water entered the properties through low thresholds at entrances/the air bricks.	

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
Review access arrangements for inspection and maintenance of watercourses.	NCC (LLFA) Landowners	6 months
<p>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 identify if it has capacity.</p> <p>Asset owner or Riparian owners to consider increasing size of piped watercourses and/or providing additional surface water storage that may currently act as a constriction.</p>	NCC (LLFA) NCC (Highways)	12 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 NCC (Highways)	12 months
<p>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.</p> <p>Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait.</p>	NCC (LLFA)	6 months

Flooding and flood risk within the Woodrow Lane Sub Catchment – Great Moulton



Description of catchment

Small isolated area of land bounded by a railway line and High Green. Land falls towards Woodrow Lane before heading NW towards Aslacton the next settlement downstream.

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 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 Woodrow Lane, Great Moulton. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 19/01/2021, (FWF/21/3827)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after 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 Black Mill Lane, Great Moulton. This incident was reported by <ul style="list-style-type: none"> • a resident via an online flood report form on the 5/02/2021, (FWF/21/4207) 	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. 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 Lead Local Flood Authority has no previous reports of internal flooding in Great Moulton.

Causes of flooding within the catchment and recommendations

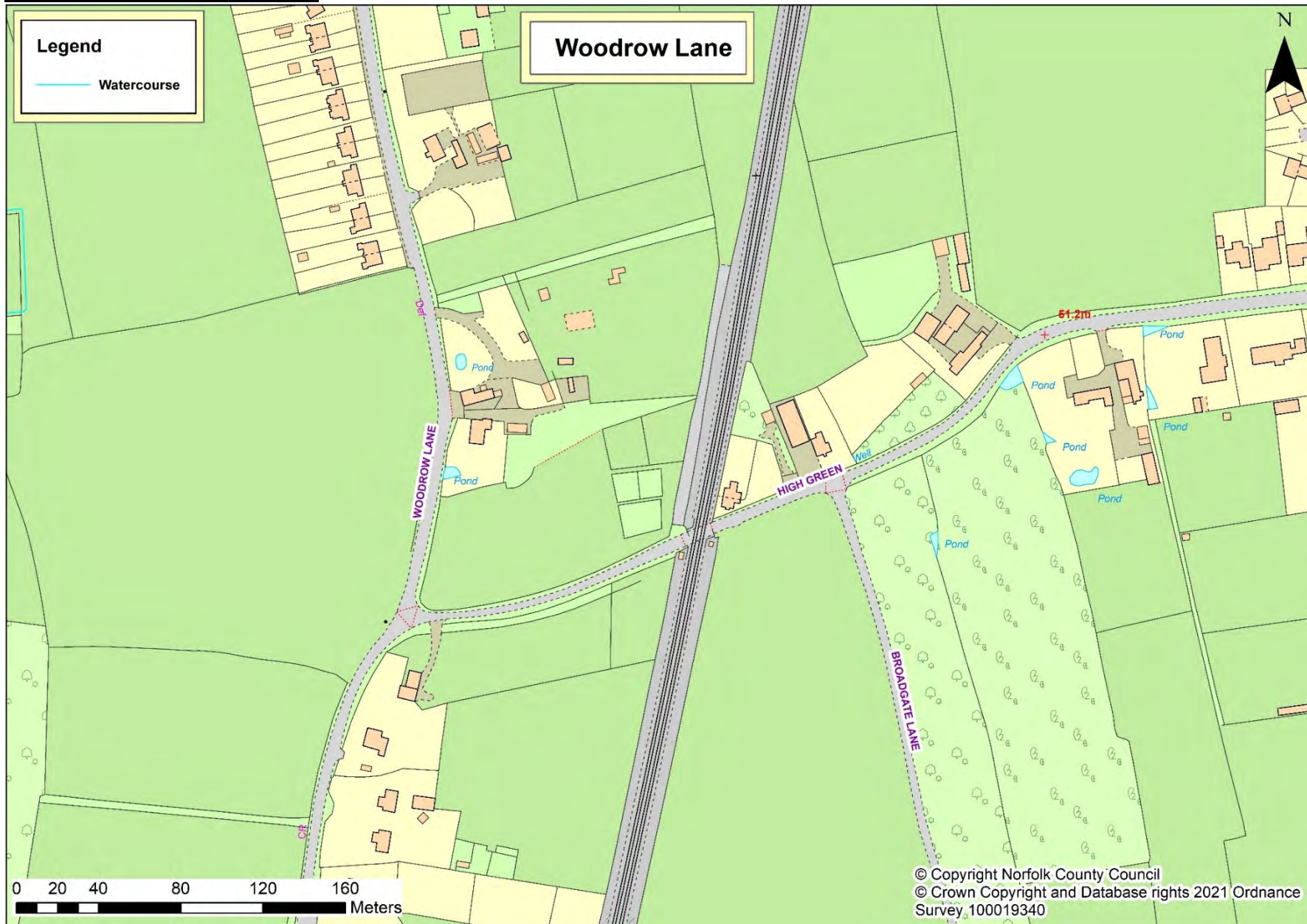
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the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

Woodrow Lane – 23/12/2020

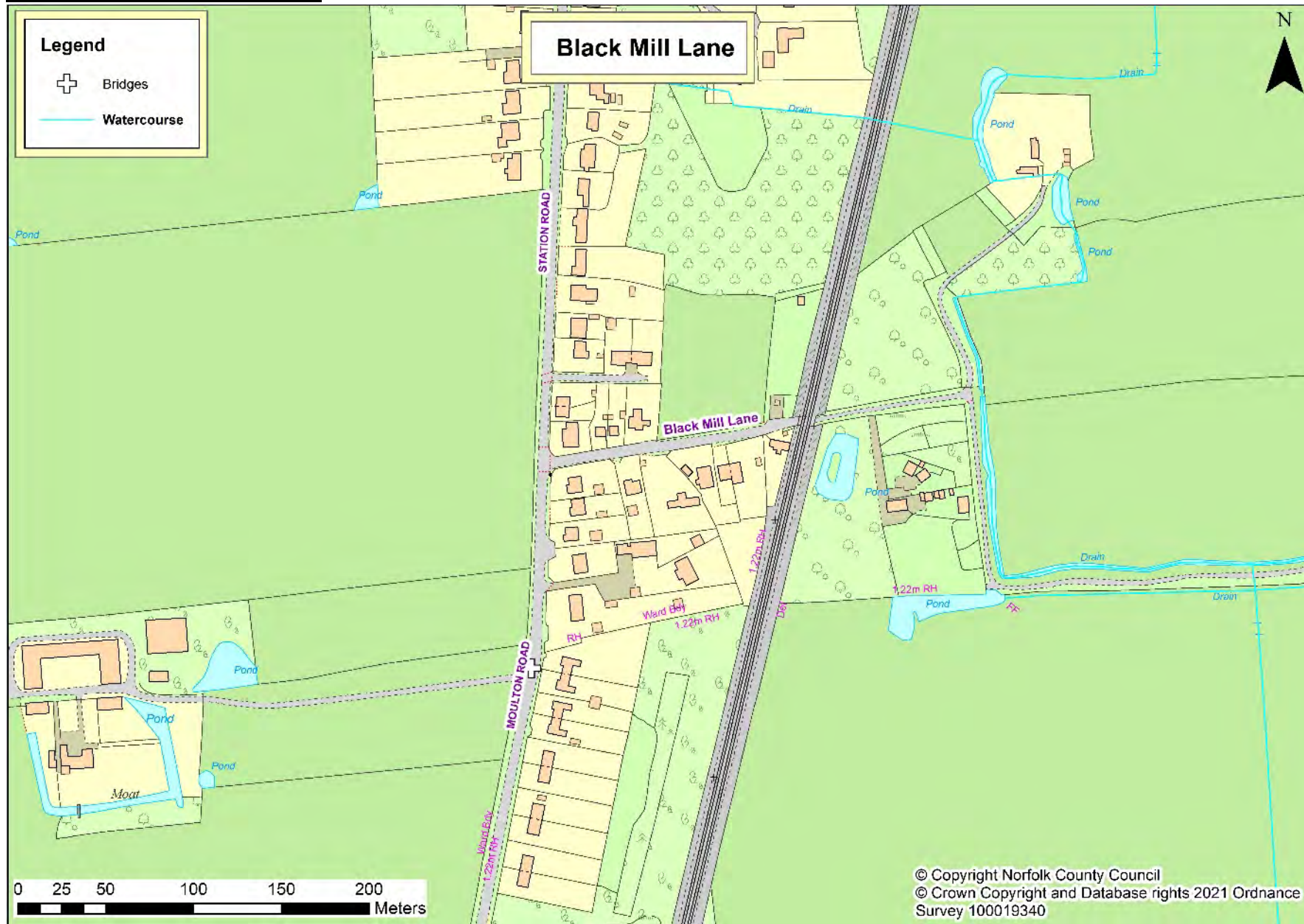


Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
<p>Woodrow Lane</p> <p>Great Moulton</p> <p>24/12/2020</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>Run-off from rainfall onto saturated ground was concentrated along overland flowpaths on which the affected property is positioned on.</p> <p>Flowpaths are constricted by piped crossing under Wood Row Lane</p>	<p>Norfolk County Council will investigate with third parties on developing a 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.</p>	<p>NCC LLFA and NCC Highways</p>
<p>Woodrow Lane</p> <p>Great Moulton</p> <p>24/12/2020</p>	<p>The private and highway surface water drainage system outfall was partially obstructed by debris or silt levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>Roadside watercourses in Woodrow Lane were partially obstructed by debris or silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p>	<p>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/other foreign objects) at all times.</p>	<p>NCC Highways</p> <p>Riparian Landowner</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
	<p>The volume of flooding may have been exacerbated by the Woodrow Lane culvert restricting flow through this section of the watercourse.</p>	<p>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.</p> <p>Investigate/model culverts and identify if it has capacity.</p> <p>Asset owner or Riparian owners to consider increasing size of piped watercourses and/or providing additional surface water storage that may currently act as a constriction</p>	<p>NCC (Highways)</p>
<p>Woodrow Lane</p> <p>Great Moulton</p> <p>24/12/2020</p>	<p>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.</p>	<p>Norfolk County Council will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale rural sustainable drainage systems.</p> <p>NCC LLFA advise affected residents of reinstating or landscaping new exceedance routes around property to divert flood water to safer areas.</p>	<p>NCC LLFA</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
<p>Woodrow Lane</p> <p>Great Moulton</p> <p>24/12/2020</p>	<p>The flood water entered the property through [low thresholds at entrances/the air bricks/the electricity conduits.</p>	<p>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.</p> <p>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.</p>	<p>NCC LLFA</p>

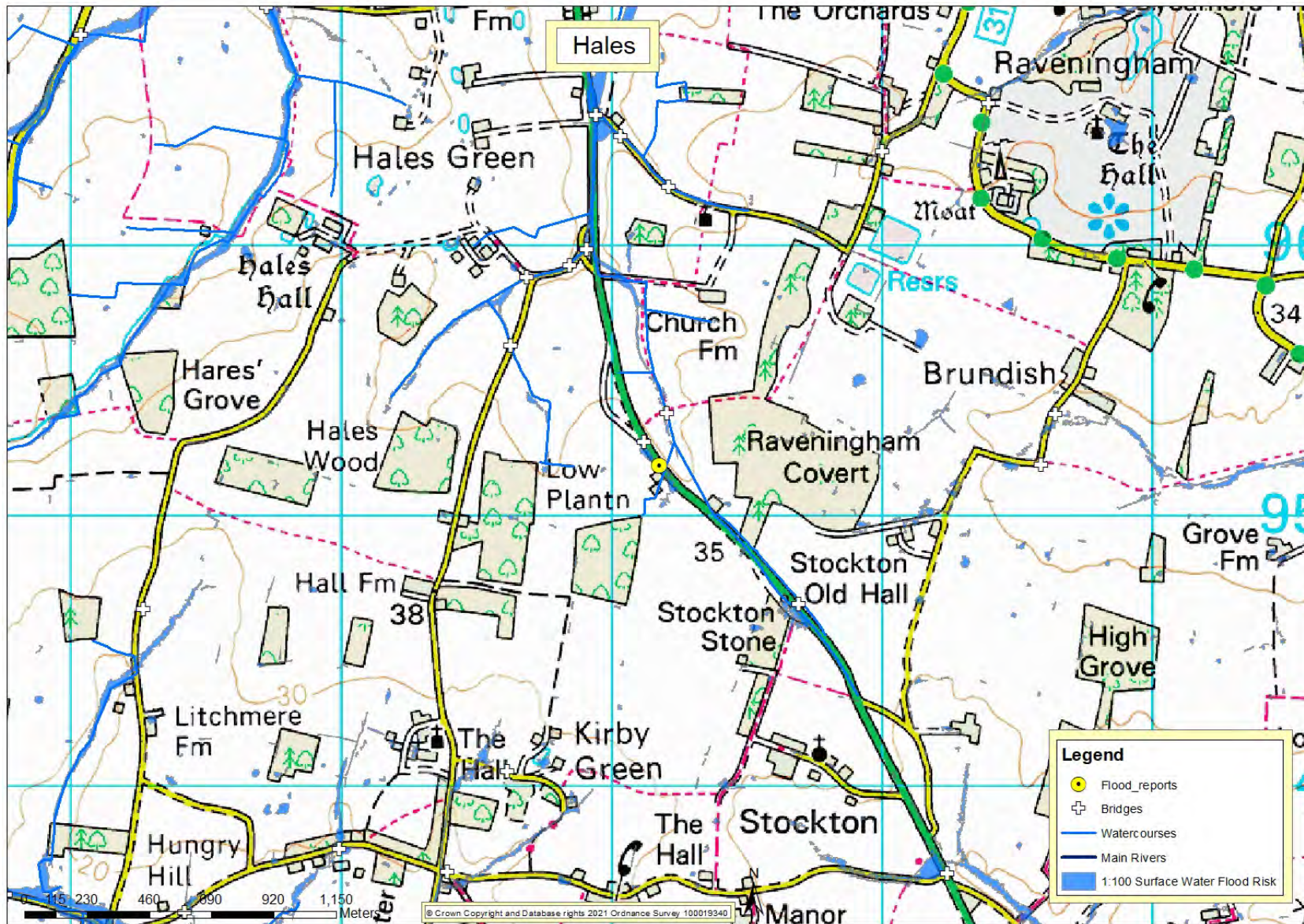
Black Mill Lane – 23/12/2020



Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Black Mill Lane, Great Moulton, 23/12/2020	The watercourse/river was partially obstructed by debris or silt/high water levels downstream/structural failure/unconsented works. This reduced the efficiency/caused the failure of the upstream drainage system contributing to flooding at the affected properties.	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.	Network Rail
Black Mill Lane, Great Moulton, 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 rural sustainable drainage systems. NCC LLFA advise affected residents of reinstating or landscaping new exceedance routes around property to divert flood water to safer areas.	NCC LLFA

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Black Mill Lane, Great Moulton, 23/12/2020	The flood water entered the property through low thresholds at entrances/the air bricks/the electricity conduits.	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. 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.	no data
Black Mill Lane, Great Moulton, 23/12/2020	Surface run-off from rainfall flowed off adjacent fields and pooled at the foot of the railway embankment leading to ingress of water into affected properties that were situated near to the railway. Situation also worsened by the physical barrier that is the railway embankment which trapped moving floodwater alongside its embankment tow. Water depths would be at the greatest against the embankment as the land falls from Station Rd to the embankment	Riparian owners to clear watercourses (open and/or piped) through areas of concern particularly downstream of Black Mill Lane. Ensures sufficient capacity and reduction of blockage potential likely to cause reduced conveyance and breaches.	Network Rail and other local landowners

Flooding and flood risk within Hales



Hales

Flood incidents within this area

Within this area 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
	<p>On the 23/12/2020 - 1 property was internally flooded on Beccles Road, Hales. This incident was reported by</p> <ul style="list-style-type: none">Norfolk County Council (Highways) via an electronic report on the 26/01/2021, (3964)	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.</p>

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Beccles Road, Hales.

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.

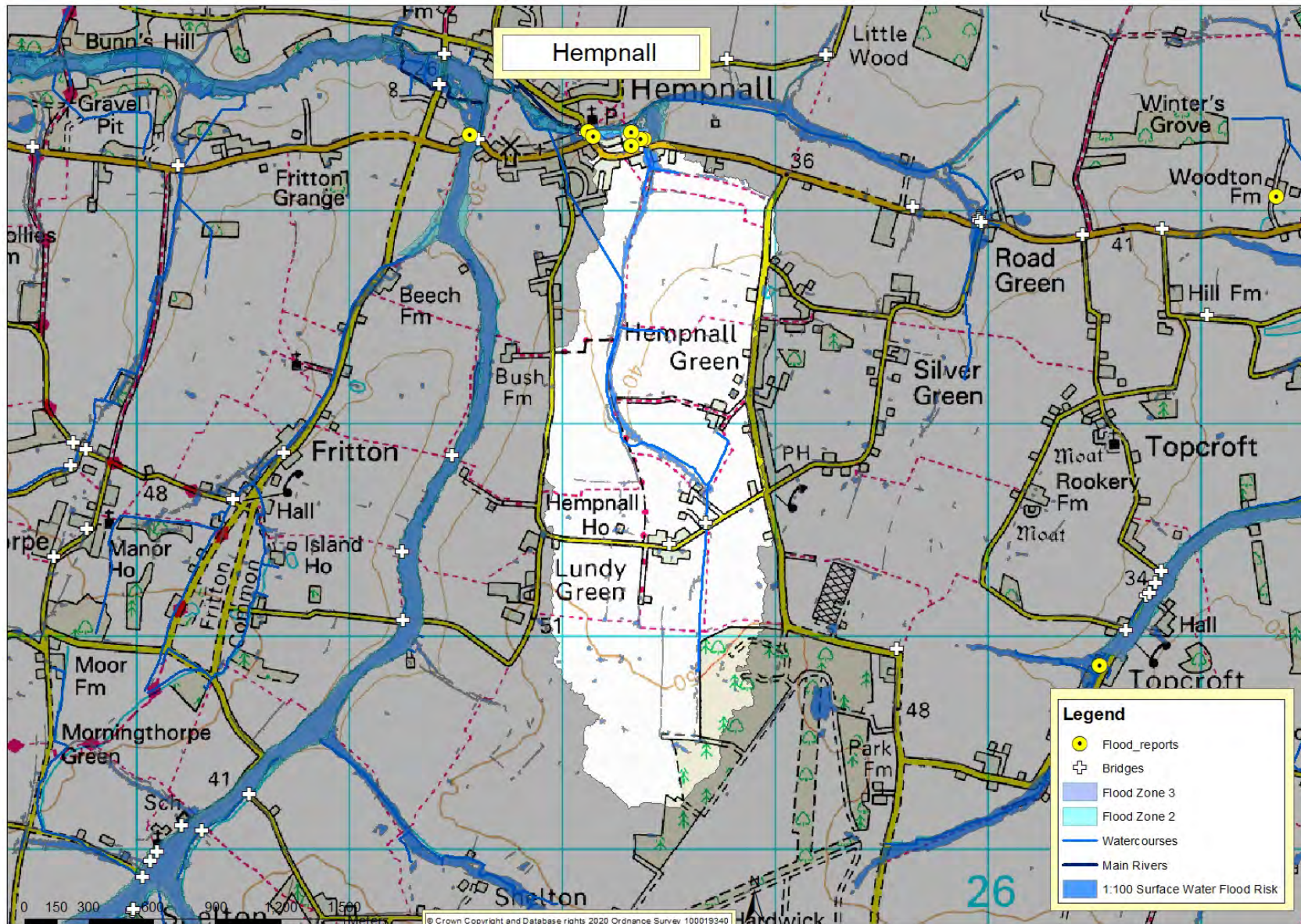
Following flooding to people, property and infrastructure

- 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?
<p>Beccles Road Hales 23/12/2020</p>	<p>Surface run-off from significant rainfall flowed off adjacent fields and into the surface water drainage system. This system was fully obstructed by debris and silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels</p>	<p>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.</p> <p>Norfolk County Council 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.</p>	<p>Norfolk County Council (Highways)</p>

Flooding and flood risk within the Hempnall catchment



Description of catchment

This rural catchment flows north through a series of ditches and watercourse towards the east side of the village. To the north of the B1527 the watercourse becomes a main river, flowing west into the River Tas

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	48	5
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	1	94	5
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	7	1
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	8	2
[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	6	1
[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	6	1

Flood incidents within this catchment

Within this catchment 7 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	<p>On the 24/12/2020 - 1 property was internally flooded on Bungay Road, Hempnall. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 12/01/2021, (3745) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 4 properties were internally flooded on Bungay Road, Hempnall. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 21/03/2021, (4361) • a resident via an online flood report form on the 23/02/2021, (4250) • a resident via an online flood report form on the 21/01/2021, (3909) • a resident via an online flood report form on the 27/12/2020, (3304) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on Mill Road, Hempnall. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 23/02/2021, (4226) 	<p>Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report after the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on The Street, Hempnall. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 05/03/2021, (4278) 	

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Bungay Road, The Street, Mill Road, Hempnall.

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.

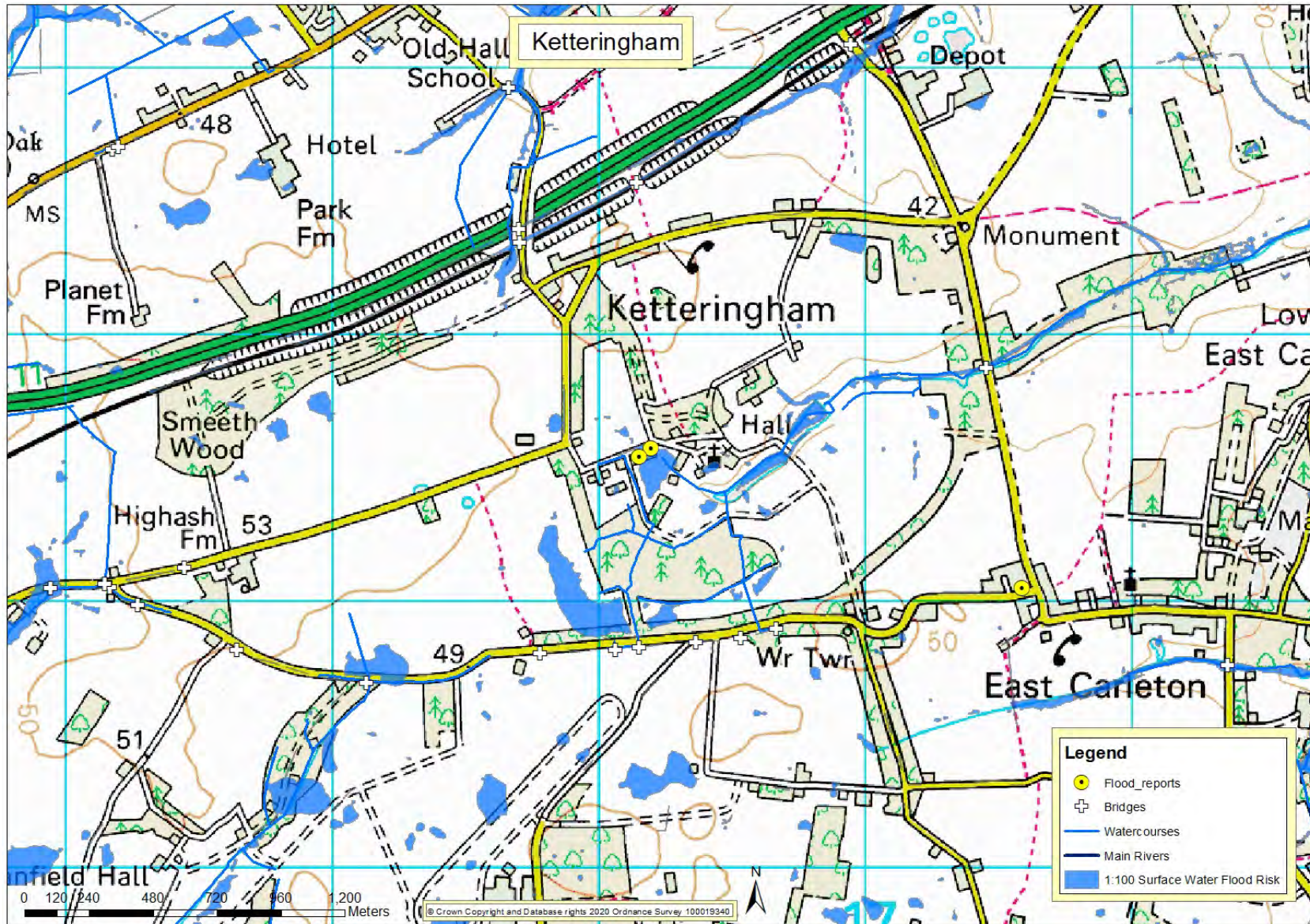
Following flooding to people, property and infrastructure

- 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?
<p>Bungay Road 24/12/2020 & 23/12/2020</p> <p>The Street 23/12/2020</p> <p>Mill Road 23/12/2020</p> <p>Hempnall</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels</p> <p>Run-off from rainfall was directed towards the watercourse. These flows could not be accommodated as the system was already overloaded and obstructed by high levels of debris. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>The flooding may have been exacerbated by high-water levels (flood flows) in the watercourse which was especially high. This may have caused the performance of other systems to decrease.</p>	<p>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</p> <p>Environment Agency will communicate with local residents of properties known to have flooded internally to investigate options for managing flood risk. This may need to be dependent on those property owners affected contributing towards a solution. Alternatively property owners could carry out their own measures where funding is not forthcoming or residents are unwilling to wait</p> <p>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.</p>	<p>Environment Agency</p> <p>Riparian owners</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
		<p>Works by riparian landowners to maintain a watercourse need to be carried out in a sensitive way so as to avoid harming the channel. De-silting and weed-cutting work needs to be well planned and carefully executed, and may require a permit from the Environment Agency or Internal Drainage Board. Works should avoid:</p> <ul style="list-style-type: none"> • Bed and bank material (e.g. gravel) being removed and deposited on the banks • Fish and other aquatic organisms being removed from the water (e.g. freshwater mussels) • Channels being stripped of all their in-stream vegetation • All woody debris being removed (e.g. fallen trees and branches) <p>Bare, steep earth banks that provide little wildlife habitat.</p>	

Flooding and flood risk in Ketteringham



Flood incidents within this area

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

Date of Incident	Incident as reported	What was the response to the flood incident
	On the 24/12/2020 - 2 properties were internally flooded on Church Road, Ketteringham. These incidents were reported by: <ul style="list-style-type: none"><li data-bbox="496 584 884 689">• a resident via an online flood report form on the 17/01/2021, (3806)<li data-bbox="496 696 884 801">• a resident via an online flood report form on the 12/02/2021, (4129)	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 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated. There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Church Road, Ketteringham.

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?
<p>Church Road Ketteringham 24/12/2020</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels</p> <p>The land drainage system was partially obstructed by an undersized culvert. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>Surface run-off from rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features.</p> <p>Surface run-off from rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features.</p>	<p>Local landowners should consider reviewing the capacity & level of maintenance required to sustain the design efficiency of their culvert that serves the flooding location in line with the risk identified.</p> <p>Amendments should be made to the management of neighbouring land to ensure water is not directed to other properties. Norfolk County Council should assist with this.</p> <p>Property owners should protect their buildings through flood protection measures where appropriate.</p>	<p>Local landowners Property owners Norfolk County Council (LLFA)</p>

Flooding and flood risk within the Long Stratton catchment



Description of catchment

Long Stratton

The drainage network within the Town is a mix of culverted and open watercourses with multiple owners that has developed over many decades. Areas of the Town are served by Anglian Water surface water systems which connect at various points to the watercourses. However some areas are privately drained and their discharge locations are unknown. The highways drain via a number of separate systems to the watercourses, but also some areas connect to the Anglian Water surface water system.

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:	1	82	55
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	1	123	65
[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 17 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	<p>On the 24/12/2020 - 1 property was internally flooded on Ipswich Road, Long Stratton. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via email correspondence on the 20/01/2021, (3858) 	<p>The landowner carried out measures to minimise the impact of flooding during the incident.</p>
24/12/2020	<p>On the 24/12/2020 - 5 properties were internally flooded on The Street, Long Stratton. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via email correspondence on the 12/01/2021, (3817) • a resident via email correspondence on the 20/01/2021, (4011) • a resident via email correspondence on the 03/02/2021, (3971) • a resident via an online flood report form on the 20/01//2021, (3880) • a resident via an online flood report form on the 20/01//2021, (3860) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
24/12/2020	<p>On the 24/12/2020 - 1 property was internally flooded on Old Dairy Loke, Long Stratton. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 14/01/2021, (3762) 	<p>Anglian Water Services Ltd visited affected residents to offer advice and to gather information during the incident.</p>
24/12/2020	<p>On the 24/12/2020 - 1 property was internally flooded on St Michaels Road, Long Stratton. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via email correspondence on the 22/01/2021, (3734) 	<p>Norfolk County Council (Highways) carried out measures to minimise the impact of flooding during the incident.</p>

Date of Incident	Incident as reported	What was the response to the flood incident
23/12/2020	<p>On the 23/12/2020 - 4 properties were internally flooded on Ipswich Road, Long Stratton. These incidents were reported by</p> <ul style="list-style-type: none"> • South Norfolk District Council via email correspondence on the 28/01/2021, (4013) • a resident via email correspondence on the 18/01/2021, (3836) • a resident via an online flood report form on the 19/01/2021, (3833) • a resident via email correspondence on the 20/01/2021, (3775) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Residents carried out measures to minimise the impact of flooding during the incident.</p> <p>Norfolk Rivers IDB carried out measures to minimise the impact of flooding during the incident.</p> <p>Anglian Water Services Ltd carried out measures to minimise the impact of flooding during the incident.</p>
	<p>On the 23/12/2020 - 4 properties were internally flooded on Ipswich Road, Long Stratton. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via a flood report form on the 28/01/2021, (3998) • a resident via an online flood report form on the 18/01/2021, (3755) • a resident via an online flood report form on the 08/01/2021, (3623) • a resident via an online flood report form on the 06/01/2021, (3620) 	
	<p>On the 24/12/2020 - 1 property was internally flooded on Hall Lane, Long Stratton. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via email correspondence on the 23/01/2021, (3911) 	

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

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

Date of incident	Impact	Rainfall intensity
17/08/2020	1 property flooded on Manor Court (2567)	Unknown
Autumn 2020	Frequent surcharging of gullies on the Street and Swan Lane junction. These issues continued up to the flood event in December and reoccurred in January and March 2021. Root ingress in an AW culvert, damage of highways chambers by utility installations and poor maintenance of riparian watercourses at culvert outfalls were contributing factors.	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

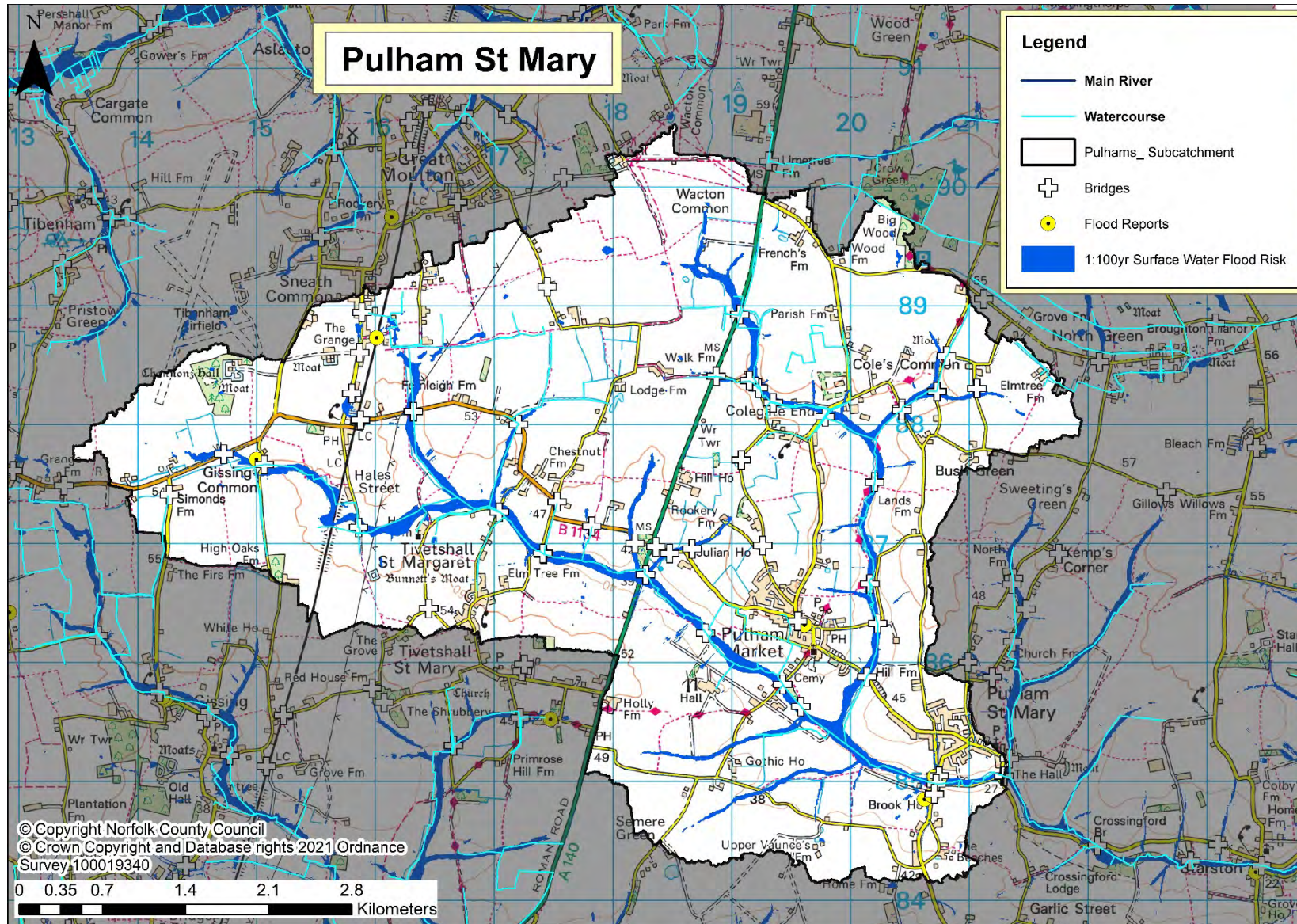
- Risk Management Authorities should
 - communicate with affected residents where their assets have given rise to the flooding of properties.
 - review the appropriateness of their response to flooding.
 - determine the integrity and/or capacity of their assets where they have contributed to the flooding 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?
<p>Ipswich Road, 24/12/2020</p> <p>The Street, 24/12/2020 & 23/12/2020</p> <p>Old Dairy Loke, 24/12/2020</p> <p>St Michaels Road, 24/12/2020</p> <p>Ipswich Road, 23/12/2020</p> <p>Hall Lane, 23/12/2020</p> <p>Star Lane, 23/12/2020</p> <p>Long Stratton</p>	<p>Anglian Water's surface water drainage system was overloaded between Hall Lane and Manor Court. Behind Manor Court the system becomes an open watercourse. This part was overgrown and restricted flow. The system is then piped again with a trash screen at entry. This screen was obstructed by debris and the following piped section was fully obstructed by root ingress. This reduced the efficiency of the upstream drainage system causing water to surcharge out of the system and flow overland contributing to flooding at the affected properties.</p> <p>Surface run-off from rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features.</p> <p>Vehicles using the highway passed through the flood water causing it to wash towards the affected properties and exacerbate the flooding.</p>	<p>Anglian Water 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. Anglian Water 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.</p> <p>Anglian Water and Norfolk County Council (LLFA) will work with South Norfolk District Council to carry out a survey of the surface water drainage system.</p> <p>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.</p>	<p>Anglian Water NCC (LLFA and Highways) SNDC Riparian owners</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
	<p>Run-off from rainfall was obstructed by debris and silt which directed flood water towards the affected properties.</p> <p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>Surface run-off from rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features.</p> <p>The flooding may have been exacerbated by high-water levels (flood flows) in the watercourse and excessive rainfall. This may have caused the performance of other systems (i.e. Anglian Water drainage) to decrease due to surcharged outfalls or worse suffer from reverse flows.</p>	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them 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.</p>	

Flooding and flood risk within the Upper Pulhams catchment (Pulham St Mary)



Description of catchment

The Pulhams is a large tributary watercourse of the River Waveney catchment that flows west to east through Pulham St Mary, Starston, past Harleston and ultimately to Homersfield with its confluence with the River Waveney. Pulham St Mary resides in the mid-catchment position where upstream consists of approx 28km² of mostly agricultural land uses within the headwaters. Known locally as the Beck, the catchment is split into two main flow paths 1) Headwater stream from Gissing/Tivetshall which falls West to East and 2) headwater stream from Colgate End falling NW to SE, these both converge just upstream of Station Rd, Pulham St Mary where the cluster of properties are affected.

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	8	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	14	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	14	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 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	<p>On the 23/12/2020 - 4 properties were internally flooded on Station Road, Pulham St Mary. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 17/01/2021, (FWF/21/3809) • a resident via an online flood report form on the 13/01/2021, (FWF/21/3786) • a resident via an online flood report form on the 13/01/2021, (FWF/21/3782) • a resident via an online flood report form on the 11/01/2021, (FWF/21/3761) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Residents carried out measures to minimise the impact of flooding during the incident.</p> <p>The Waveney, Lower Yare & Lothingland IDB assessed the capacity of their drainage system after the incident.</p> <p>Norfolk County Council (Highways) visited affected residents to offer advice and to gather information after the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on South Green, Pulham St Mary. This incident was reported by:</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 17/02/2021, (FWF/21/4217) 	<p>Norfolk County Council assessed the validity and impact of the flood report.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on Bank Street, Pulham Market. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an email communication on the 14/01/2021, (FWF/21/3790) 	<p>Norfolk County Council assessed the validity and impact of the flood report.</p>

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
2012,2014	Internal flooding from fluvial sources	n/a

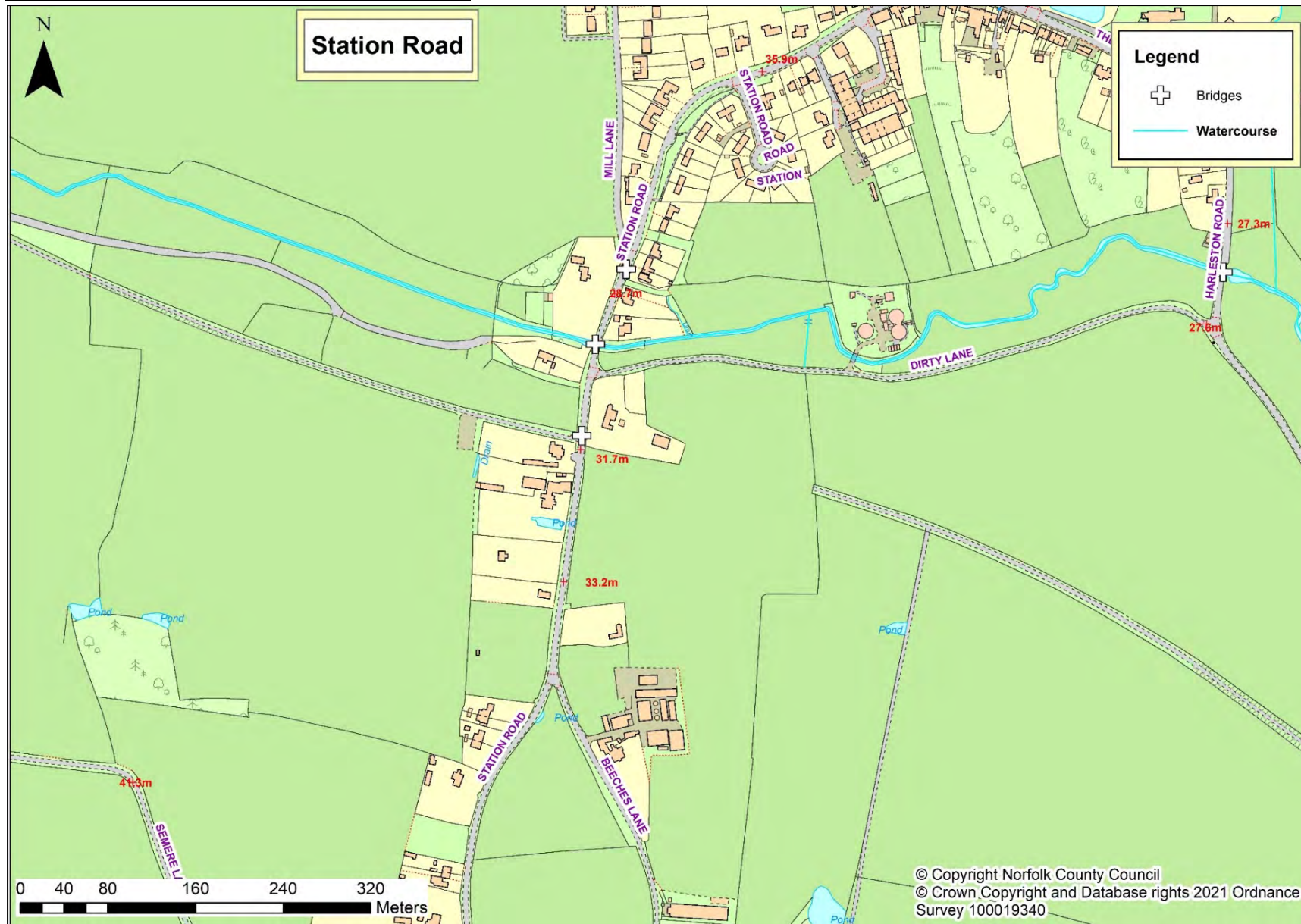
Causes of flooding within the catchment and recommendations

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.

Station Rd, Pulham St Mary – 23/12/2020



Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>A substantial amount of rain fell on the 23rd Dec onto a catchment with prior high saturation levels. The catchment is 28km² upstream of Station Road generating flashy high flows to which local watercourses and drainage infrastructure could not cope. 76mm fell at the very top of this catchment in Gissing (which is a 50yr storm).</p> <p>Two mechanisms of flooding occurred in Station Rd:-</p>	
<p>1) Fluvial flooding directly from the Beck watercourse in the bottom of the valley (Flood zone 3)</p>	<p>IDB – Waveney, Lower Yare and Lothingland board</p>

Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>Post-event drone footage displays the functional floodplain inundated but outlines that the Becks floodplain is relatively narrow and constrained by a quick rise to high ground to the north and south of the channel.</p> <p>Following site visits, multiple constrictions were evident along the Beck, from Station Rd towards Harleston Road. Several structures including 3x road bridges and culverts, fallen trees, in-channel cattle fences and earth bunds would have inhibited floods flow natural conveyance east towards Starston.</p> <p>Drone footage again outlines signs of afflux occurring at two road culverts; namely the access culvert to the Dirty Lane Sewage Treatment Works (STW) and Harleston Rd bridge. This afflux was potentially exacerbated due to</p> <ol style="list-style-type: none"> 1) the single barrel culverts being under-capacitated 2) blockage due to cattle fences. 3) Very high parapet walls, used to tie into the surrounding higher ground levels (embankments), removing mechanisms for safe overspill or high-level bypass. 4) The sill of the STW access culvert consists of plastic matting was doubled over reducing capacity and likely increasing frictional losses. <p>Each one individually or if occurring simultaneously may have artificially raised flood levels upstream of these structures. It appears from the footage that Harleston Rd bridge is the worsen constriction out of the three.</p> <p>It is also likely that a 4m high earth embankment spanning the entire western boundary of the AW treatment works on Dirty Lane (likely installed to protect this critical infrastructure from flooding) also restricted the safe passage of flood flows through this area of the Beck.</p>	<p>IDB (regulatory authority) NCC Highways (asset owner) AW (asset owner - STW)</p>
<p>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 Dirty Lane spanning the entire width of the channel.</p>	<p>IDB – Waveney, Lower Yare and Lothingland board</p>

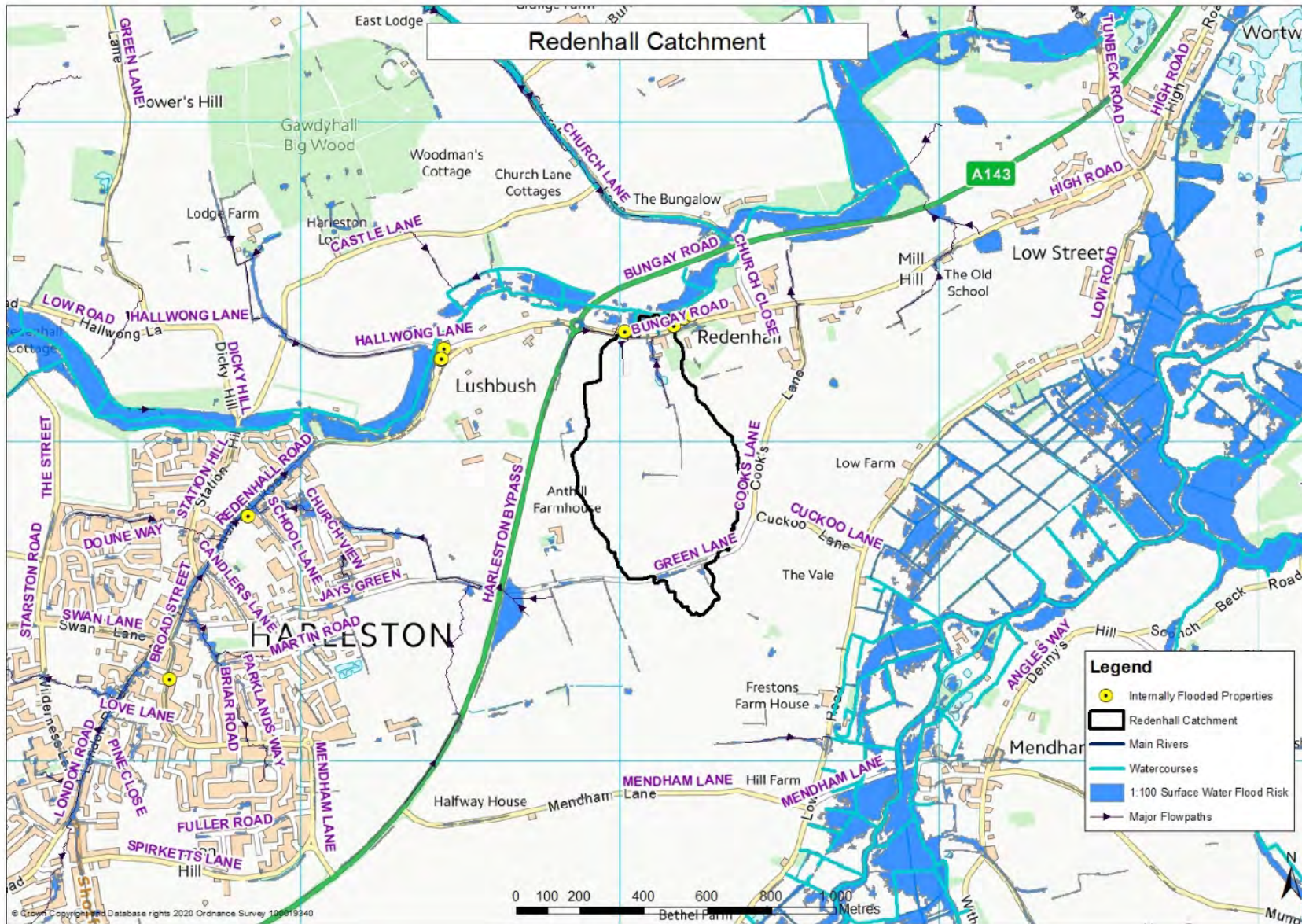
Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>2) Excessive runoff from waterlogged fields directed onto the highway led to ingress of flood water towards properties situated lower than the highway. Station Road (both north and south of the Beck) and Mill Lane acted as a conduit for overland runoff towards the Beck. A hump in Station Rd (South) led to severe ponding of water on the southern side of the Beck in Station Rd. Locals witnessed a torrent of overland flow from the fields along Station Rd (South) thus overwhelming road drainage and local ditches.</p> <p>This also applies to Mill Lane where a small drainage system in the roadside also runs from the top of the village. Mill Lane serves as the main drainage for Poppies Lane and Harleston Rd. The ditch running alongside Mill Lane is incomplete with the banks having subsided. Runoff also came from the centre of the village down Station Rd (north).</p>	<p>NCC (LLFA) and NCC (Highways)</p>
<p>The surface water drainage system network was likely hydraulically obstructed by high flood flows in the Beck watercourse. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties. Road gullies were also noted to be heavily silted however this was observed post event.</p>	<p>IDB (regulatory authority) NCC Highways (asset owner)</p>

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review maintenance responsibilities for all watercourses and its associated drainage infrastructure and implement to a wider action plan.	NCC (LLFA)	6 months
Review the inspection and maintenance schedule for:- 1) Local watercourses, the Beck currently on 5yr cyclical de-silt regime. 2) All surface water drainage assets within the adopted Highway. 3) Culverts or private crossings spanning the Beck	1) IDB 2) NCC (Highways) 3) AW	6 months
Review access arrangements for inspection and maintenance of watercourses.	IDB NCC (LLFA)	6 months
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. 3x culverts include Station Rd bridge, STW access culvert in Dirty Lane and Harleston Rd. Also, the effect of the 4m high bund at the STW should also be assessed. Investigate or model culverts and identify if they have sufficient capacity to cope with flood flows and/or can be modified to reduce flood risk to receptors in this report. Asset owner or Riparian owners to consider increasing size of piped watercourses and/or providing additional surface water storage that may currently act as a constriction (caveat that risk to Starston downstream must also be taken in consideration)	NCC (Highways) AW	12 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.	IDB, NCC (Highways), Landowners	12 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>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.</p>	NCC (LLFA)	6 months
<p>RMA's to seek opportunities for mitigation works and partnership funding for this, which aims to increase standard of protection to properties in Station Road. Works recommended include:</p> <ul style="list-style-type: none"> - • Improve conveyance of watercourses through widening, straightening and regrading channels. • Seek new areas of storage (additional areas of floodplain) that have multifunctional benefit (i.e. wetland/irrigation) upstream of Station Rd towards Pulham Market. • Assess whether 3x culverts on the Beck are fit for purpose. • Check if there is scope for a relief channel around the back of the STW • Check if there scope for a high level overflow through Harleston Rd Bridge and STW Access culvert. <p>*All the above must be investigated over a catchment wide approach though, for any release of flow would have to be compensated for as to not worsen flood risk to settlements downstream (i.e. Starston) and/or holding back flow upstream should not increase flood risk to settlements like Pulham Market.</p>	IDB NCC (Highways) NCC (LLFA) AW	12- 36 months
<p>Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.</p>	NCC Highways NCC LLFA	12 Months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Reinstate historic storage features like ponds, scrapes and ditch lines to intercept overland runoff before it can runoff onto roads or direct to properties. LLFA to contact landowners where this could be beneficial.	Landowners	

Flooding and flood risk within the Redenhall catchment



Description of catchment

Redenhall is adjacent to a large tributary watercourse known locally as Tunbeck of the River Waveney catchment that flows west to east through Pulham St Mary, Starston, past Harleston and ultimately to Homersfield with its confluence with the River Waveney. Redenhall resides in the downstream catchment position where upstream consists of the larger urban area of Harleston of mostly agricultural land uses within the headwaters.

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	2	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	2	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	2	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	2	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	1	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	1	0

Flood incidents within this catchment

Within this catchment 10 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	<p>On the 24/12/2020 - 2 properties were internally flooded on Bungay Road, Redenhall with Harleston. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 15/01/2021, (FWF/21/3764) • a resident via personal communication on the 15/01/2021, (FWF/21/3908) <p>On the 24/12/2020 - 5 properties were internally flooded on Redenhall Road, Redenhall with Harleston. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 15/01/2021, (FWF/21/3926) • a resident via an online flood report form on the 15/01/2021, (FWF/21/3788) • a resident via an online flood report form on the 17/01/2021, (FWF/21/3808) • Norfolk County Council Highways via a report on the 04/01/2021, (FWF/21/3773) • Norfolk County Council Highways via a report on the 04/01/2021, (FWF/21/3876) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p> <p>The IDB communicated with the riparian owners with regards to unconsented works carried out at the culverts immediately downstream of the affected properties and these have now been removed.</p> <p>NCC Highways assessed the damage to the Redenhall Bridge and implemented traffic measures to limit traffic crossing the bridge.</p>
23/12/2020	<p>On the 23/12/2020 - 2 properties were internally flooded on Bungay Road, Redenhall with Harleston. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 16/01/2021, (FWF/21/3807) • a resident via an online flood report form on the 19/01/2021, (FWF/21/3829) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on Mendham Lane, Redenhall with Harleston. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 30/12/2020, (FWF/20/3340) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>

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.

10 of the incidents (90.9%) of internal flooding in this catchment are within 2.5km of a rain gauge.

Data from rain gauges located in Harleston has been analysed to ascertain the intensity of the rainfall events experienced in the catchment.

The rainfall events recorded by gauges for this catchment are:

23 March 2021 - 3mm of rainfall was recorded as falling in 24 hours 0 minutes at the Harleston rainfall monitoring station. This intensity of rainfall for the total duration equates to a - year rainfall event. However an amateur gauge in Brockdish recorded 70mm over the day.

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
1987	Not known – Reference is made in correspondence between residents and Anglian Water post flooding to the area (Information supplied by Redenhall Flood Group)	Not known

Causes of flooding within the catchment and recommendations

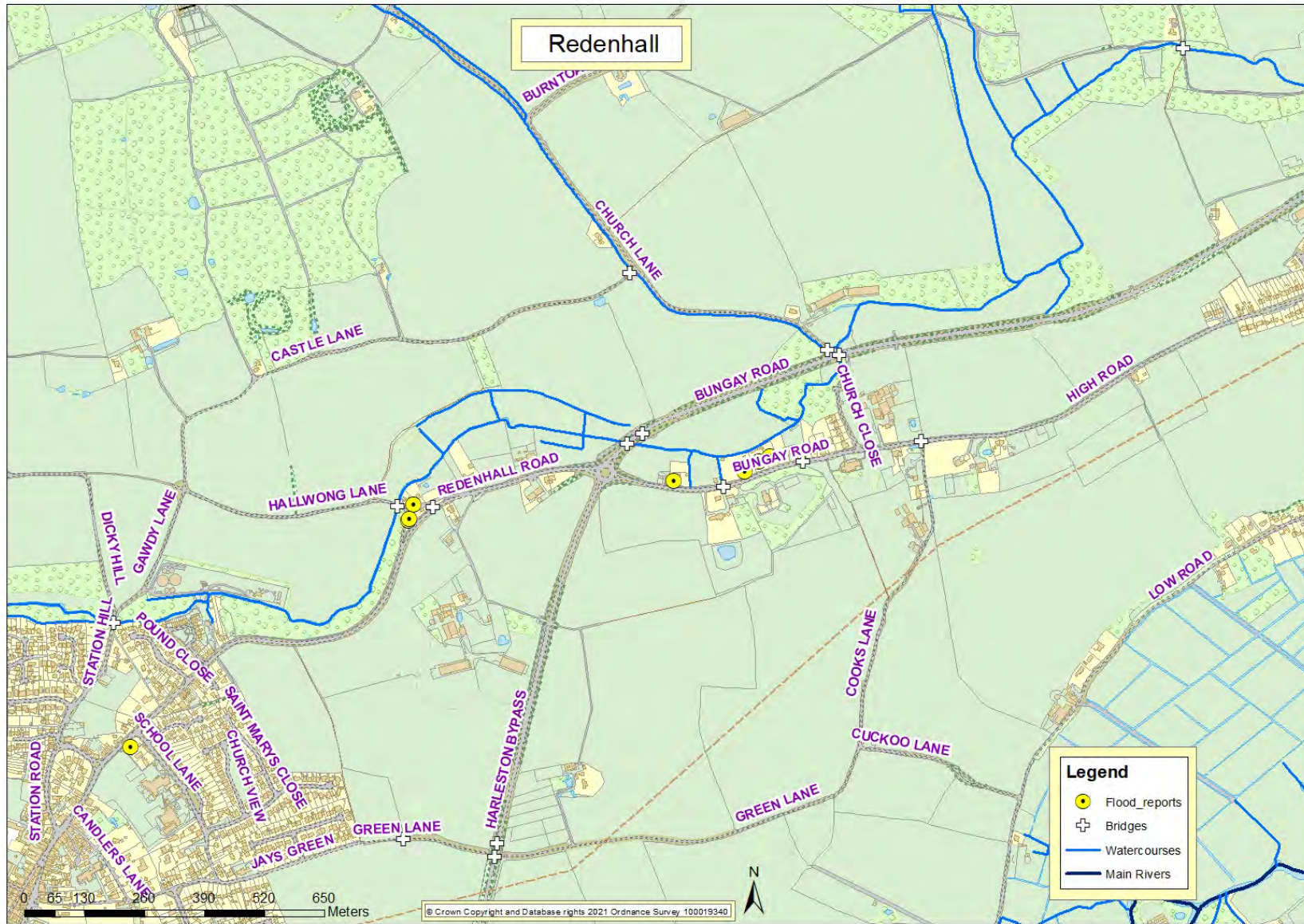
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the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

Bungay Road and Lush Bush, Redenhall and Harleston – 24/12/2020



Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>A substantial amount of rain fell on the 23rd Dec onto the catchment with prior high saturation levels.</p> <p>The properties within Redenhall and Lush Bush are within or adjacent to the flood plain (Flood Zone 3) and watercourse.</p> <p>Run-off from significant rainfall was concentrated along surface water flowpaths.</p> <p>Run-off from rainfall was obstructed by debris and silt which directed flood water towards the affected properties, this included blockages to the following structures:</p> <ul style="list-style-type: none"> • Gawdy Hall Culvert (3.7m total span) and Gawdy Hall Underpass is (4.3m total span) which are immediately north of the roundabout that is intersected by Redenhall Road and the A143 (Bungay Road) and downstream of the properties flooded in Lush Bush. These bridges are the responsibility of Norfolk County Council. • The Redenhall Bridge (4.3m total span) which is intersected by the A143 and Church Lane, which is downstream of the properties within redenhall. This bridge is the responsibility of Norfolk County Council. <p>Unconsented structures had been placed at the downstream end of the Gawdy Hall Culvert and Redenhall Bridge. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>The area surrounding Redenhall and Lush Bush is within IDB District (Waveney, Lower Yare and Lothingland) but is not main river and the IDB are responsible for regulating activities on this watercourse and maintaining the watercourse.</p> <p>A number of residents described a large surge all the way down the Beck to The Dove at Wortwell with the upstream flooding only partially related to the mechanisms that caused flooding downstream in locations such as Ditchingham Dam. Ditchingham Dam was affected by very high river levels but the Beck itself may not have been significantly affected by the water levels within the Waveney.</p>	<p>Norfolk County Council: Highways - Public highway maintenance & asset owner</p> <p>The watercourse is within the regulatory authority of the Waveney, Lower Yare and Lothingland Internal Drainage Board (IDB) and is maintained by the IDB – Land Drainage Powers</p>

Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
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.	Norfolk County Council: Highways - Public highway maintenance & asset owner
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.	
The surface water drainage system network was likely hydraulically obstructed by high flood flows in the Beck watercourse. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties.	IDB (regulatory authority) NCC Highways (asset owner)

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
To determine an appropriate maintenance regime in line with the risk identified and communicate with affected parties and riparian owners.	IDB	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) Property Owners	12 months
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 bridges and identify if they have sufficient capacity for conveying flood flows.	NCC (LLFA and Highways)	12 months
NCC 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.	NCC and IDB	12-36 Months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.	NCC	12 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>Review and improve partnership working between agencies to improve the response to flood events</p> <p>Support the development of flood groups/community groups which could include:</p> <ul style="list-style-type: none"> * having an emergency flood plan* * understanding surface water movement and riparian rights and responsibilities, * understanding the local drainage network and the ownership of different structures along the flowpath, * additional flood protection measures property owners could install and maintain * potential community action and parish support structures to help with the local management of informal flowpaths and * the wider issues of the causes and various ways of managing flooding. <p>An Emergency Plan could consider the following suggestions from residents:</p> <ul style="list-style-type: none"> a) support for emergency accommodation, b)how to access to emergency services c) an immediate Road Closure procedure that would have saved further significant impact, d)Access to resources such as sand bags, emergency food and water during the incident. e)Practical and physical help in clearing up after a flood event. f) Long term help and advice should be available to access for dealing with insurance companies and the effects of PTSD. 		

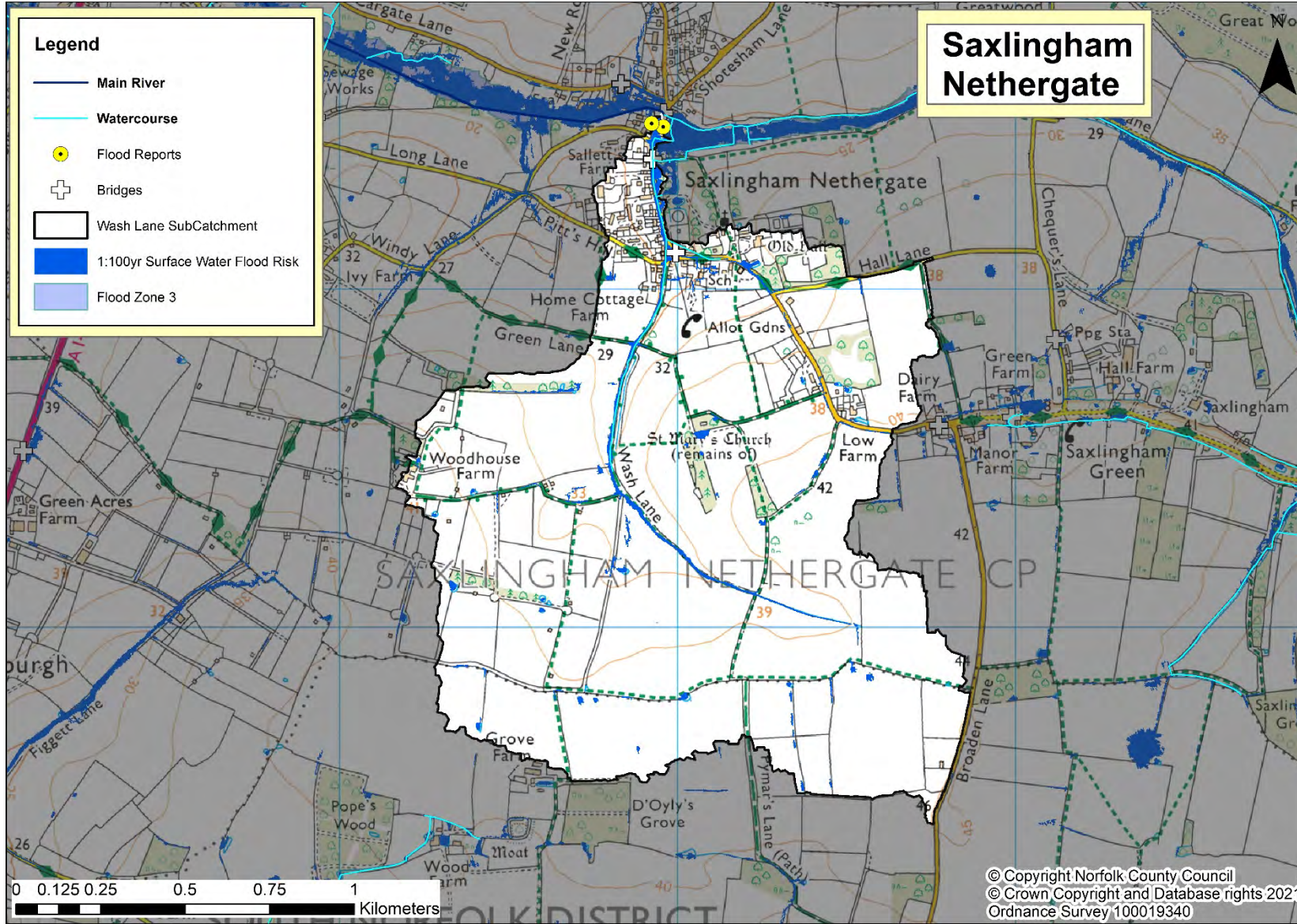
Redenhall Road, Titlow Road and Mendham Lane – Harleston



Location and date of flooding	Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
Redenhall Road, Redenhall with Harleston, 23/12/2020 Titlow Road, Redenhall with Harleston, 23/12/2020	A substantial amount of rain fell on the 23rd Dec onto the catchment with prior high saturation levels. Run-off from significant rainfall was concentrated along surface water flowpaths.	
Redenhall Road, Redenhall with Harleston, 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. The highway surface water drainage system was obstructed by debris or silt caused the failure of the upstream drainage system contributing to flooding at the affected properties.	Norfolk County Council: Highways - Public highway maintenance & asset owner
Titlow Road, Redenhall with Harleston, 23/12/2020 Mendham Lane, Redenhall with Harleston, 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.	Landowner/Property Owner
Mendham Lane, Redenhall with Harleston, 23/12/2020	Water was directed from a neighbouring property by their roof drainage / towards the affected property.	Neighbouring landowner

Location and date of flooding	Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>Redenhall Road, Redenhall with Harleston, 23/12/2020</p> <p>Titlow Road, Redenhall with Harleston, 23/12/2020</p> <p>Mendham Lane, Redenhall with Harleston, 23/12/2020</p>	<p>Advise residents of Property Level Resilience measures and funding opportunities.</p> <p>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.</p>	<p>NCC (LLFA)</p>	<p>Complete</p>
<p>Redenhall Road, Redenhall with Harleston, 23/12/2020</p>	<p>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. Norfolk County Council 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.</p>		
<p>Redenhall Road, Redenhall with Harleston, 23/12/2020</p>	<p>Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.</p>	<p>NCC</p>	<p>12 months</p>
<p>Mendham Lane, Redenhall with Harleston, 23/12/2020</p>	<p>The adjacent property owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency.</p>		

Flooding and flood risk within the Wash Lane catchment – Saxlingham Nethergate



Description of catchment

Wash Lane is a small headwater catchment south of Saxlingham Nethergate (2.1km²). This is one of two watercourses that flow through the village. Both headwaters confluence near Cargate Lane/The Street junction where the main risk area is located in the village. The watercourse then heads west as now an unnamed main river and eventually meets with the Main River Tas in Newton Flotman.

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	4	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. We note, however, that significantly more properties were flooded internally, based on feedback from neighbours or risk management authority reports. None the less LLFA have been excluded these properties as the LLFA has not received a direct and verifiable report nor the permission from the actual property owner to include, hold or publish information. 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 for this date will be investigated and published in an additional report. 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	<p>On the 23/12/2020 - 2 properties were internally flooded on The Street, Saxlingham Nethergate. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 23/01/2021, (FWF/21/3892) • a resident via an online flood report form on the 22/01/2021, (FWF/21/3891) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>

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 Lead Local Flood Authority has no previous reports of internal flooding in Saxlingham Nethergate.

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.

The Street, Saxlingham 23/12/2020



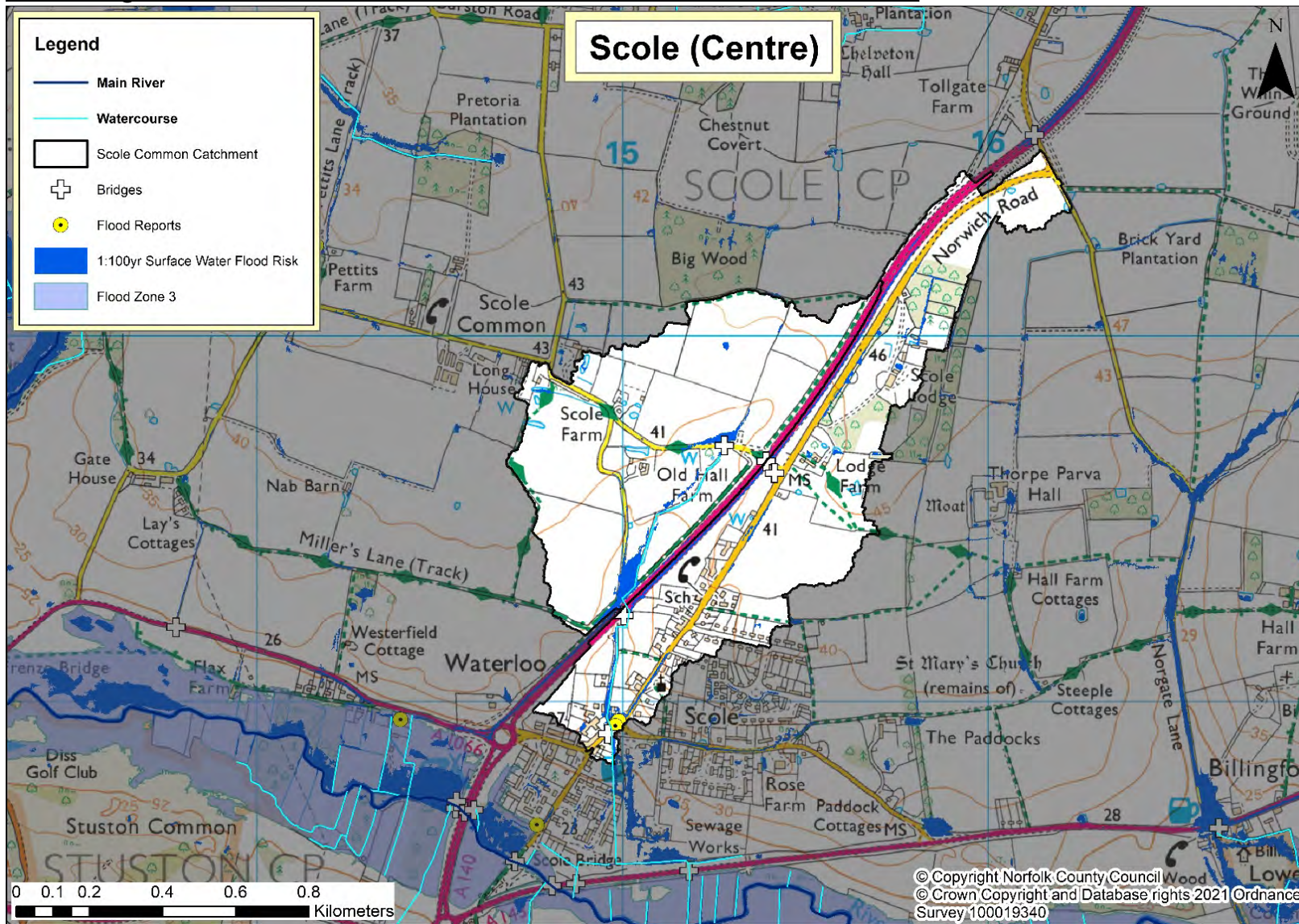
Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels (See Figure 1 for catchment area).</p> <p>Due to the saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the local watercourses</p> <p>Surface run-off from rainfall flowed off adjacent fields and towards natural lows/areas of flooding especially the the Wash Lane watercourse upstream of the village.</p>	
<p>Local observations witnessed local watercourses breaching and leading to the flooding observed in The Street during the event on the 23rd Dec.</p> <ol style="list-style-type: none"> 1) The Wash Lane (Bridleway) watercourse was flowing out of channel onto The Street near the War Memorial and then flowing overland in a Northerly direction within the Street. The wash lane watercourse is piped under the War Memorial but its inlet structure is very small and liable to blockage. 2) The floodwater was unable to re-enter the watercourse once in the Street due to how the road is hung. Hence the road acted as conduit and essentially became the watercourse. Furthermore, the actual channel in the Street is severely undersized and constrained by the highway boundary which does not help matters and private field access where culverts again act as a bottleneck. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties. 3) Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned on/adjacent to. 4) Bank Stabilisation works to the main river near Cargate Lane have also been undertaken which appear to be unconsented, however residents did not observe any flooding from this system on the 23rd. 	<p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water</p> <p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>

Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>Anglian Water have historically maintained the section of watercourse within in the Street. However, Parish CC have advised that AW have now divested this ownership.</p>	
<p>The volume of flooding into The Street and surrounding areas may have been exacerbated by the road culvert near Cargate Lane, restricting flow through this section of the watercourse. This also affects the other headwater stream from the East of Saxlingham Nethergate.</p>	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>
<p>The surface water drainage system network was likely hydraulically obstructed by high flood flows in the Wash Lane/The Street watercourse. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties.</p> <p>Road gullies were also noted to be heavily silted however this was observed post event.</p>	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p> <p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water.</p>
<p>The flood water entered the properties through low thresholds at entrances/the air bricks.</p>	
<p>Partial blockages were identified at several locations along The Street Watercourse, especially downstream of Upper Street. 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.</p>	<p>NCC (LLFA) and Landowners</p>

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review ownership and 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
Review access arrangements for inspection and maintenance of watercourses.	NCC (LLFA)	6 months
<p>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 identify if it has capacity.</p> <p>Asset owner or Riparian owners to consider reinstating and/or increasing size of piped watercourses and/or providing additional surface water storage that may currently offset constrictions.</p>	<p>NCC (LLFA) NCC (Highways)</p>	12 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.	<p>Riparian Landowners NCC (Highways)</p>	12 months
Asset Owners to review the capacity & level of maintenance required to sustain the design efficiency of their drainage systems in the Street 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.	<p>NCC (Highways) Anglian Water</p>	12 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>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.</p>	<p>NCC (LLFA)</p>	<p>6 months</p>
<p>Norfolk County Council will investigate with third parties on developing a partnership funding solution to mitigate the risk experienced at this location.</p> <p>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.</p> <p>Works recommended include:-</p> <ol style="list-style-type: none"> 6) Improve conveyance and capacity of watercourses through widening, straightening and regrading in The Street. Highway foundations will be affected. 7) Utilise in-channel storage within the Wash Lane watercourse upstream of War Memorial using NFM techniques such as Woody Debris Dams. High sided channel with low residual risk. Structures will need to be staggered off each high bank to maintain the PROW. 	<p>NCC (LLFA) NCC (Highways) Riparian Landowners</p>	<p>12- 24 months</p>

Flooding and flood risk within the Scole Common catchment



Description of catchment

Small tributary catchment of the Waveney situated to the North West of Scole. Catchment is split by the A140 trunk road with approx 4.3km² on the northern side of the road and 5km² on the southern side of the road. The southern catchment is mostly urbanised whilst the northern section is mostly rural with agricultural land uses. The main risk area is in the centre of Scole where a depression is located at intersection of Low Rd and Norwich Rd. The

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	11	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	22	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 incident of internal flooding has been assessed as part of this investigation (NCC are aware of 5 other properties unofficially flooding in this vicinity). 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 Norwich Rd, Scole. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 6/01/2021, (FWF/21/3625)	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
June 2016	Internal 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.

Low Road/Norwich Road – Scole – 24/12/2020



Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>A substantial amount of rain fell on the 23/24rd Dec onto a catchment with prior high saturation levels. The catchment is 4.3km² upstream of Low Road generating flashy high flows to which local watercourses and drainage infrastructure could not cope.</p> <p>Run-off from significant rainfall pools at a low point within the catchment affecting a property. Property sits at the lowest point on Norwich Road in the centre of the village where an ordinary watercourse is located.</p> <p>The main problem is that the water that accumulates in the area does not have adequate drainage to the Main river Waveney.</p> <p>Two mechanisms of flooding occurred in Norwich Rd/Low Rd:-</p>	
<p>1) Fluvial flooding directly from the Scole Common watercourse within Low Road which flows North to South towards Norwich Rd.</p>	
<p>Following site visits, multiple constrictions were evident along the watercourse, downstream of A140. The upper catchment emerges from a 450mm pipe under the A140 at the North end of Low Rd. There follows a trail of blocked pipes, damaged drains, undersize pipes that criss-cross underneath Low Rd, blocked ditches and a security screen on the Norwich Rd Culvert. All these deficiencies likely resulted with breaches into Low Road and deep pool at the low spot in the Norwich Rd/Low Rd Junction.</p> <p>The Norwich Rd Culverts capacity to convey floodwater from this point is unclear as it travels underneath dwellings on the Southern side of Norwich Rd.</p>	<p>NCC Highways (asset owner)</p>

Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>2) Excessive road runoff runs down Norwich Road, north to south. The total road catchment is approx. 16000m² with a constant longitudinal fall from the A140 junction to the Low Rd/Bungay Rd low spot. From the Church, it appears the road is hung to the Eastern side of the road where there are no drains, these being on the opposite side.</p> <p>The flow of water then crosses the road close to the War Memorial where the camber changes and promotes runoff down a footway where water adds to the ponding in the low spot. A single drain is evident and discharges to the Low Rd ditch but its hydraulic efficiency is likely reduced when the grate on the Norwich Rd culvert is blocked – which according to affected residents occurs frequently with detritus being brought down Low Rd.</p>	<p>NCC (LLFA) NCC (Highways)</p>
<p>The Low Rd watercourse and surface water drainage system network in Norwich Rd was likely hydraulically obstructed by high flows in the Main River Waveney. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties.</p>	<p>EA (regulatory authority) NCC Highways (asset owner)</p>
<p>The flood water entered the property through front and rear thresholds/the air bricks/the electricity conduits.</p>	

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review maintenance responsibilities for all watercourses.	NCC (LLFA)	6 months
Review the inspection and maintenance schedule for:- 1) Local watercourses 2) All surface water drainage assets within the adopted Highway.	1) Riparian Owners 2) NCC (Highways)	6 months
The EA 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	IDB NCC (LLFA)	6 months
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. Asset owner or Riparian owners to consider increasing size of piped watercourses and/or providing additional surface water storage that may currently act as a constriction.	NCC (Highways) Riparian Owners	12 months
Determine the route of water down Norwich Rd Culvert towards Main River Waveney via CCTV surveys and check whether it is fit for purpose (condition grading). Also considers the effectiveness of the security screen on the inlet to this culvert.	NCC (Highways)	6 Months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>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.</p>	<p>Riparian Landowners NCC (Highways)</p>	<p>12 months</p>
<p>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.</p> <p>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.</p>	<p>NCC (LLFA)</p>	<p>6 months</p>
<p>RMA's to seek opportunities for mitigation works and partnership funding for this, which aims to increase standard of protection to properties in Norwich Road. Works recommended include: -</p> <p>8) Improve conveyance of watercourses through widening, straightening and regrading channels where practical.</p> <p>9) Seek new areas of storage (additional areas of floodplain) or enhance existing features/ flow controls upstream of A140 in Scole Common.</p>	<p>IDB NCC (Highways) NCC (LLFA) AW</p>	<p>12- 36 months</p>
<p>Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.</p> <p>Norfolk County Council will consider options that would prevent water from pooling on the highway.</p>	<p>NCC Highways NCC LLFA</p>	<p>12 Months</p>

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Reinstate historic storage features like ponds, scrapes and ditch lines to intercept overland runoff before it can runoff onto roads or direct to properties. LLFA to contact landowners where this could be beneficial.	Riparian Landowners NCC LLFA	12 Months
Limit any new discharges into Scole Common/Low Rd watercourse related to new development to below greenfield rates.	South Norfolk DC	12 Months

Description of catchment

Main River Waveney at Scole – drains approx. area of 141km² at this point.

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	81	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	215	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	155	0

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
24/12/2020	On the 24/12/2020 - 1 property was internally flooded on Bridge Road, Scole. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 23/01/2021, (FWF/21/4137)	Norfolk County Council (Lead Local Flood Authority) Norfolk County Council assessed validity and impact of the flood report after the incident.

Recent rainfall within the 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 Lead Local Flood Authority has no previous reports of internal flooding on Bridge Road, Scole.

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.

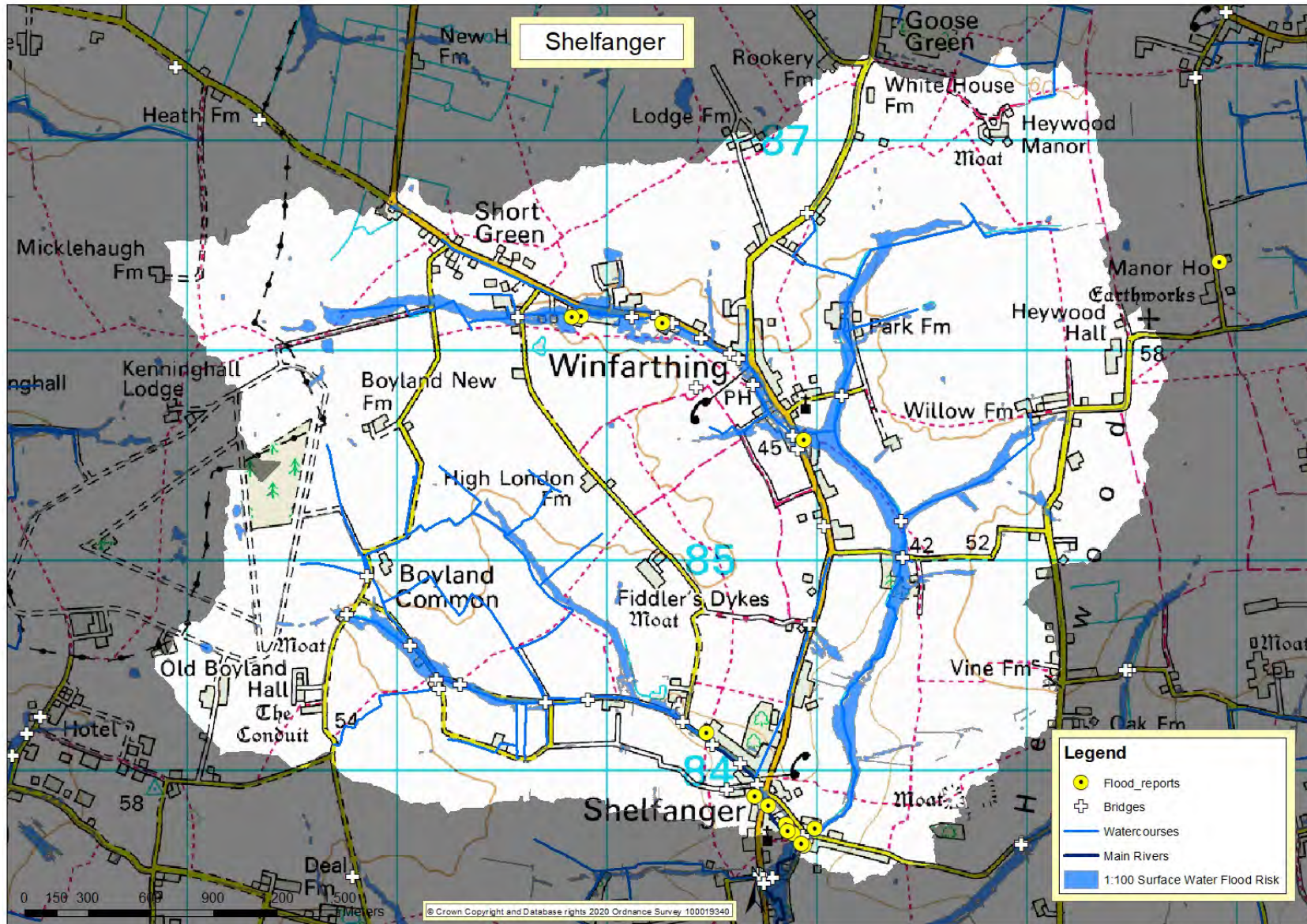
Following flooding to people, property and infrastructure

- 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.

Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>A substantial amount of rain fell on the 23rd Dec onto a catchment with prior high saturation levels. The catchment is 141km² upstream of Bridge Rd, Scole generating a flashy response to which local watercourses and drainage infrastructure could not cope.</p>	
<p>Flood extents in the functional floodplain area of Waveney were overtopping private thresholds, floodwater entered from the south.</p> <p>The area surrounding Bridge Rd is recognised main river and is within Flood Zone 3.</p>	EA (regulatory authority)
<p>Highway Drainage and surface water drainage system network in Bridge Rd was likely hydraulically obstructed by high flows in the Main River Waveney. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties.</p>	EA (regulatory authority) NCC Highways (asset owner)
<p>The flood water entered the property through front and rear thresholds/the air bricks/the electricity conduits. Seepage of high groundwater due to close proximity to main river meant into living spaces and onto above-ground structures (i.e. roads/private forecourts) was reported to a depth of approximately 300 mm.</p>	EA (regulatory authority)

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review and confirm ownership and maintenance responsibilities for all flood defences and associated drainage infrastructure and implement to a wider action plan.	NCC (LLFA)/ NCC (Highways)/ EA	6 months
Review and confirm operational response for flood events of this calibre and associated drainage infrastructure and implement to a wider action plan.	EA	6 months
EA will determine an appropriate maintenance regime in line with the risk identified and communicate with affected parties and riparian owners.	EA	6-12 months
<p>Property owners should protect their buildings through flood protection measures where appropriate.</p> <p>Environment Agency will communicate with local residents of properties known to have flooded internally to investigate options for managing flood risk. This may need to be dependent on those property owners affected contributing towards a solution. Alternatively property owners could carry out their own measures where funding is not forthcoming or residents are unwilling to wait.</p> <p>The EA will use their updated flood risk model of the River Waveney to help improve their understanding of flood risk in Scole</p>	EA	6 Months
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 identify if have capacity for flood flows.	EA	12 months
Norfolk County Council will consider options that would prevent water from pooling on the highway.	NCC (Highways)	12 months

Flooding and Flood risk within the Shelfanger catchment



Description of catchment

This large rural catchment flows east and south through the settlements of Winfarthing and Shelfanger. The watercourse passes through many culverts and bridges and becomes a Main River at the northern edge of Shelfanger, which eventually outfalls into the River Waveney east of Diss

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	2	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	2	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	2	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	2	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	1	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	1	0

Flood incidents within this area

Within Shelfanger 9 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	<p>On the 24/12/2020 - 2 properties were internally flooded on Common Road, Shelfanger. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 11/01/2021, (3713) • a resident via an online flood report form on the 21/01/2021, (3873) 	<p>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.</p>
24/12/2020	<p>On the 24/12/2020 - 1 property was internally flooded on The Green, Shelfanger. This incident was reported by:</p> <ul style="list-style-type: none"> • a resident via an email on the 27/01/2021, (3969) 	<p>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.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on Wash Lane, Shelfanger. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via an email on the 13/01/2021, (3784) 	<p>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.</p>
23/12/200	<p>On the 23/12/2020 - 1 property was internally flooded on Heywood Road, Shelfanger. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via an email on the 15/01/2021, (3801) 	<p>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.</p>
23/12/020	<p>On the 23/12/2020 - 1 property was internally flooded on Church Road, Shelfanger. This incident was reported by:</p> <ul style="list-style-type: none"> • a resident via an email on the 13/01/2021, (3837) 	<p>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.</p>

Date of Incident	Incident as reported	What was the response to the flood incident
24/12/2020	<p>On the 24/12/2020 - 3 properties were internally flooded on Rectory Road, Shelfanger. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 25/01/2021, (3910) • a resident via an email on the 21/01/2021, (3898) • a resident via an online flood report form on the 21/01/2021 (3885) 	<p>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.</p>

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

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

Date of incident	Impact	Rainfall intensity
1960's & 2001	Rectory Road	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.

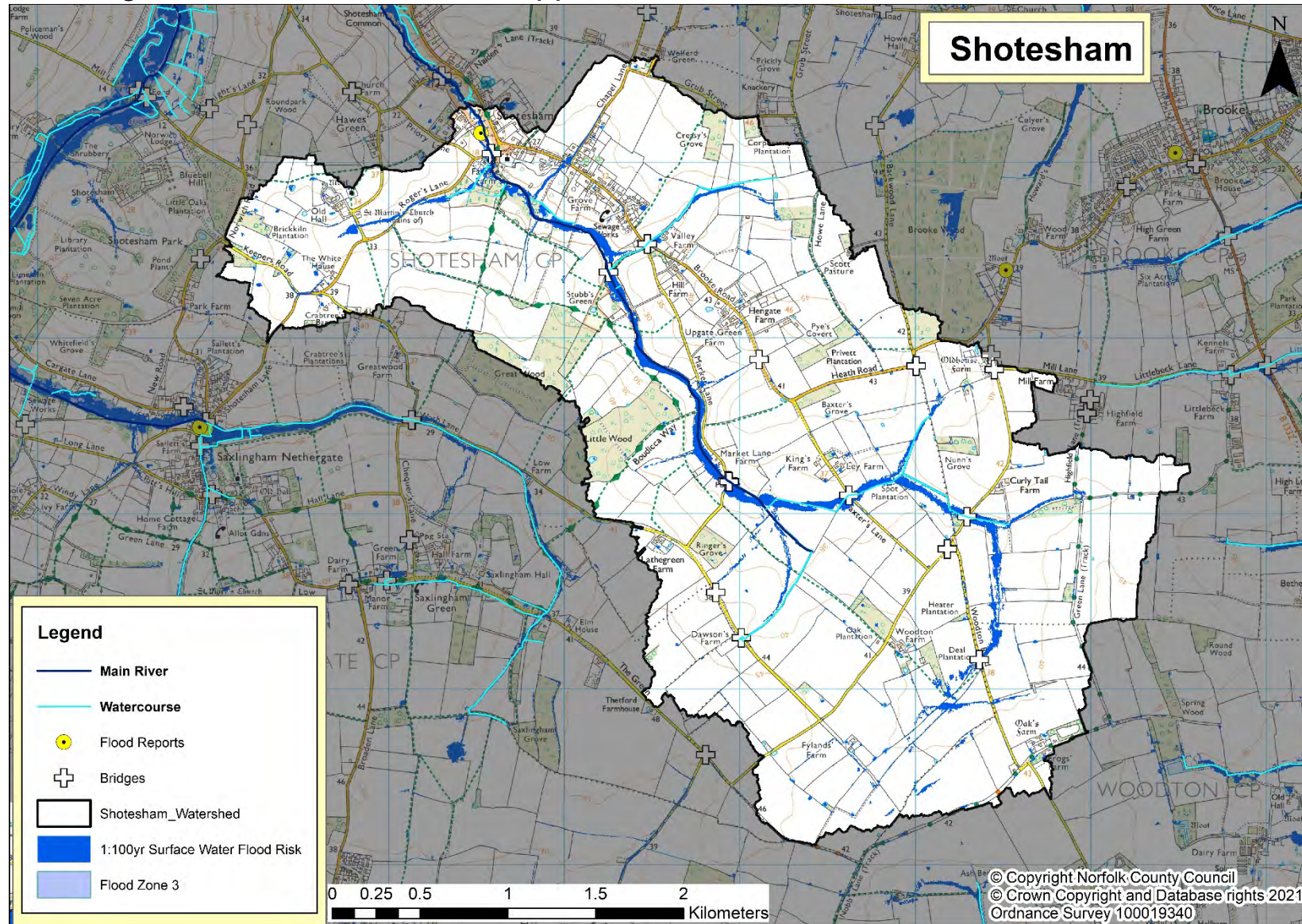
Following flooding to people, property and infrastructure

- 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?
<p>The Green 24/12/2020</p> <p>Common Road 24/12/2020</p> <p>Rectory Road 23/12/2020</p> <p>Wash Lane 23/12/2020</p> <p>Heywood Road 23/12/2020</p> <p>Church Road 23/12/2020</p> <p>Shelfanger</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>There are multiple bridges and access points along the river that create pinch points for river flow during flood events.</p> <p>The river was partially obstructed by high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>The river overtopped directing water towards the surface water drainage network. This overloaded the system and caused it to surcharge elsewhere contributing to the flooding at the affected properties.</p> <p>Surface run-off from significant rainfall flowed off adjacent fields and into watercourse. This was partially obstructed by debris and silt at several points. This reduced the efficiency of the drainage system contributing to flooding at the affected properties.</p>	<p>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.</p> <p>The EA will use their updated flood risk model of the River Waveney (and tributaries) to help improve their understanding of flood risk in Shelfanger. This modelling will help inform an 'Initial Assessment' to explore options to manage the flood risk, working with the community and our partners. The Environment Agency will communicate with local residents of properties known to have flooded internally to investigate options for managing flood risk. It may be dependent on those property owners affected contributing towards a solution</p>	<p>Local landowners Property owners Norfolk County Council (LLFA) and Environment Agency</p>

Flooding and flood risk within the Upper Shotesham catchment



Description of catchment

Main River headwater catchment upstream of Shotesham and which feeds into the River Tas. The catchment (11km²) falls South East to North West towards Stokes Holy Cross. The catchment is a rural landscape with mainly agricultural land uses. The main risk area is The Street, Shotesham.

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	1	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 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	<p>On the 23/12/2020 - 1 property was internally flooded on The Street (The Common), Shotesham.</p> <p>This incident was reported by</p> <ul style="list-style-type: none">a resident via an online flood report form on the 7/02/2021, (FWF/21/4378)	<p>Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p> <p>The Fire and Rescue Service responded.</p>

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
Nov 2014	Internal 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.

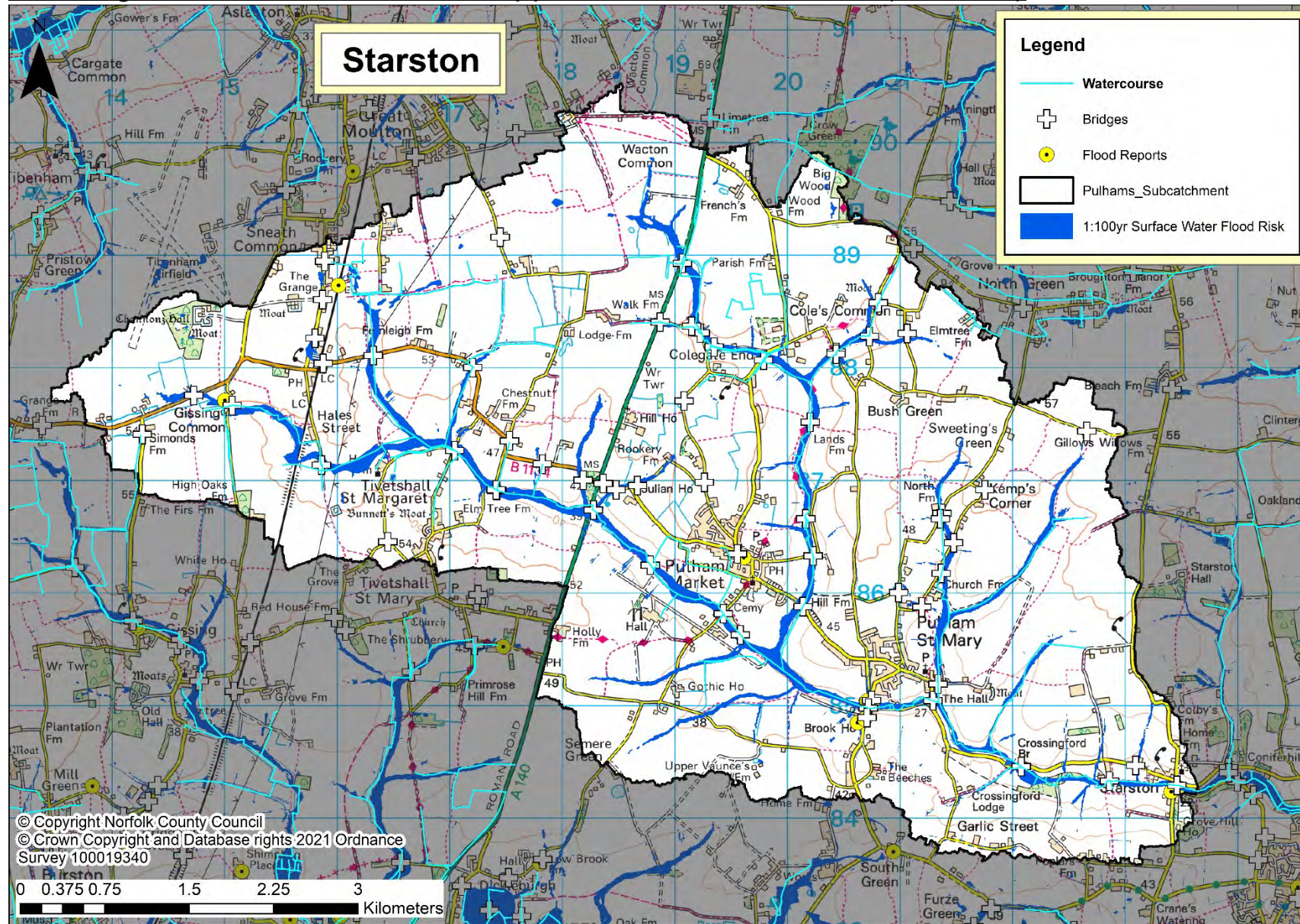
The Street, Shotesham, 23/12/2020



Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels (See Figure 1 for catchment area).</p> <p>Due to the saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the local watercourses causing flash flooding.</p> <p>These high river flows within the catchment affected property within the channels natural floodplain in the Common. However additional overland runoff came onto the Common on the night of 23rd December and did so down Rogers Lane, and across the back of the Common via low fields from the west of Priory Lane. This has little to do with the natural course of the floodplain, but does relate to drainage ditches which funnel the water from surrounding fields towards the Common.</p>	EA, NCC (LLFA) and Landowners
<p>Rudimentary earth embankment has been erected by properties. Unknown whether this has been constructed pre or post event.</p>	Landowners
<p>The flood water entered the properties through low thresholds at entrances/the air bricks.</p>	
<p>Partial blockages were identified at several locations along Patten Watercourse, especially downstream of Upper Street. 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.</p>	NCC (LLFA) and Landowners

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>The Environment Agency (EA) 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 obtain Flood Risk Activity Permit to maintain watercourses and EA to continue to take a risk based approach to its maintenance program</p>	EA	6 months
<p>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.</p> <p>Asset owner or Riparian owners to consider reinstating and/or increasing size of piped watercourses and/or providing additional surface water storage that may currently offset constrictions.</p>	NCC Highways NCC LLFA	12 months
<p>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.</p>	NCC LLFA	12 months
<p>Advise residents of Property Level Resilience measures and funding opportunities.</p> <p>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. One suggestion from a resident was to upsize one of the culverts situated at the entrance to the properties that could allow more surface water to flow.</p>	Property Owner NCC LLFA	6 months

Flooding and flood risk within the Upper Pulhams catchment (Starston)



Description of catchment

The Pulhams is a large tributary watercourse of the River Waveney catchment that flows west to east through Starston, Harleston, Redenhall and ultimately to Homersfield with its confluence with the River Waveney. Starston resides in a mid-catchment position where upstream the Upper Pulhams consists of approx. 37km² of mostly agricultural land uses within the headwaters. Known locally as the Beck, the catchment is split into three main flow paths 1) Main headwater stream from Gissing/Tivetshall which falls West to East, 2) headwater stream from Colgate End falling NW to SE and 3) headwater stream from Kemps Corner, all three converge just downstream of Harleston Rd, Pulham St Mary then head east towards Starston which is next major settlement.

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	9	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	17	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	20	0

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
23/12/2020	On the 23/12/2020 - 1 property was internally flooded on Railway Hill, Starston. This incident was reported by <ul style="list-style-type: none"><li data-bbox="507 584 890 730">• a resident via an online flood report form on the 21/01/2021, (FWF/21/3890)	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.

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

Data from rain gauges located in Harleston has been analysed to ascertain the intensity of the rainfall events experienced in the catchment. This analysis was useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas were exceeded. However, to ensure that any analysis reflects the localised nature of these events a 2.5km radius from these instruments has been used.

The rainfall events recorded by gauges for this catchment are:

23 March 2021 - 3mm of rainfall was recorded as falling in 24 hours 0 minutes at the Harleston rainfall monitoring station. This intensity of rainfall for the total duration equates to a - year rainfall event.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Railway Hill, Starston.

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.

Railway Hill, Starston – 23/12/2020

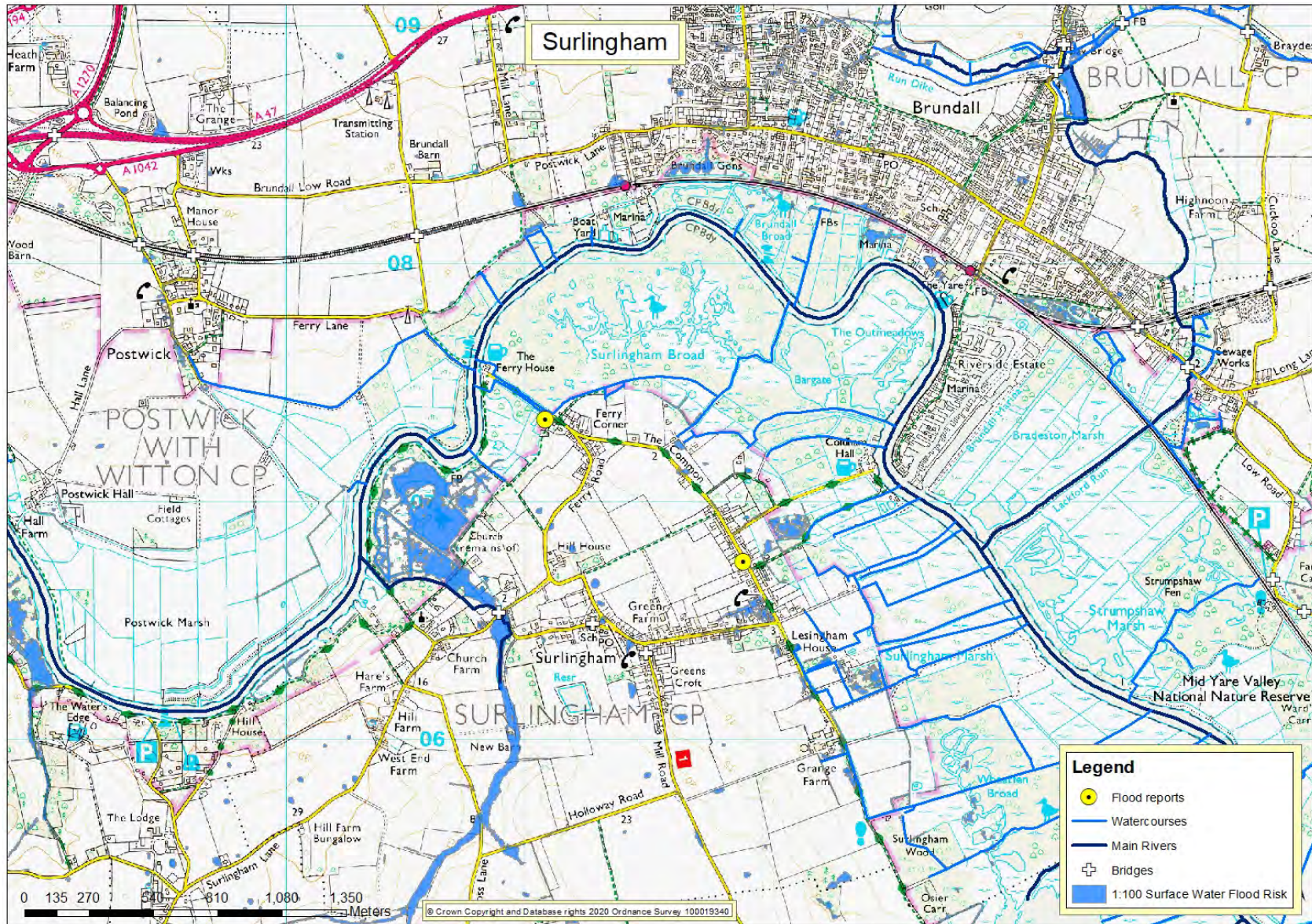


Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
<p>A substantial amount of rain fell on the 23rd Dec onto a catchment with prior high saturation levels. The catchment is 38km² upstream of Railway Hill generating flashy high flows to which local watercourses and drainage infrastructure could not cope.</p>	
<p>Fluvial flooding directly from the Beck watercourse in the bottom of the valley (Flood zone 3). The watercourse was out of bank both upstream and downstream of the village.</p>	<p>IDB – Waveney, Lower Yare and Lothingland board</p>
<p>Several hydraulic structures including weirs may have inhibited floods flow, but its more likely these were drowned out during the event.</p> <p>Similar to other villages in the Pulhams, road culverts and bridges like the one in The Street likely exacerbated flood depths and evidence of water flooding over the deck from Parish Council reports and flooding The Street. Thus, bottlenecks need reviewing for their hydraulic efficiency.</p>	<p>IDB (regulatory authority) NCC Highways (asset owner) AW (asset owner)</p>
<p>The surface water drainage system network was likely hydraulically obstructed by high flood flows in the Beck watercourse. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties. Road gullies were also noted to be heavily silted however this was observed post event.</p>	<p>IDB (regulatory authority) NCC Highways (asset owner)</p>

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Review maintenance responsibilities for all watercourses and its associated drainage infrastructure and implement to a wider action plan.	NCC (LLFA)	6 months
Review the inspection and maintenance schedule for:- 1) Local watercourses, the Beck currently on 5yr cyclical de-silt regime. 2) All surface water drainage assets within the adopted Highway.	1) IDB 2) NCC (Highways)	6 months
Review access arrangements for inspection and maintenance of watercourses.	IDB NCC (LLFA)	6 months
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. Asset owner or Riparian owners to consider increasing size of piped watercourses and/or providing additional surface water storage that may currently act as a constriction.	NCC (Highways) IDB	12 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.	IDB Riparian Landowners NCC (Highways)	12 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>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.</p> <p>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.</p>	NCC (LLFA)	6 months
<p>RMA's to seek opportunities for mitigation works and partnership funding for this, which aims to increase standard of protection to properties in Station Road. Works recommended include: -</p> <p>10) Improve conveyance of watercourses through widening, straightening and regrading channels.</p> <p>11) Removal of weirs. Take a catchment wide view though, for any release of flow would have to be compensated for as to not worsen flood risk to settlements downstream i.e. Harleston.</p> <p>12) Seek new areas of storage (additional areas of floodplain to reconnect) that have multifunctional benefits (i.e. wetlands) upstream of Starston</p>	IDB NCC (Highways) NCC (LLFA) AW	12- 36 months
<p>Norfolk County Council will consider opportunities to route flood water, on the highway, away from affected properties to alternative points of discharge, or other solutions as practicable.</p>	NCC Highways NCC LLFA	12 Months

Flooding and flood risk within Surlingham



Surlingham

Flood incidents within this area

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

Date of Incident	Incident as reported	What was the response to the flood incident
24/12/2020	On the 24/12/2020 - 1 property was internally flooded on Ferry Road, Surlingham. This incident was reported by <ul style="list-style-type: none">a County Councillor via email correspondence on the 25/01/2021, (3275)	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 The Street, Surlingham. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 19/01/2021, (3832)	The Fire and Rescue Service responded and pumped out during the incident. 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 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated. There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Historic flooding incidents within the catchment

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

Date of incident	Impact	Rainfall intensity
	Ferry Road to be added	

Causes of flooding within the catchment and recommendations

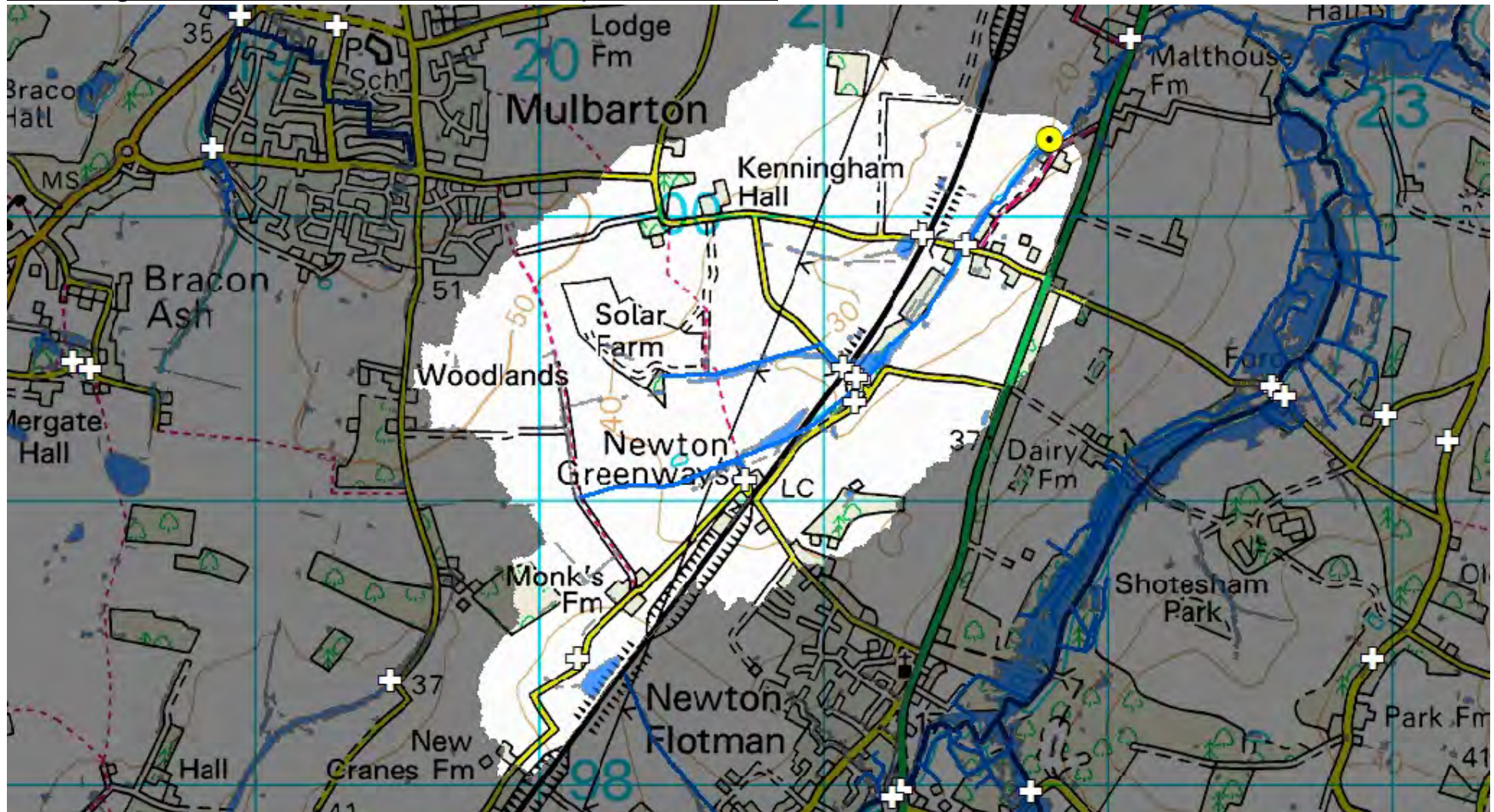
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the 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?
Ferry Road, Surlingham, 24/12/2020	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>Run-off from rainfall was directed towards the Anglian Water foul drainage network which the property has recently been connected to. The affected property is at the end of this drainage network. The flows could not be accommodated as the system was already overloaded. This led to surcharging of the drainage system inside the property.</p>	<p>Anglian Water should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.</p>	no data
The Street, Surlingham, 23/12/2020	<p>Surface run-off from significant rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features.</p>	<p>Amendments should be made to the management of neighbouring land to ensure water is not directed to other properties. Norfolk County Council should assist with this. Property owners should protect their buildings through flood protection measures where appropriate.</p>	<p>Local landowners Norfolk County Council (LLFA) Property owners</p>

Flooding and flood risk within Swainstorppe catchment



Swainsthorpe

Flood incidents within this area

Within this area 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	<p>On the 23/12/2020 - 1 property was internally flooded on Norwich Road, Swainsthorpe. This incident was reported by</p> <ul style="list-style-type: none">Norfolk County Council (Highways) via email correspondence on the 5/01/2021, (3611)	<p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited the site to assess the validity of the report and to gather information after the incident.</p>

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Swainsthorpe.

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?
<p>Norwich Road Swainsthorpe 23/12/2020</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>Run-off from significant rainfall was directed towards the surface water drainage system which was partially obstructed by high water levels downstream. Individual property drainage downstream was unable to cope with heavy flows. This reduced the efficiency of the upstream drainage system contributing to the accumulation of flood water at the affected property.</p>	<p>The relevant property owner should instigate a regular regime of maintenance to ensure the system is free from obstruction at all times.</p> <p>Norfolk County Council (LLFA) should investigate the potential of carrying out a survey of the private culverted part of the system.</p>	<p>Local landowner</p>

Flooding and flood risk within Tharston & Hapton



Tharston & Hapton

Flood incidents within this area

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

Date of Incident	Incident as reported	What was the response to the flood incident
	<p>On the 24/12/2020 - 2 properties was internally flooded on Low Tharston, Tharston and Hapton. This incident was reported by</p> <ul style="list-style-type: none">• a resident via personal communication on the 22/01/2021, (3834)• a resident via an online flood report form on the 09/05/2021 (4632)	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Tharston & Hapton.

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.

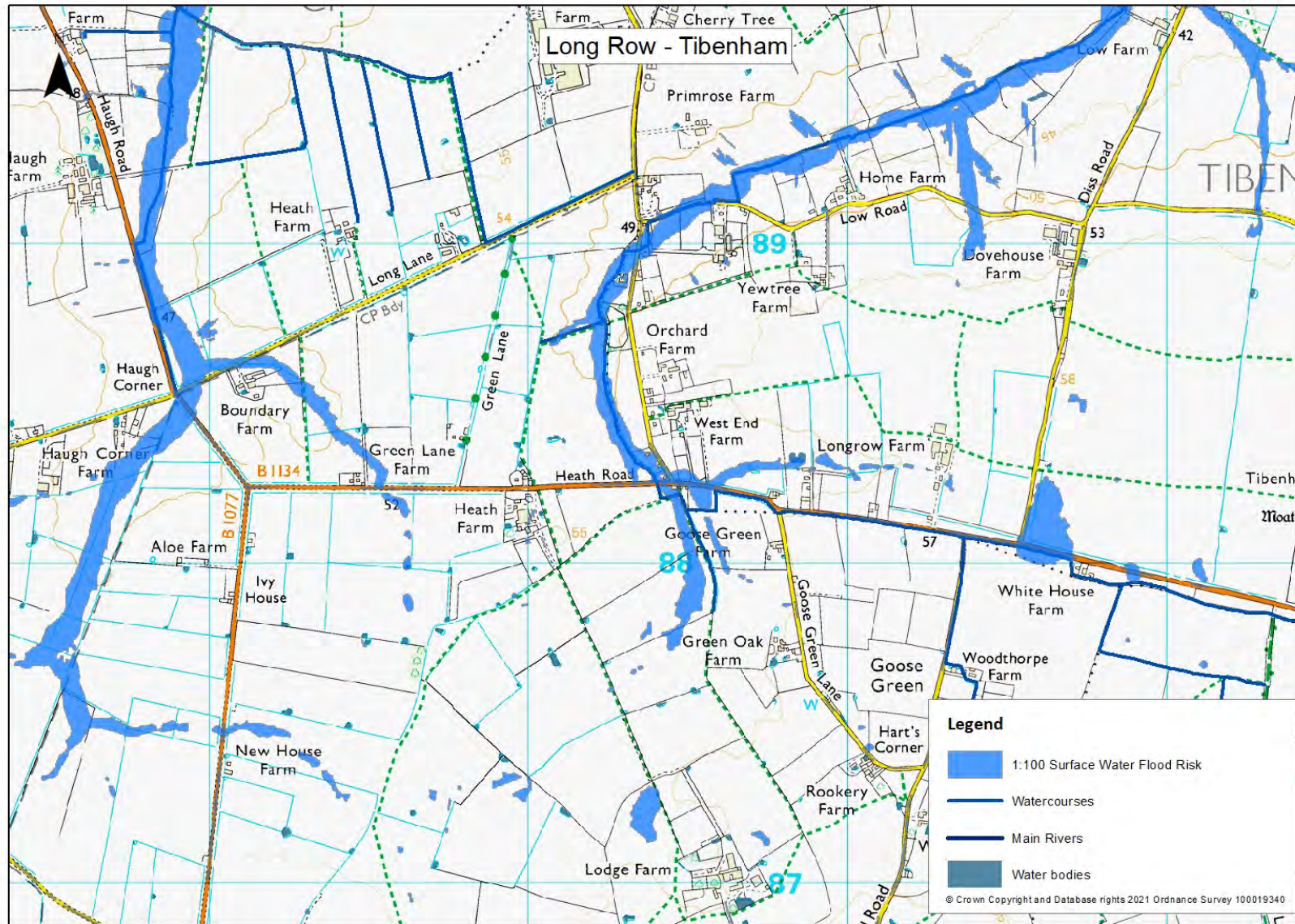
Following flooding to people, property and infrastructure

- 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?
<p>Low Tharston</p> <p>Tharston and Hapton</p> <p>24/12/2020</p>	<p>A substantial amount of rainfall fell on the 23/24thrd Dec onto a catchment with preceding high saturation levels.</p> <p>Surface run-off from significant rainfall flowed off adjacent fields and onto the highway. It then flowed into the mill pond which was already overloaded. This caused it to overtop and water was directed towards the affected property.</p> <p>The flooding may have been exacerbated by high-water levels (flood flows) in the watercourse which was especially high. This may have caused the performance of other systems (i.e. the spillway) to decrease.</p>	<p>The Environment Agency (EA) have permissive powers only to undertake maintenance, responsibility rests with the riparian owners, any maintenance done under the EA's 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.</p> <p>Environment Agency will communicate with local residents of properties known to have flooded internally to investigate options for managing flood risk. This may need to be dependent on those property owners affected contributing towards a solution. Alternatively property owners could carry out their own measures where funding is not forthcoming or residents are unwilling to wait."</p>	<p>Environment Agency</p> <p>Local landowners</p>

Flooding and flood risk within Tibenham



Tibenham

Flood incidents within this area

Within this area 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
	On the 23/12/2020 - 1 property was internally flooded on Long Row, Tibenham. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 22/01/2021, (3842)	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 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated. There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Tibenham.

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.

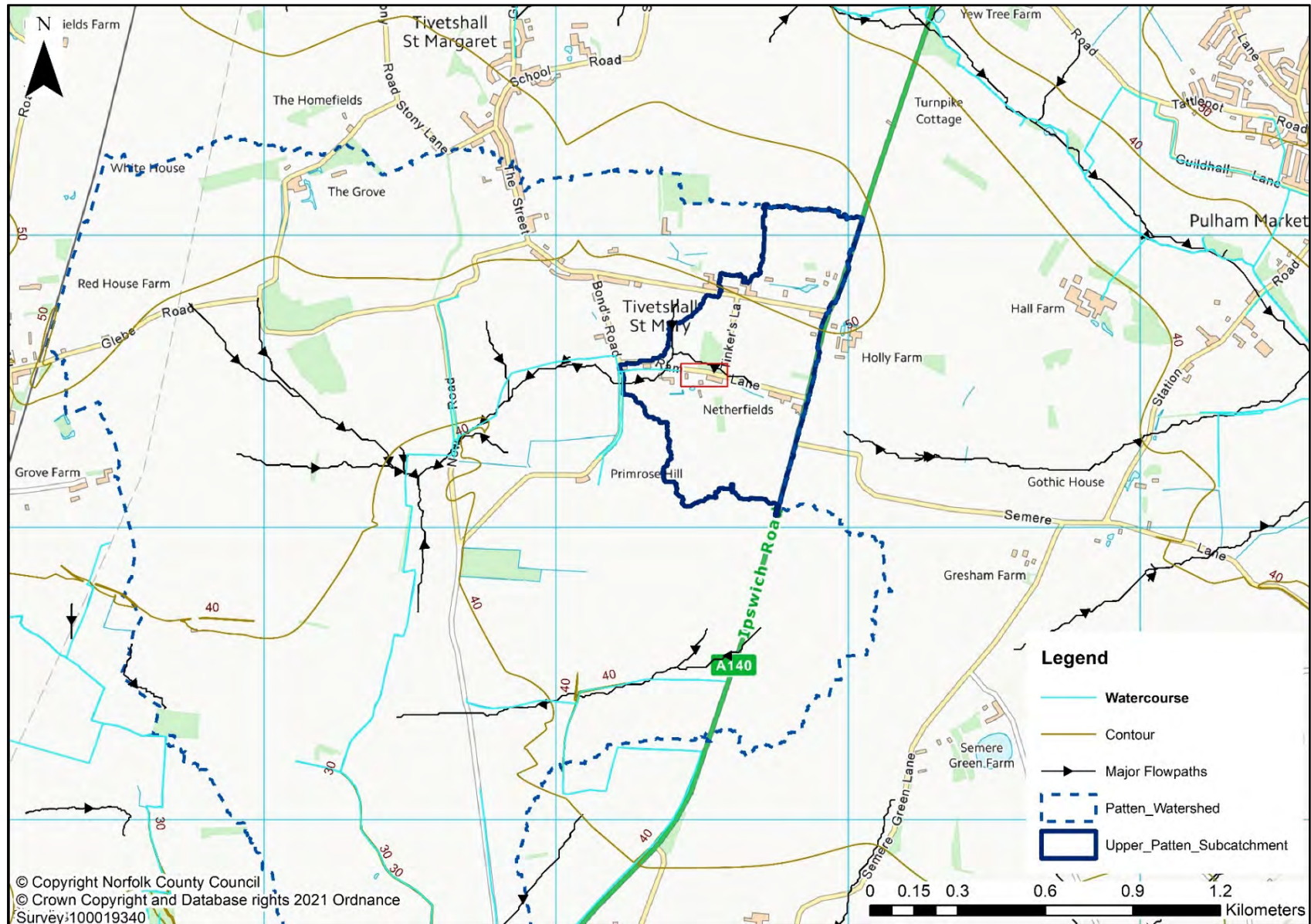
Following flooding to people, property and infrastructure

- 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?
<p>Long Row Tibenham 23/12/2020</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>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 properties.</p>	<p>Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.</p>	<p>Norfolk County Council (Highways)</p>

Flooding and flood risk within the Upper Patten catchment – Tivetshall St Mary



Description of catchment

Upper headwater catchment of the Patten watercourse that flows towards Shimpling (0.45km²) in the South West. This small watercourse flows east to west through Tivetshall St Mary. The catchment is largely rural with some runoff from main A140 trunk road. Main risk areas are Ram Lane.

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 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 Ram Lane, Tivetshall St Mary. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 29/12/2020, (FWF/20/3718)	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 Lead Local Flood Authority has no previous reports of internal flooding in Tivetshall St Mary.

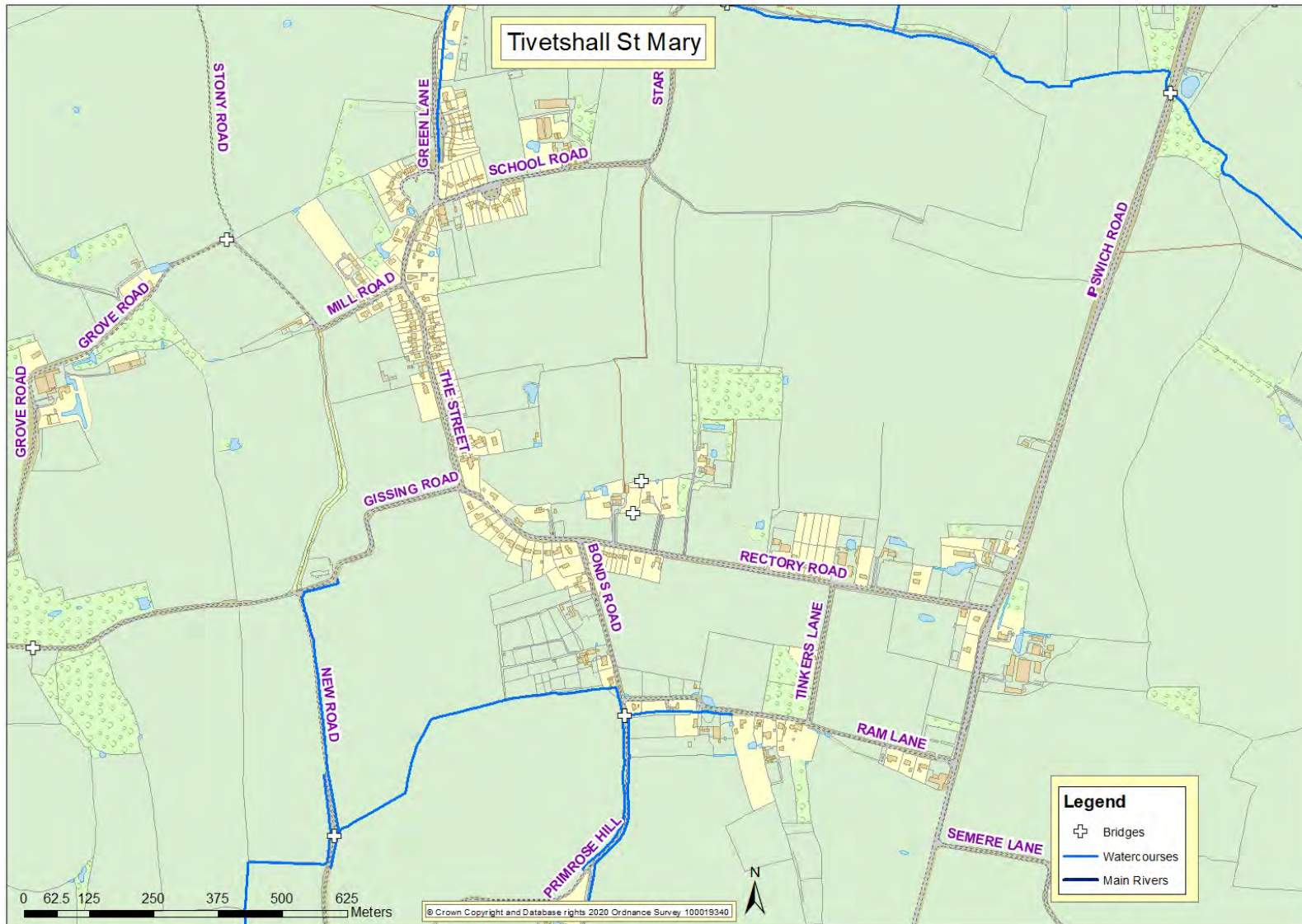
Causes of flooding within the catchment and recommendations

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.

Ram Lane, Tivetshall St Mary, 23/12/2020



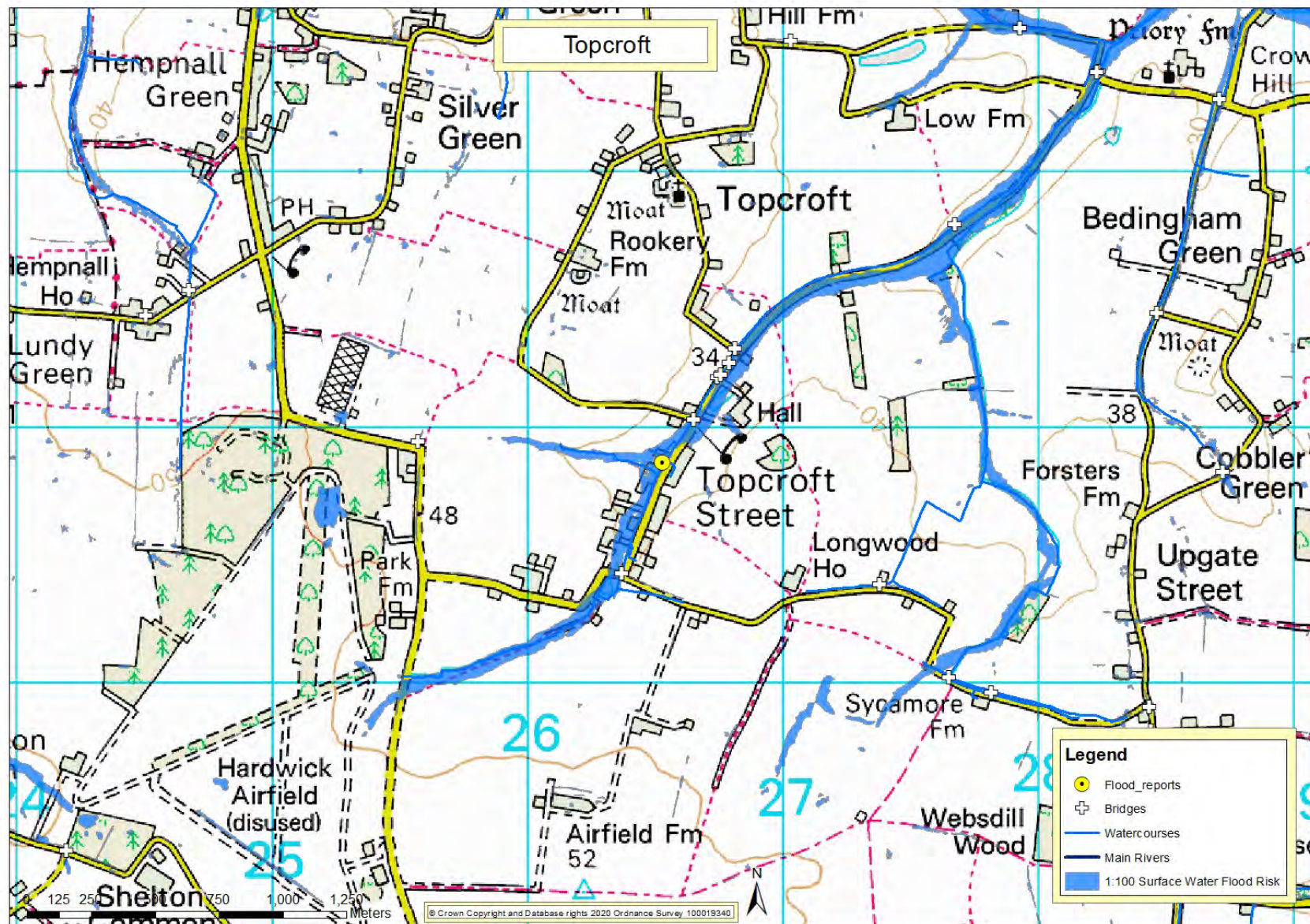
Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels (See Figure 1 for catchment area).</p> <p>Due to the saturation of soils localised ground conditions caused run-off to be directed quickly from where it fell as rain to the local watercourses</p> <p>Surface run-off from rainfall flowed off adjacent fields and towards natural lows/areas of flooding.</p>	
<p>Local observations witnessed local watercourses breaching and leading to the flooding observed in Ram Lane during the event on the 23rd Dec.</p> <p>1) The Patten Watercourse was overtopping its bank(s) alongside Ram Lane and Tinkers Lane leading to fast moving flood water in the road and private land flowing West. The road acted as conduit and essentially became the Patten watercourse.</p> <p>2) Run-off from significant rainfall was concentrated along overland flowpaths on which the affected properties are positioned on/adjacent to.</p> <p>3) Significant rainfall and flooding from ordinary watercourses was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties.</p>	<p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water</p> <p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>
<p>The volume of flooding into Ram Lam and surrounding areas may have been exacerbated by the Tinkers Lane culvert restricting flow through this section of the Patten watercourse and grips in the verges allowing water to reverse flow back out of banks. Residents have stopped up these grips post event.</p>	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p>

Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
<p>The surface water drainage system network was likely hydraulically obstructed by high flood flows in the Patten watercourse. This reduced the efficiency of the upstream drainage system to remove surface water runoff in the road which also likely added to the flooding at the affected properties.</p> <p>Road gullies, which there are few of, also noted to be heavily silted however this was observed post event.</p>	<p>Norfolk County Council (Highways): Public highway maintenance, land & asset owner</p> <p>Norfolk County Council (LLFA): Regulatory body for ordinary watercourses/ surface water.</p>
<p>The flood water entered the properties through low thresholds at entrances/the air bricks.</p>	
<p>Partial blockages were identified at several locations along Patten Watercourse, especially within Ram Lane itself. 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.</p>	<p>NCC (LLFA) and Landowners</p>

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
Review access arrangements for inspection and maintenance of watercourses.	NCC (LLFA)	6 months
<p>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 identify if it has capacity.</p> <p>Asset owner or Riparian owners to consider reinstating and/or increasing size of piped watercourses and/or providing additional surface water storage that may currently offset constrictions.</p>	<p>NCC (LLFA)</p> <p>NCC (Highways)</p>	12 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.	<p>Riparian Landowners</p> <p>NCC (Highways)</p>	12 months

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>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.</p>	<p>Property Owners / NCC (LLFA)</p>	<p>6 months</p>

Flooding and flood risk in Topcroft



Topcroft

Flood incidents within this area

Within this area 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
	On the 23/12/2020 - 1 property was internally flooded on Topcroft Street, Topcroft. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 27/01/2021, (3737)	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 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated. There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Topcroft.

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?
<p>Topcroft Street Topcroft 23/12/2020</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.] Surface run-off from rainfall flowed off adjacent fields into the land drainage network. These flows could not be accommodated as the system was already overloaded.</p>		<p>Local landowner</p>

Flooding and flood risk within Welborne



Flood incidents within this area

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

Date of Incident	Incident as reported	What was the response to the flood incident
	On the 23/12/2020 - 1 property was internally flooded on Pound Lane, Welborne. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 27/01/2021, (3303)	The Fire and Rescue Service responded and pumped out during the incident.
	On the 23/12/2020 - 1 property was internally flooded on Hall Road Welbourne, Welborne. This incident was reported by <ul style="list-style-type: none">a resident via an online flood report form on the 26/12/2020, (3301)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. The landowner carried out maintenance work to the highway drainage system after the incident.

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Welborne.

Causes of flooding within the catchment and recommendations

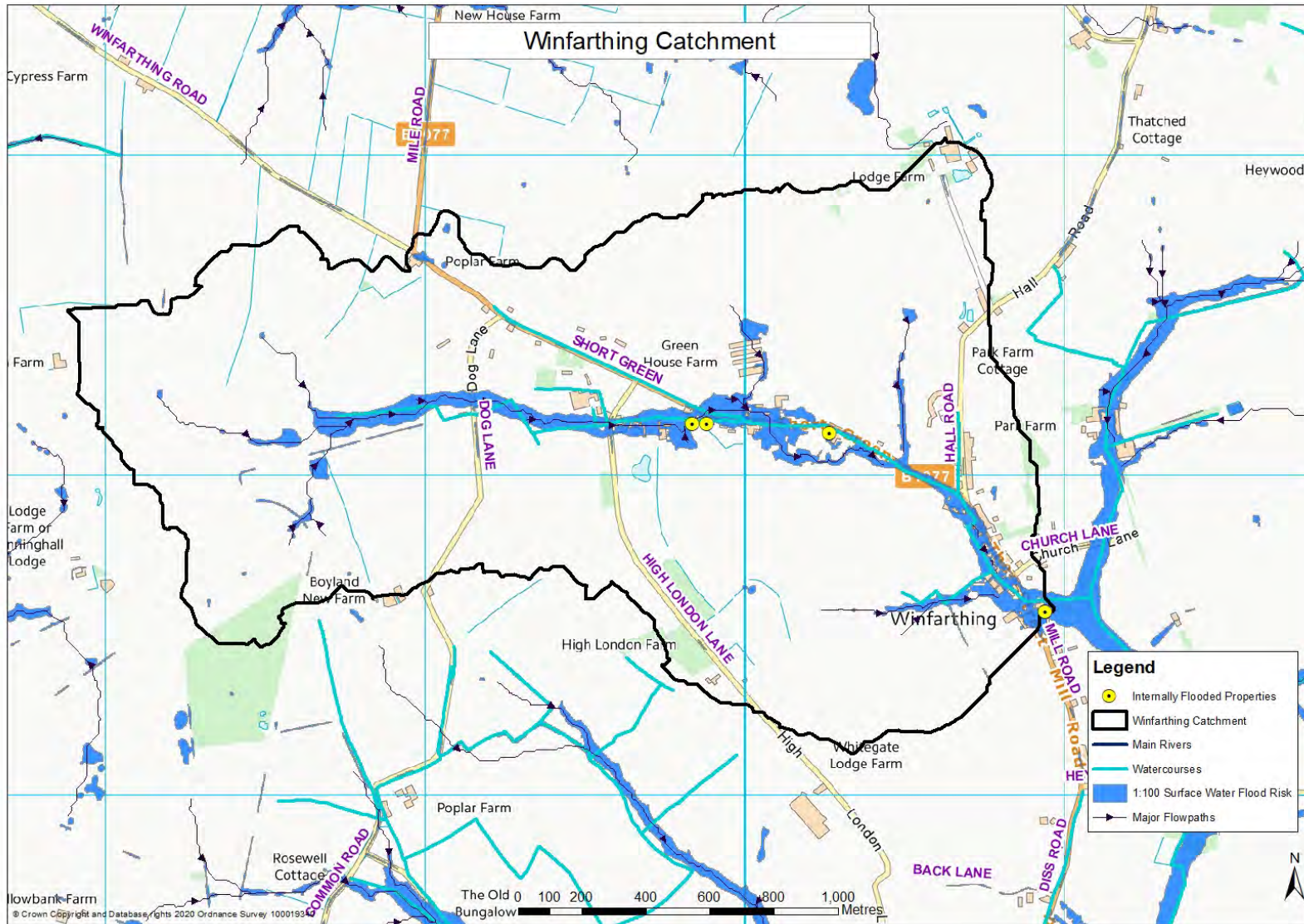
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the 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?
<p>Pound Lane 23/12/2020 Hall Road 23/12/2020 Welbourne</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>The land drainage system was partially obstructed by debris and silt. This cause surface run-off to make its way onto highway where it flowed along the road network and onto the accesses of affected properties that were situated lower than these features.</p> <p>Run-off from rainfall was directed towards an undersized culvert. These flows could not be accommodated as the system is of insufficient capacity to deal with this amount of water. This directed flood water towards the affected properties.</p>	<p>The Local landowners should instigate a regular regime of maintenance to ensure the system is free from obstruction at all times.</p> <p>Norfolk County Council 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. Norfolk County Council will determine if works are needed to improve the system. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.</p>	<p>Norfolk County Council (Highways) Local landowners</p>

Flooding and flood risk within the Winfarthing catchment



Description of catchment

Winfarthing

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:	1	22	2
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	1	32	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 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	<p>On the 24/12/2020 - 4 properties were internally flooded on Short Green, Winfarthing. These incidents were reported by</p> <ul style="list-style-type: none">• a resident via an online flood report form on the 21/04/2021, (4466)• a resident via an online flood report form on the 20/01/2021, (3877)• the Parish Council via an email communication on the 18/01/2021, (3812)• a resident via an online flood report form on the 26/12/2020, (3719)	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
23/12/2020	<p>On the 23/12/2020 - 1 property was internally flooded on Mill Road, Winfarthing. This incident was reported by</p> <ul style="list-style-type: none">• a resident via an online flood report form on the 3/02/2021, (4057)	<p>Norfolk County Council (Lead Local Flood Authority) Norfolk County Council assessed validity and impact of the flood report after the incident.</p>

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Mill Road or Short Green, Winfarthing.

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?
<p>Short Green, 24/12/2020 & 23/12/2020</p> <p>Mill Road, 23/12/2020</p> <p>Winfarthing</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>Run-off from rainfall was concentrated along overland flowpaths on which the affected property[ies is/are positioned on/adjacent to].</p>	<p>Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.</p>	<p>no data</p>
<p>Short Green</p> <p>24/12/2020 & 23/12/2020</p> <p>Mill Road</p> <p>23/12/2020</p> <p>Winfarthing</p>	<p>Run-off from [significant] rainfall was directed towards the [surface water/foul / combined] drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected property[ies]. This was due to [additional property connections (e.g. connected conservatories and house extensions) to existing networks / the infiltration of (surface water / groundwater) into existing drainage networks].</p>	<p>[Enter relevant organisation(s)] should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.</p>	<p>no data</p>

Flood incidents within Winfarthing outside of catchment

Within this area 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 Heath Road, Winfarthing. This incident was reported by <ul style="list-style-type: none">a Parish Council via an email communication on the 18/01/2021, (3810)	Norfolk County Council (Lead Local Flood Authority) assessed the validity and impact of the flood report.

Recent rainfall within the catchment

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

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

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding on Heath Road, Winfarthing.

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.

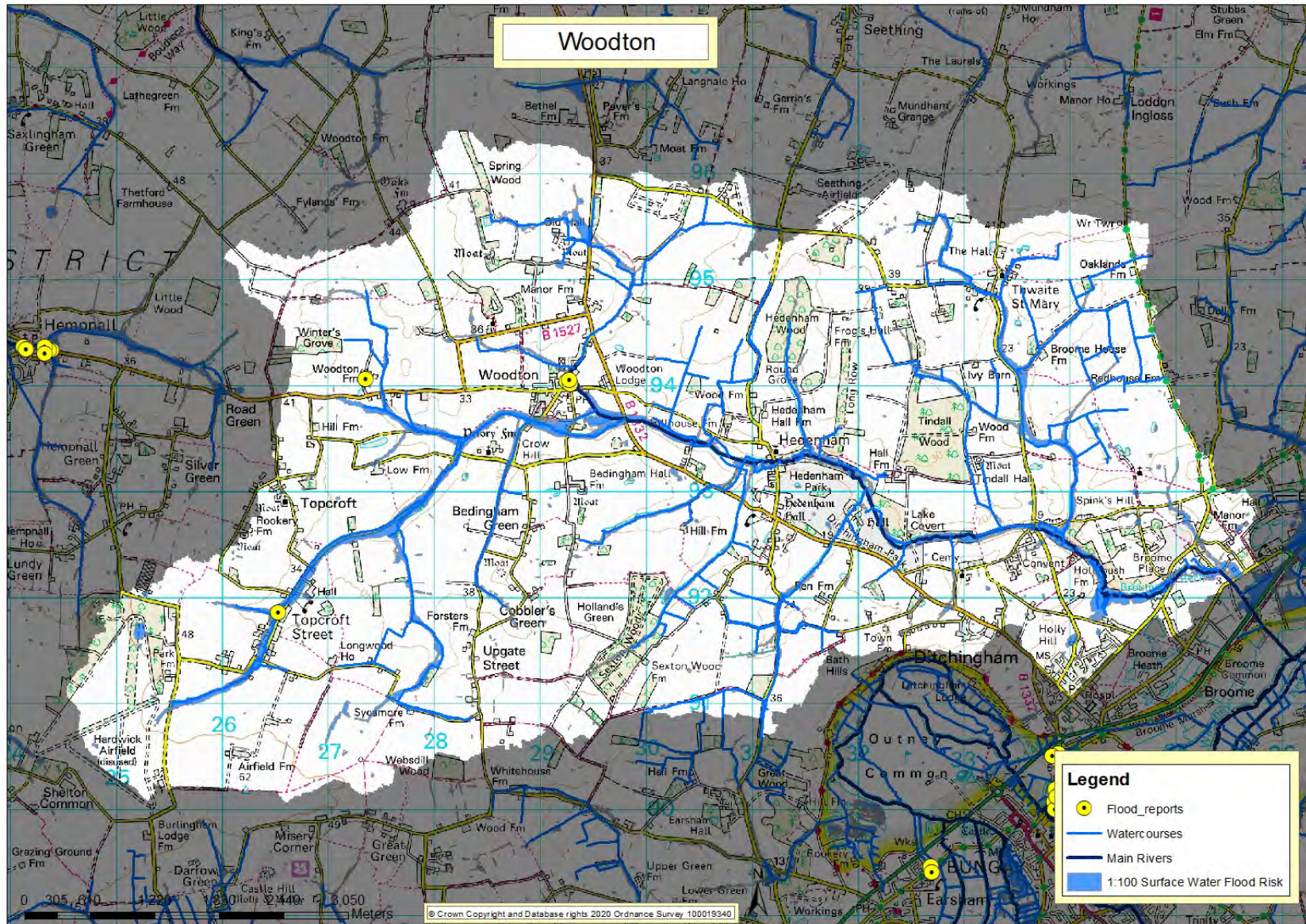
Following flooding to people, property and infrastructure

- 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?
Heath Road Winfarthing 23/12/2020	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>Run-off from significant rainfall was concentrated along overland flowpaths on which the affected property is positioned adjacent to.</p> <p>Surface run-off from significant rainfall flowed off adjacent fields and into the ordinary watercourse. These flows could not be accommodated as the system was already overloaded.</p>	<p>Amendments should be made to neighbouring land to ensure water is not directed towards properties.</p> <p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them 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.</p>	<p>Local landowners</p> <p>Property owners</p>

Flooding and flood risk within the Broom Beck catchment (Woodton)



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	35	2
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	1	81	5
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	16	1
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	1	26	2
[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	9	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	15	1

Flood incidents within this catchment

Within this catchment 5 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 5 additional properties (as reported to the County Council) did not flood due to the efforts of property owners and in large part due to the assistance of the Environment Agency. 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 Hempnall Road, Woodton. This incident was reported by <ul style="list-style-type: none"> • a resident via email correspondence on the 12/01/2021, (3774) 	A resident carried out measures to minimise the impact of flooding during the incident.
23/12/2020	On the 23/12/2020 - 4 properties were internally flooded on The Street, Woodton. These incidents were reported by <ul style="list-style-type: none"> • a resident via an online flood report form on the 10/03/2021, (4314) • a resident via an online flood report form on the 13/01/2021, (3750) • a resident via an online flood report form on the 7/02/2021, (3718) • a resident via an online flood report form on the 5/01/2021, (3616) 	A resident carried out measures to minimise the impact of flooding during the incident. The Fire and Rescue Service responded and pumped out during the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. The Environment Agency 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 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated. There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Historic flooding incidents within the catchment

The Lead Local Flood Authority has no previous reports of internal flooding in Woodton. The residents anecdotally reported flooding in 2012.

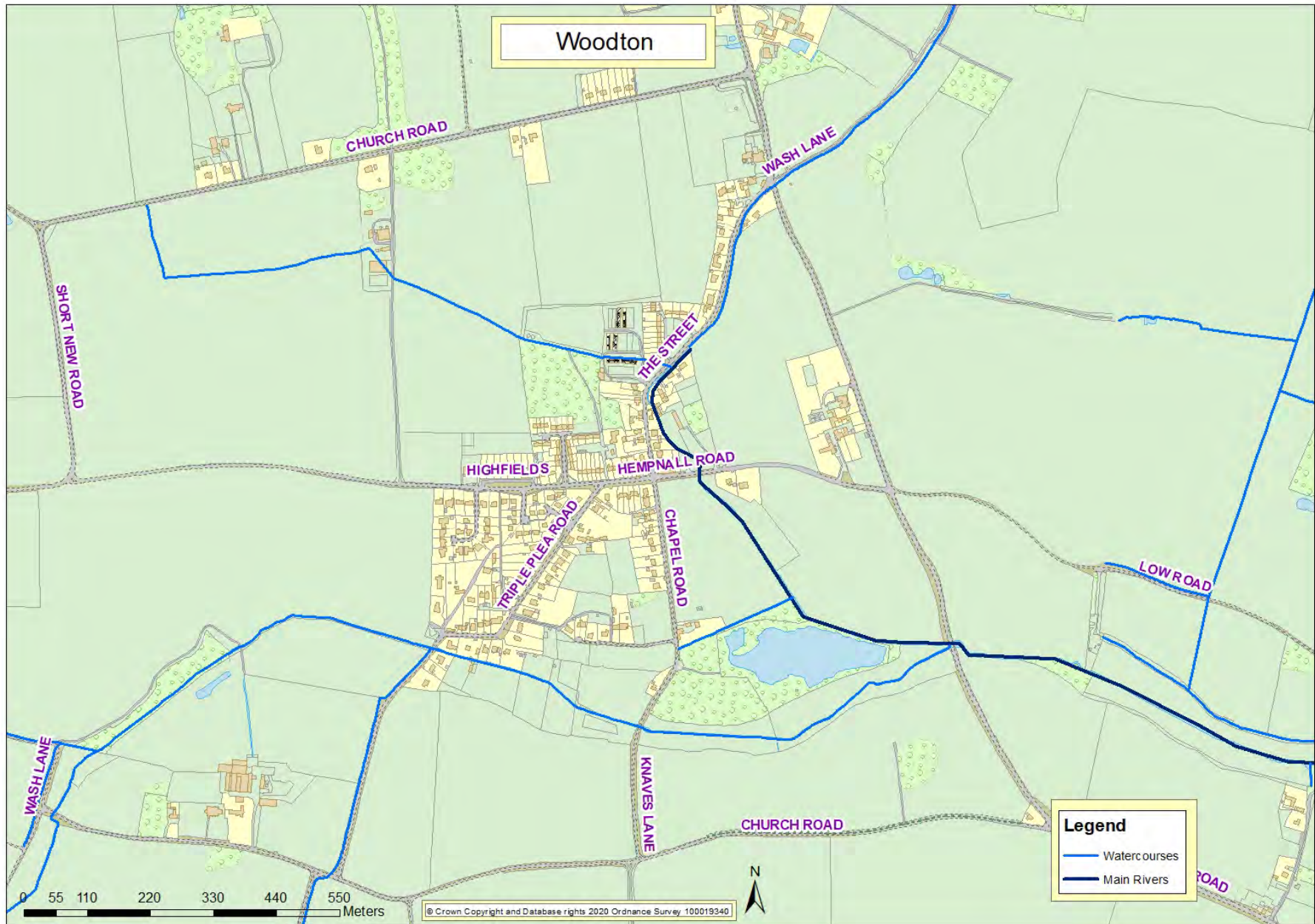
Causes of flooding within the catchment and recommendations

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

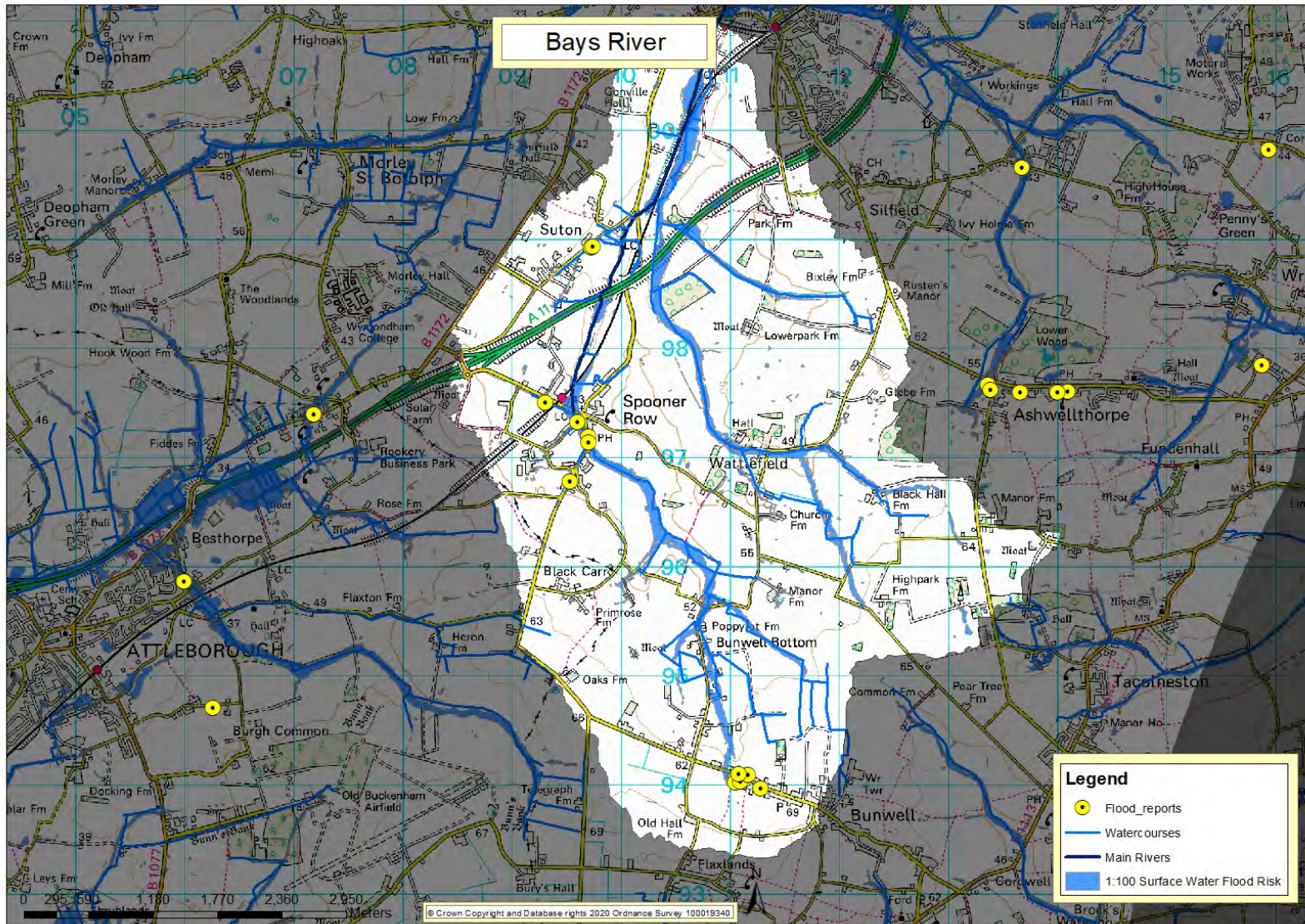
- Risk Management Authorities should
 - communicate with affected residents where their assets have given rise to the flooding of properties.
 - review the appropriateness of their response to flooding.
 - determine the integrity and/or capacity of their assets where they have contributed to the flooding 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?
<p>Hempnall Road, 24/12/2020</p> <p>The Street, 23/12/2020</p> <p>Woodton</p>	<p>A substantial amount of rainfall fell on the 23rd Dec onto a catchment with preceding high saturation levels.</p> <p>The river was partially obstructed by high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p> <p>Run-off from rainfall was directed towards the foul drainage network. These flows could not be accommodated as the system was already overloaded. This caused the water to surcharge within the affected properties.</p> <p>The river overtopped directing water towards the surface water drainage network. This overloaded the system and caused it to surcharge elsewhere contributing to the flooding at the affected properties.</p>	<p>AW to investigate sealing manholes or using low-leak lids where safe to do so. Checks should be undertaken that no residual flooding elsewhere in the system by sealing problem manholes. Anglian Water to investigate foul sewer and private connections and consider non return valves where practical and where they do not increase risk elsewhere.</p> <p>Norfolk County Council (LLFA) should consider working with local landowners to manage the amount or rate of surface water entering the river in flood events.</p>	<p>Anglian Water</p> <p>Norfolk County Council (Highways & LLFA)</p> <p>Environment Agency</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
	<p>There are multiple bridges and access points along the river that create pinch points for river flow during flood events.</p> <p>Significant rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties.</p>	<p>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 the EA to continue to take a risk based approach to its maintenance program</p> <p>Environment Agency (EA) and partners will communicate with local residents of properties known to have flooded internally to investigate options for managing flood risk. This may need to be dependent on those property owners affected contributing towards a solution. Alternatively property owners could carry out their own measures where funding is not forthcoming or residents are unwilling to wait.</p> <p>The EA will use their updated flood risk model of the River Waveney (and tributaries) to help improve the understanding of flood risk in Woodton</p>	

Flooding and flood risk in Bays River catchment (Wymondham)



Description of catchment

The watercourse flowing through the flooded location is part of the Bays River catchment that in turn forms part of and discharges downstream into the River Tiffey and eventually into the River Yare several kilometres downstream in Wymondham. The beck flows from south to north and meanders through 3 Norfolk County Council highway culverts before flowing into the what then becomes the River Tiffey where the land plateaus.

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	28	2
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	68	7
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	5	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	5	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	3	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	4	0

Flood incidents within this catchment

Within this catchment 9 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	<p>On the 23/12/2020 - 2 properties were internally flooded on Sutton Street, Wymondham. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 25/01/2021, (FWF/21/3912) • a resident via an online flood report form on the 26/12/2020, (FWF/21/3300) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p>
24/12/2020	<p>On the 24/12/2020 - 4 properties were internally flooded on Bunwell Road, Wymondham. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 22/01/2021, (FWF/21/3889) • a resident via an online flood report form on the 22/01/2021, (FWF/21/3862) • a resident via an online flood report form on the 31/05/2021. (FWF/21/4796) • South Norfolk District Council via an email communication on the 29/03/2021 (FWF/21/3839) 	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
	<p>On the 24/12/2020 - 1 property was internally flooded on Queens Street, Spooner Row, Wymondham. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 21/01/2021, (FWF/21/3870) 	

Date of Incident	Incident as reported	What was the response to the flood incident
	<p>On the 24/12/2020 - 1 property was internally flooded on Station Road, Wymondham. This was reported by</p> <ul style="list-style-type: none"> A resident via online report form on the 15/02/2021 (FWF/21/4119) 	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 rainfall

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.

Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
Run-off from significant rainfall was directed towards Individual property drainage. These flows could not be accommodated as the system is of insufficient capacity to deal with this amount of water. This directed flood water towards the affected properties.	Land owners Riparian owners
Surface run-off from significant rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than these features.	Norfolk County Council: Highways - Public highway
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.	
The flood water entered the properties through low thresholds at entrances & the air bricks.	Property owner

Recommendations	Who has responsibility to follow up the recommendation?	Timescales
<p>Advise residents of Property Level Resilience measures and funding opportunities.</p> <p>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. One suggestion from a resident was to upsize one of the culverts situated at the entrance to the properties that could allow more surface water to flow.</p>	<p>Property owners Norfolk County Council</p>	<p>12 Months</p>
<p>Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.</p>	<p>Norfolk County Council</p>	<p>12 Months</p>
<p>Norfolk County Council should work with the adjacent landowners and affected residents to identify the potential for managing the amount or rate of surface water entering their drainage system and the potential to divert or store surface water away from properties.</p>	<p>Norfolk County Council</p>	<p>12 Months</p>

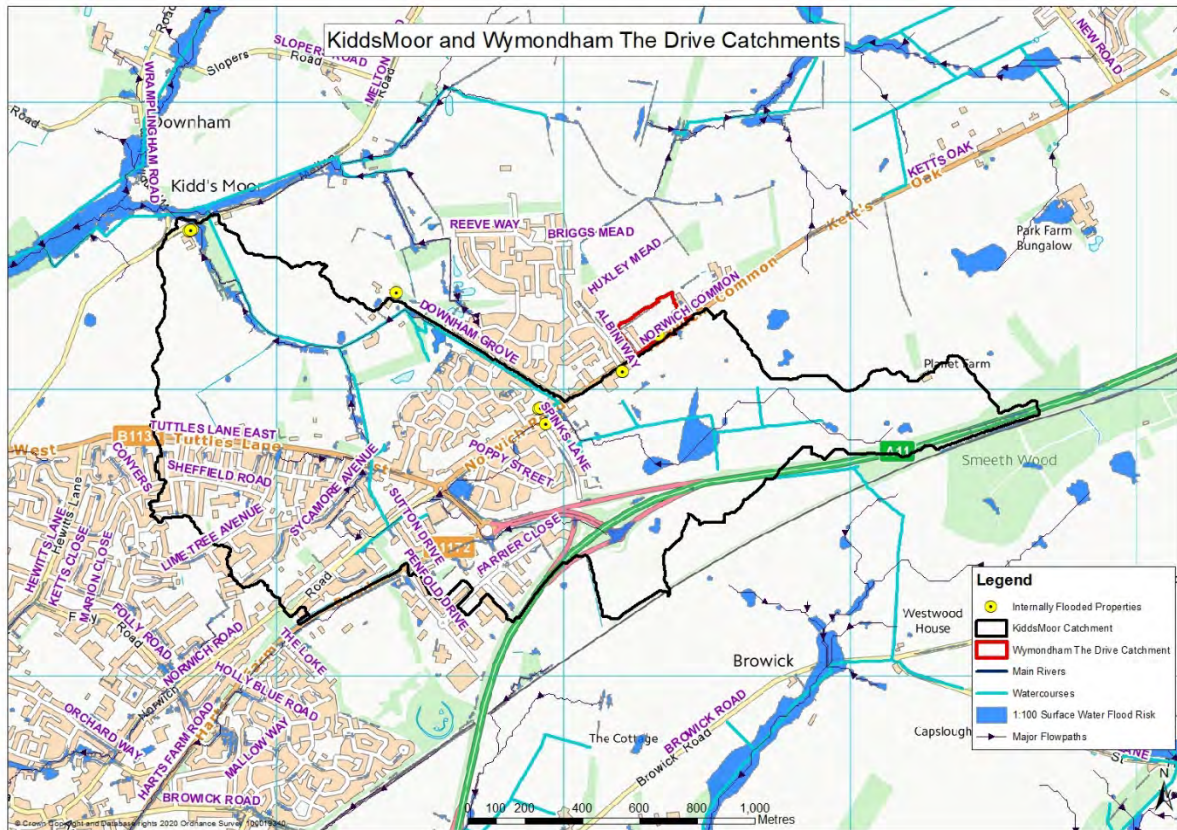
Location and date of flooding	Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
Bunwell Road, Spooner Row, 24/12/2020	Run-off from rainfall was concentrated along overland flowpaths on which the affected properties are positioned on.	Property owner
Bunwell Road, Spooner Row, 24/12/2020	The watercourse was fully obstructed by high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	Riparian owners
Bunwell Road, Spooner Row, 24/12/2020	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.	
Bunwell Road, Spooner Row, 24/12/2020	Surface run-off from rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features.	Norfolk County Council Highways
Bunwell Road, Spooner Row, 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.	Landowners

Location and date of flooding	Causes of flooding	Risk Management Authority with Relevant Flood Risk Function
Station Road, Spooner Row, 24/12/2020	The watercourse was fully obstructed due to partially obstructed by debris or silt/high water levels downstream/structural failure/unconsented works works carried out at the neighbouring property. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	Norfolk County Council as LLFA – Land Drainage powers

Location and date of flooding	Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Bunwell Road, Spooner Row, 24/12/2020	Norfolk County Council will investigate with third parties 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 as Lead Local Flood Authority	18 – 36 months
Bunwell Road, Spooner Row, 24/12/2020	The EA 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 and riparian owners	6 months

Location and date of flooding	Recommendations	Who has responsibility to follow up the recommendation?	Timescales
Bunwell Road, Spooner Row, 24/12/2020	<p>Advise residents of Property Level Resilience measures and funding opportunities.</p> <p>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.</p>	<p>Norfolk County Council (Lead Local Flood Authority)</p> <p>Property owners</p>	Complete
Station Road, Spooner Row, 24/12/2020	Norfolk County Council will determine if further action is needed to remove the unconsented structure in line with the risk identified and communicate with affected parties and riparian owners.	Norfolk County Council as LLFA – Land Drainage powers	

Kidds Moor and Wymondham the Drive catchments



Description of catchment

The catchment originates in an area of open farmland, intersected by the A11 to the east of Wymondham. Flows travel via a series of open ditches and culverts through the suburban north-east of the town, before returning to open countryside near Kidd's Moor. The watercourse then flows west to join the River Tiffey downstream of Chapel Bridge.

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 event:	1	11	0
[b] Number of properties subject to surface water flood risk at 1 in 100 event:	3	26	1
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 event:	0	0	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 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 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 event:	0	0	0

Flood incidents within this catchment

Within this catchment 11 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	<p>On the 23/12/2020 - 2 properties were internally flooded on Kidds Moor, Wymondham. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 26/01/2021, (FWF/21/3939) • a resident via an online flood report form on the 24/12/2020, (FWF/21/3246) 	<p>Norfolk County Council visited to assess the validity and impacts of the flood report.</p>
24/12/2020	<p>On the 24/12/2020 - 1 property was internally flooded on Kidds Moor, Wymondham. This incident was reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 22/01/2021, (FWF/21/3882) 	<p>Norfolk County Council visited to assess the validity and impacts of the flood report.</p>
24/12/2020	<p>On the 24/12/2020 - 1 property was internally flooded on Downham Grove, Wymondham. This incident was reported by a resident via an online flood report form on the 26/12/2020, (FWF/20/3282)</p>	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>The Fire and Rescue Service responded and pumped out during the incident.</p> <p>A resident carried out measures to minimise the impact of flooding during the incident.</p> <p>South Norfolk District Council visited affected residents to offer advice and to gather information after the incident.</p>

Date of Incident	Incident as reported	What was the response to the flood incident
24/12/2020	<p>On the 24/12/2020 - 5 properties were internally flooded on Norwich Common, Wymondham. These incidents were reported by</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 14/01/2021, (FWF/21/3785) • a resident via an email communication on the 21/01/2021, (FWF/21/3721) • a resident via an online flood report form on the 31/12/2020, (FWF/20/3342) • a resident via an online flood report form on the 06/01/2021, (FWF/21/3339) • a resident via an online flood report form on the 20/12/2020, (FWF/20/3257) 	<p>Residents carried out measures to minimise the impact of flooding during the incident.</p> <p>Norfolk County Council (LLFA and Highways) visited affected residents to offer advice and to gather information after the incident.</p> <p>South Norfolk District Council visited affected residents to offer advice and to gather information after the incident.</p> <p>Norfolk County Council (Highways) carried out maintenance works to their system through cleansing and clearing works.</p>
24/12/2020	<p>On the 24/12/2020 - 1 property was internally flooded on Spinks Lane, Wymondham. This was reported by</p> <ul style="list-style-type: none"> • A resident via online report form on the 27/12/2020 (FWF/20/3305) 	<p>Residents carried out measures to minimise the impact of flooding during the incident.</p> <p>Norfolk County Council (LLFA and Highways) visited affected residents to offer advice and to gather information after the incident.</p> <p>South Norfolk District Council visited affected residents to offer advice and to gather information after the incident.</p> <p>Norfolk County Council (Highways) carried out maintenance works to their system through cleansing and clearing works.</p>

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 Norwich Road, Wymondham. This was reported by A resident via email communication on the 03/01/2021 (FWF/21/3601)	Residents carried out measures to minimise the impact of flooding during the incident. Norfolk County Council (LLFA and Highways) visited affected residents to offer advice and to gather information after the incident. South Norfolk District Council visited affected residents to offer advice and to gather information after the incident. Norfolk County Council (Highways) carried out maintenance works to their system through cleansing and clearing works.

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
12/07/2016	Internal flooding to 1 property on Spinks Lane. Flooding was reported for 2 other occasions in 2016.	Unknown
10/08/2017	Internal flooding to 1 property on Sycamore Avenue.	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?
<p>Norwich Road Spinks Lane</p>	<p>Surface run-off from significant rainfall flowed off adjacent fields and onto the accesses of affected properties that were situated lower than these features.</p> <p>Run-off from rainfall was directed towards the ordinary watercourse. These flows could not be accommodated as the watercourse was overgrown and required clearing.</p> <p>A nearby development under construction installed unconsented and undersized culverts that may have impeded and redirected flow.</p> <p>The surface water drainage system has historically been modified and amended with various sized culverts. This has created several pinch points within the system that struggle to allow free flow.</p> <p>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.</p>	<p>The relevant landowner and 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.</p> <p>Norfolk County Council (LLFA) should work with developers to ensure newly installed culverts are appropriately sized for the catchment.</p> <p>Norfolk County Council will liaise with Local Planning Authorities to encourage better monitoring of surface run off and silt management on new developments during construction.</p>	<p>Landowners</p> <p>Riparian owners</p> <p>Norfolk County Council (LLFA)</p> <p>Local Planning Authority</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Norwich Common	<p>Run-off from rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was impeded by a partial blockage in a culvert under Norwich Road.</p> <p>Rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected property.</p>	<p>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. Norfolk County Council 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.</p> <p>Norfolk County Council will consider options that would prevent water from pooling on the highway.</p>	Norfolk County Council (Highways)

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
<p>Downham Grove, Wymondham, 24/12/2020</p>	<p>Run-off from rainfall was concentrated along overland flowpaths on which the affected property is positioned</p> <p>The watercourse was fully obstructed by debris within an undersized culvert. This caused the failure of the upstream drainage system contributing to flooding at the affected properties.</p> <p>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.</p>	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them 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.</p> <p>Norfolk County Council will work with Riparian owners to increase the flow capacity of the downstream culvert.</p>	<p>Landowners</p> <p>Riparian owners</p> <p>Norfolk County Council (LLFA)</p>

Location and date of flooding	Causes of flooding	Recommendation	Who has responsibilities to manage the cause(s) of the flood?
Kidds Moor	<p>Run-off from rainfall was directed towards the ordinary watercourse. These flows could not be accommodated as the system was already overloaded.</p> <p>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.</p>	<p>Landowners and riparian owners should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events.</p>	<p>Landowners</p> <p>Riparian owners</p>

Disclaimer

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

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

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

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

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

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

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

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Appendix A - Key definitions and responsibilities

What is flooding?

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

What is internal and external flooding?

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

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

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

What is Local Flood Risk?

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

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

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 (any landowner whom has a watercourse running within or adjacent to their land has duties under common law)

- 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.