



Norfolk County Council

Investigation Report into the flooding in Mileham in 2018

Report Reference: FIR031

Report prepared by Bethany Green and reviewed by Mark Henderson on 18 January 2019



Executive Summary

(a) Flooding incidents and causes

The flooding that occurred on Litcham Road, Mileham has been caused by a combination of factors. Firstly, increased runoff during storm and heavy rainfall events contributes to the entry of floodwater into property. This was partly due to the existing drainage system being blocked, unmaintained or obstructed which creates surface runoff flow paths on the road. Surface runoff from the roads due to the drainage system being overloaded and surcharging was further washed off the public highway into private property by passing vehicles. This led to the internal flooding of two properties between 2016 and 2018. There have also been a number of reports of external flooding, with 11 properties reporting extensive external flooding to gardens, driveways and the highway.

(b) Key findings

The flooding is extremely concentrated on one end of the road and there are likely a number of concomitant reasons which have led to the flooding of these properties on Litcham Road. As there is no rain gauge from which to measure the rainfall return periods in this location, we are unable to determine if flooding was largely due to high rainfall events or problems with the drainage system. Notwithstanding heavy rainfall events, the surface water drainage system in Mileham requires some improvements to protect residents from flooding in the future. The findings are summarised below:

- The drainage system along Litcham Road was blocked, unmaintained or obstructed.
- Further blockages to the system were located to the North of Litcham Road and downstream towards the River Nar causing the water to back up further upstream and stay for a long period following rain, unable to get away.
- Improved maintenance of the drainage system is required.
- The catchment has lost attenuation points over time through in-filling of historic ditches and ponds, directing more water to Litcham Road.
- Runoff from the wider catchment and surrounding fields added to the volume of water on the road and caused the drainage system to be filled with silt, reducing its capacity and causing water to spill out onto the highway, which acted as an overland flow path for water making its way to the River Nar.
- The capacity of surface water drainage including land drains, highway drainage and private surface water drainage has been exceeded a number of times. This caused a surcharging of the network as the system was unable to cope with the large volumes of water.
- The development of Litcham over time has increased the amount of impermeable areas, likely reducing the availability for infiltration in the catchment.
- Passing vehicles created a wash that pushed excess water into properties through low thresholds at the entrances.

(c) Key recommendations

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

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.

Norfolk County Council should;

- 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.
- 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

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.

Breckland District Council should;

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

Justification for Flood Investigation

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

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

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

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

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

It was deemed necessary to complete a formal Investigation Report into the flooding in Mileham in 2018 as:

- multiple residential properties were internally flooded.

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

The flood investigation report aims to:

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

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

The flood investigation report cannot:

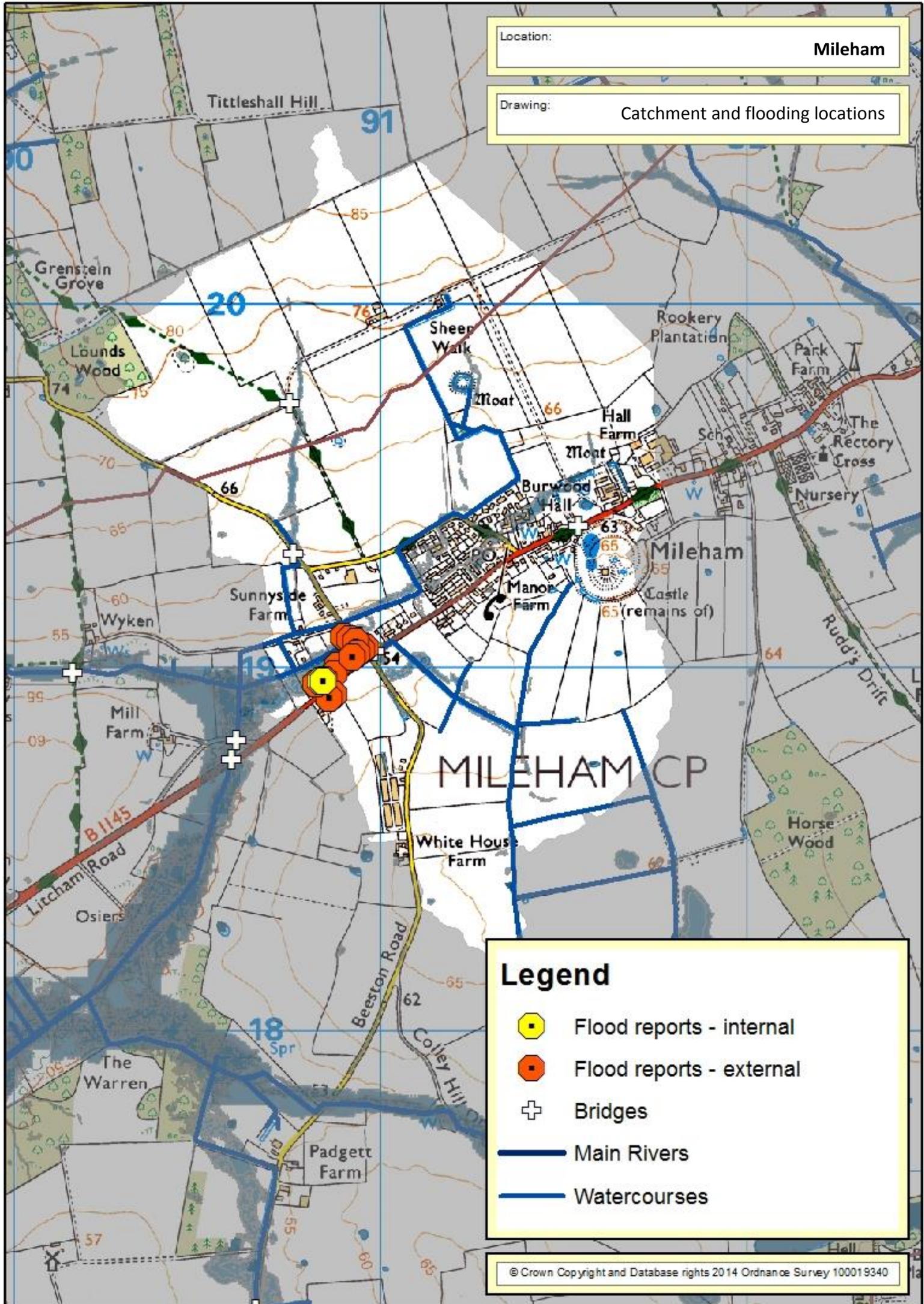
- Resolve the flooding issues or provide designed solutions.
- Force authorities to undertake any of the recommended actions.

Location:

Mileham

Drawing:

Catchment and flooding locations



Legend

-  Flood reports - internal
-  Flood reports - external
-  Bridges
-  Main Rivers
-  Watercourses

What are catchments?

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

Description of catchment

Mileham catchment covers most of the village of Mileham. The water flows east to west, outfalling to the River Nar. The catchment is largely rural and therefore water picks up silt from farmland as it makes its way downstream. Recent development in the village of Mileham has increased the impermeable surfaces and contributed to greater runoff concentrating on and around Litcham Road.

Flood Risk within the catchment

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

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] No. of properties subject to surface water flood risk at 1 in 30 year event:	0	22	0
[b] No. of properties subject to surface water flood risk at 1 in 100 year event:	0	39	0
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event:	0	0	0
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

Flood incidents within this catchment

Within this catchment 24 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
02/06/2018	On the 02/06/2018 – 2 properties were internally flooded and 1 property externally flooded on Litcham Road, Mileham.	Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer

	<p>FWF/18/3/6460) (FWF/18/3/6462) (FWF/18/3/6520)</p>	<p>advice and to gather information after the incident. Norfolk Rivers IDB worked together as part of a multi-agency group to co-ordinate their response to the flooding after the incident. Anglian Water Services Ltd visited affected residents to offer advice and to gather information after the incident.</p>
27/12/2017	<p>On the 27/12/2017 - 4 properties were externally flooded on Litcham Road, Mileham. (Please note some of these reports indicated internal flooding, however the LLFA did not receive evidence of flooding on this date)</p> <p>(FWF/17/3/7548) FWF/18/3/6458) (FWF/17/3/6693) (FWF/17/3/6690)</p>	<p>Norfolk Rivers IDB worked together as part of a multi-agency group to co-ordinate their response to the flooding after the incident. Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident to minimise the impact of flooding. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Anglian Water Services Ltd assessed the capacity of their drainage system after the incident and visited affected residents to offer advice and to gather information after the incident.</p>
02/04/2018	<p>On the 02/04/2018 - 4 properties were externally flooded on Litcham Road, Mileham.</p> <p>(FWF/17/3/7549) (FWF/18/3/6368) (FWF/18/3/6525) (FWF/18/3/6523)</p>	<p>Anglian Water Services Ltd visited affected residents to offer advice and to gather information after the incident and assessed the capacity of their drainage system after the incident. Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Norfolk Rivers IDB worked together as part of a multi-agency group to co-ordinate their response to the flooding after the incident.</p>
09/03/2016	<p>On the 09/03/2016 - 1 property was externally flooded on Litcham Road, Mileham. (FWF/16/3/6738) External</p>	<p>Anglian Water Services Ltd visited affected residents to offer advice and to gather information after the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
January 2016	<p>In January 2016 - 1 property was externally flooded. (FWF/18/3/6463)</p>	<p>The property owner took measures to protect their property. The Fire and Rescue Service attended.</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

Norfolk LLFA have been formally investigating flooding since 2011. To date, there are no historic flooding events recorded in Mileham by Norfolk LLFA apart from those mentioned in this report. However, the flooding in Mileham has been reported by residents to have been getting increasingly worse over the last few years hence why the village may not have experienced flooding in the past.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The reports of flooding in Mileham have increased in frequency recently. This is likely due to a combination of different factors. This report has not separated flooding incident causes into different event dates as it is believed that the causes are the same for all the flooding reports. The list below collates the various different causes together and 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. Some of these actions have already taken place or are in the process of happening. Others are yet to be actioned.

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 following causes of flooding to the properties on Litcham Road have been identified:

Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Run-off from significant rainfall was concentrated along overland flow paths on which the affected properties are positioned.	Land Owners, Norfolk County Council
Significant rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties.	Norfolk County Council Highways Authority
The surface water drainage system running along Litcham Road and into the River Nar was partially obstructed, overgrown or unmaintained towards the outfall. This reduced the efficiency of the drainage system and when water levels are high downstream this also contributes to low capacity along the system and flooding at the affected properties.	Norfolk County Council Highways Authority Norfolk County Council LLFA Breckland District Council Norfolk Rivers Internal Drainage Board Riparian Owners
Runoff from significant rainfall is directed towards the surface water drainage network. When the rainfall intensity is high, these flows cannot be fully accommodated by the system. When the drainage network is overloaded, this directs water towards properties due to their proximity.	Norfolk County Council Highways Authority Property Owners
Due to the development of Mileham over time, the amount of impermeable surfaces has increased and attenuation ponds and open watercourses have been lost further upstream which may have contributed to increased runoff collected downstream.	Norfolk County Council Lead Local Flood Authority Breckland District Council Litcham Parish Council Property Owners
Parts of the drainage network have been piped, containing water underground. During heavy rain the system surcharges contributing to the flooding of properties.	Norfolk County Council Highways Authority Riparian Owners
The flood water entered the properties through low thresholds at entrances and doors.	Property Owners

Recommendation	Who has responsibility to follow up the recommendation?	Timescale
<p>Norfolk County Council will lead on developing a partnership funding solution to mitigate the risk experienced at this location such as Natural Flood Management measures. 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>Norfolk County Council LLFA Norfolk Rivers Trust Norfolk Rivers IDB Breckland District Council Litcham Parish Council Riparian Owners</p>	<p>12 months</p>
<p>Norfolk County Council Highways will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable, if flood risk is not increased elsewhere in the catchment.</p>	<p>Norfolk County Council Highways Authority</p>	<p>12 months</p>
<p>NCC Highways and Norfolk Rivers IDB will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified.</p>	<p>Norfolk County Council Highways Authority Norfolk Rivers IDB</p>	<p>12 months</p>
<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council LLFA will communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders.</p>	<p>Norfolk County Council LLFA Property Owners</p>	<p>12 months</p>
<p>Risk Management Authorities should identify the ownership of assets within the drainage system and their responsibility for maintenance.</p>	<p>Norfolk County Council Norfolk Rivers IDB Breckland District Council Litcham Parish Council Riparian Owners</p>	<p>12 months</p>

Litcham Road: Causes of flooding

The surface water drainage system running along Litcham Road and into the River Nar was partially obstructed, overgrown or unmaintained towards the outfall. This reduced the efficiency of the drainage system and when water levels are high downstream this also contributes to low capacity along the system and flooding at the affected properties.

Run-off from significant rainfall was concentrated along overland flow paths on which the affected properties are positioned.

Significant rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties.

Runoff from significant rainfall is directed towards the surface water drainage network. When the rainfall intensity is high, these flows cannot be fully accommodated by the system. When the drainage network is overloaded, this directs water towards properties due to their proximity.

Runoff from surrounding fields added to the volume of water on the road and has caused the drainage system to be filled with silt, reducing its capacity and causing water to spill out onto the highway.

Due to the development of Mileham over time, the amount of impermeable surfaces has increased and attenuation ponds and open watercourses have been lost further upstream which may have contributed to increased runoff collected downstream.

Parts of the drainage network have been piped, containing water underground. During heavy rain the system surcharges contributing to the flooding of properties.

Litcham Road – Recommendations

Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council LLFA will communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders.

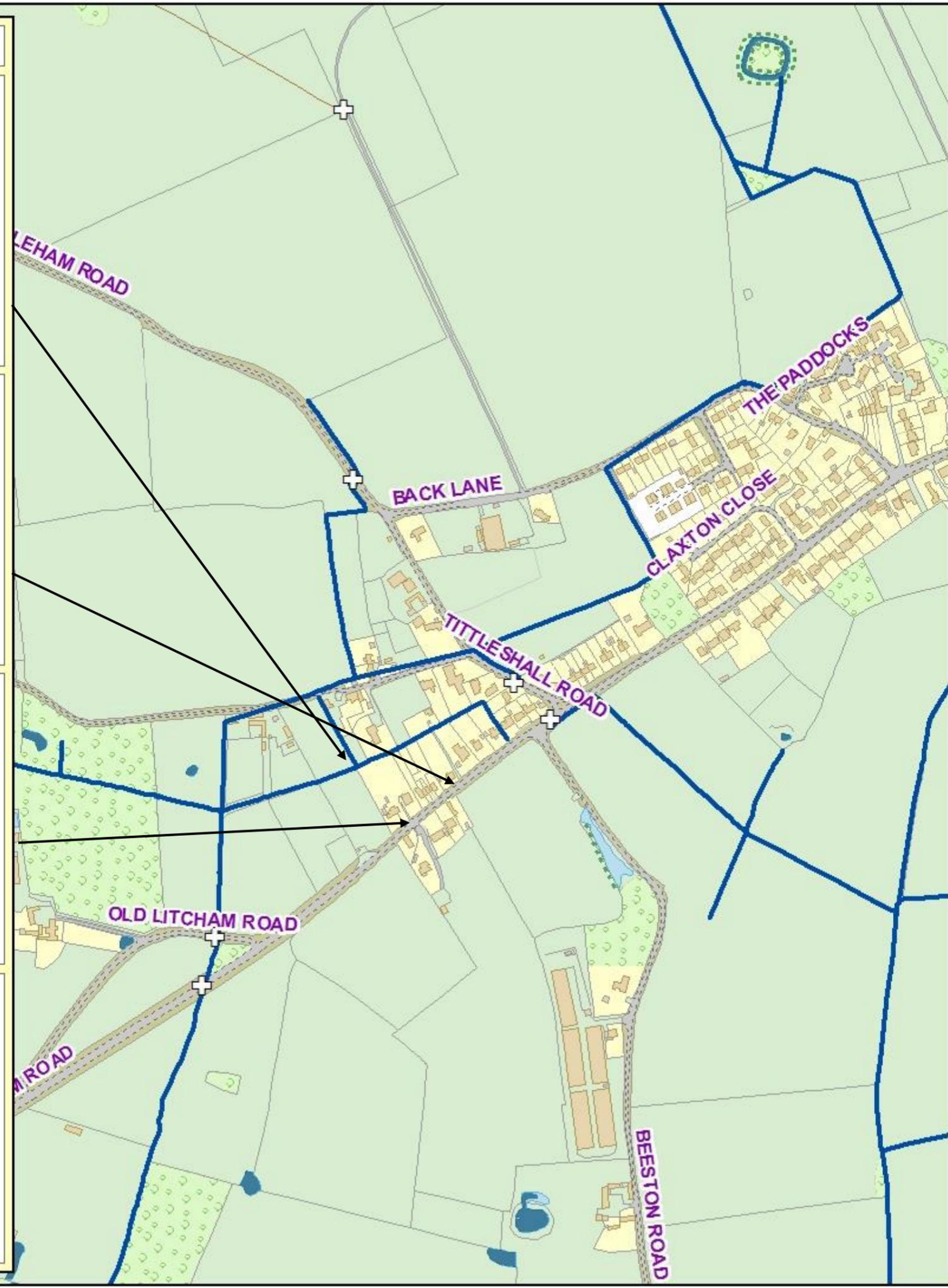
Norfolk County Council will lead on developing a partnership funding solution to mitigate the risk experienced at this location such as Natural Flood Management measures. This could be either through submission of a bid to secure Partnership funding or through negotiation with other organisations and 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 Highways and Norfolk Rivers IDB will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified.

Risk Management Authorities should identify the ownership of assets within the drainage system and their responsibility for maintenance.

Legend

-  Bridges
-  Watercourses
-  Main Rivers
-  Water bodies



Disclaimer

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

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

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

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

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

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

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

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Appendix A - Key definitions and responsibilities

What is flooding?

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

What is internal and external flooding?

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

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

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

What is Local Flood Risk?

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

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

Roles and Responsibilities of Risk Management Authorities

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

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

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

2. District Councils

- Powers to undertake works on ordinary watercourses outside of IDB areas.

- The Local Planning Authority for their District area and determine the appropriateness of developments and their exposure and effect on flood risk.
- Duties as a Category 1 Responder for Emergency Planning.

3. Internal Drainage Boards (“IDBs”)

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

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

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

5. Water Companies

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

6. Riparian Owners

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