Section 19 Flood Investigation

Storm Henk Flooding
Various Locations

January 2024

Warwickshire County Council as Lead Local Flood Authority

Version	Date	Issued to
Version 1: Draft	26/03/2024	LLFA
Version 2: Draft	04/07/24	LLFA
Version 3: Draft	22/07/24	LLFA
Version 4: Draft	26/07/2024	Partners
Version 5: Draft	11/11/2024	LLFA
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1 EXECUTIVE SUMMARY

Warwickshire received heavy rainfall on 2 January 2024 during Storm Henk. This was following a period of exceptionally wet weather in December meaning that the ground was already saturated. As a result of this, 106 reports of internal property flooding were confirmed in addition to many reports of other flooding such as land, gardens and outbuildings. There were also 446 reports of highway flooding received including 28 road closures as a result of the flooding. The impacts of flooding were widespread with reports received in all districts and boroughs within Warwickshire.

As required by Section 19 of the Flood & Water Management Act 2010, Warwickshire County Council (WCC) as Lead Local Flood Authority (LLFA) has a duty to investigate flooding where the appropriate thresholds have been met. Our thresholds for investigation are outlined in our Local Flood Risk Management Strategy and have triggered the requirement for this report in many locations. Many locations that experienced internal flooding did not meet these thresholds but are nonetheless included in this report to provide a wide-ranging account of the flooding experienced following storm Henk.

In the recovery phase that followed, WCC worked with the Environment Agency, Severn Trent Water, District & Borough Councils and the National Flood Forum to identify affected residents, provide advice and guidance, and identify further actions. Many locations identified ongoing maintenance as required to help mitigate risk of flooding in the future. Further opportunities to improve preparedness and help mitigate future flood risk are also in progress.

2 INTRODUCTION

2.1 The requirement to undertake this report.

Section 19 of the Flood & Water Management Act 2010 (FWMA) requires that the Lead Local Flood Authority (LLFA) undertake an investigation (to the extent that it considers it necessary or appropriate) upon becoming aware of flooding in its area.

The role of the LLFA in Warwickshire is carried out by the Flood Risk Management team at Warwickshire County Council (WCC).

The flood investigation must also determine the risk management authorities (RMAs) that have relevant flood risk management functions and whether each of those authorities have exercised or is proposing to exercise those functions in response to the flood event. See Appendix B for the responsibilities of the various RMAs involved in this flood event.

Warwickshire County Council's Local Flood Risk Management Strategy (LFRMS) identifies the thresholds that will apply when determining whether an investigation under Section 19 of the FWMA is required. These thresholds are as follows:

1. Flooding that poses a threat to the safety of the public or may directly result in serious injury or death.
2. Five or more residential properties internally flooded.
3. Two or more commercial properties internally flooded.
4. One or more piece of critical infrastructure affected that impact on the wider area.
5. Flooding that places vulnerable individuals or vulnerable communities at risk live e.g. hospitals, care and nursing homes, schools, etc.
6. Where one or more residential properties have flooded internally from the same source on five or more occasions within the last five years.

2.2 Scope of this report

This report summarises the completed and ongoing investigations carried out by risk management authorities into the flooding which occurred across Warwickshire following Storm Henk on 2nd January 2024.

The impacts of flooding were widespread across Warwickshire. This report encompasses all 10 locations where internal property flooding was confirmed. Individually not all these locations reach the investigation thresholds stated in the Local Flood Risk Management Strategy, but it was agreed that including all known locations, a fuller picture of the event could be provided.

This report does not obligate the LLFA or other risk management authorities into resolving the flooding issues investigated herein, nor is it possible for the LLFA to impose others to undertake any of the recommended actions.

2.3 Disclaimer

This report has been prepared as part of WCC's responsibilities under the FWMA. 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 WCC when preparing this report including reliance on information provided by others.

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3 WEATHER AND FLOOD INFORMATION

3.1 Antecedent Conditions

Warwickshire received above average rainfall in the months preceding January 2024. Between October and December 2023 the total rainfall received in Warwickshire was 177% above the long term average for the time of year (Environment Agency, 2024). This had an impact on ground conditions prior to the January flooding. By the time storm Henk arrived on 2 January 2024 the soils of Warwickshire were already saturated and may be considered to have little capacity to absorb more rainfall. This increases the chances of surface water run-off following heavy rainfall, which was observed in many parts of the County.

The rainfall prior to January 2024 also had an impact on the river conditions. The saturated conditions meant that rivers were very reactive to any rainfall. The river levels in Warwickshire were also notably high in many locations. The Environment Agency reported river flows in the Avon as exceptionally high in the week preceding Storm Henk.

3.2 Weather and flood warnings

On 2nd January 2024 the Flood Guidance Statement (FGS) was yellow for Warwickshire with a medium likelihood of minor surface water and river flooding impacts. The Met Office also issued an amber weather warning for wind in southern parts of the UK, including a small portion of Warwickshire.

There were also a number of flood alerts and flood warnings issued by the Environment Agency in Warwickshire. Between 1-2 January 2024 the Environment Agency issued 27 flood warnings to the Warwickshire Flood Risk Management Team.

3.3 Rainfall

Between the 1st and 5th January 2024 Warwickshire received a succession of weather fronts building rainfall totals within the county. The most persistent rainfall occurred on 2nd January whereby the weather system remained stationary over Warwickshire for most of the day. Warwickshire received on average between 30-50mm of rainfall across the county. Figure 1 Total rainfall recorded during Storm Henk Figure 1 Provides a summary of the national rainfall recorded during Storm Henk.

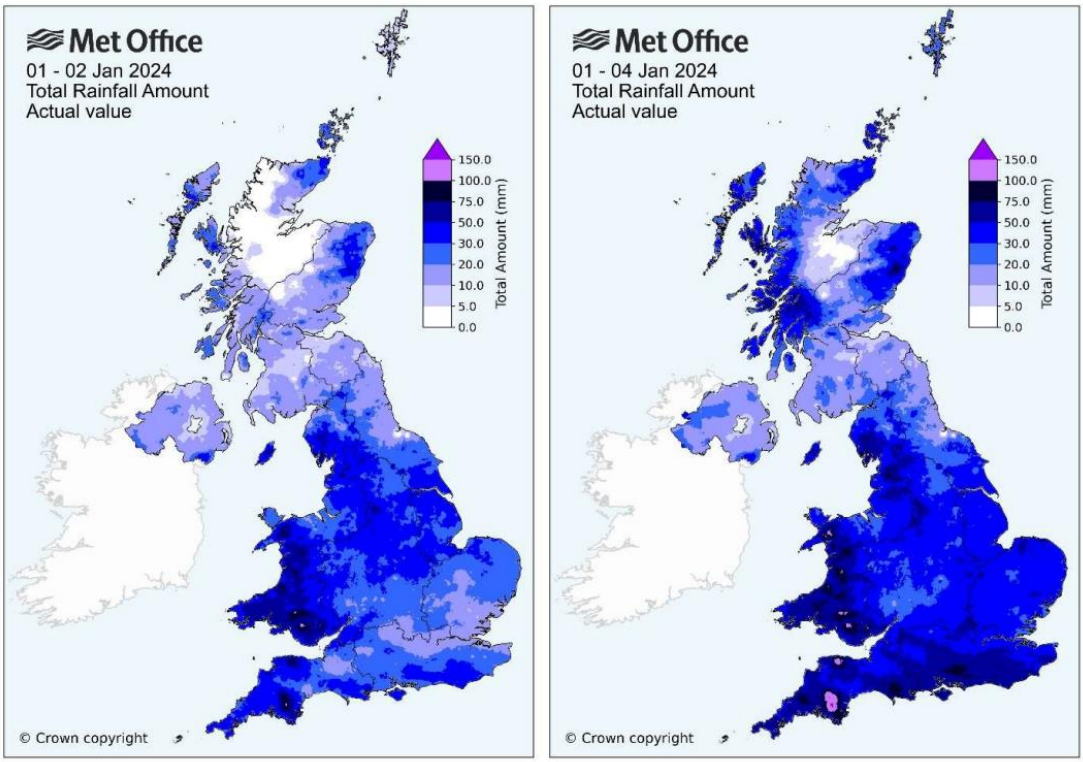


Figure 1 Total rainfall recorded during Storm Henk (Kendon, 2024)

3.4 River response

Data from Environment Agency river gauges show that there was a notable rise in river levels across Warwickshire following heavy rainfall on 2nd January 2024. Rivers levels generally peaked later on the 3rd January.

4 INVESTIGATION SUMMARY

4.1 Locations included in the investigation.

Warwickshire County Council have recorded a total of 106 confirmed properties internally flooded following Storm Henk. These were across all Borough and District Council administrative areas of Warwickshire. These locations are shown spatially in Figure 2

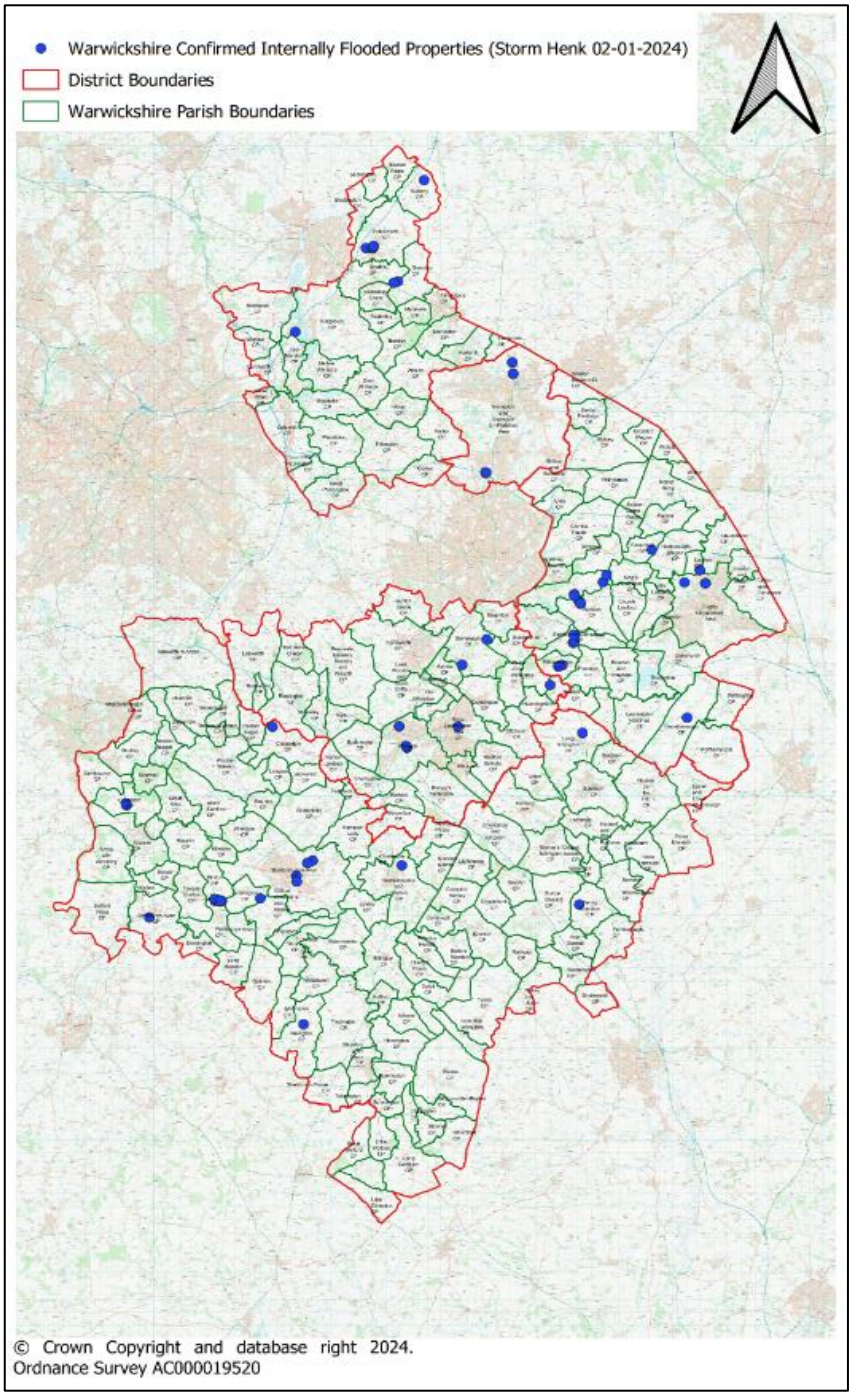


Figure 2: Map of Warwickshire showing confirmed locations of internally flooded properties from Storm Henk.

The following list of locations in **Error! Reference source not found.** form the basis o f this investigation. Our investigations in to flooding in these locations are summarised in the appendices. Each location is either included in a two-page summary or a row within the Appendix K summary table. This detail provided for each location is dependent on the extent and complexity of the investigation compared to the LFRMS thresholds detailed in section 2.1. Many individual flooded locations did not meet these thresholds, but the collective summary in Appendix K demonstrates the widespread impacts of Storm Henk across Warwickshire.

Table 1: List of flooded locations investigated following Storm Henk and where they are detailed in the Appendices.

Appendix A	Ash Green
Appendix B	Brandon
Appendix C	Bretford
Appendix D	Coughton
Appendix E	Grandborough
Appendix F	Polesworth
Appendix G	Princethorpe
Appendix H	Stoneleigh
Appendix I	Stretton
Appendix J	Wolston
Appendix K	Summary Table of Sites

4.2 Wider impact summary

4.2.1 Highway flooding and drainage

This section details the flood reports received from the wider area by the LLFA regarding standing water on the highways.

There were 446 reports of highway flooding between the 2nd and 5th January 2024, with 63% of these taking place on Tuesday 2nd January. Warwickshire County Council County Highways team responded to these reports by closing roads, placing flood signage, and deploying sandbags to businesses and properties that were significantly affected by flooding from the highway and where resources allowed. Figure 3 below shows the location of these reports which were widespread across the county.

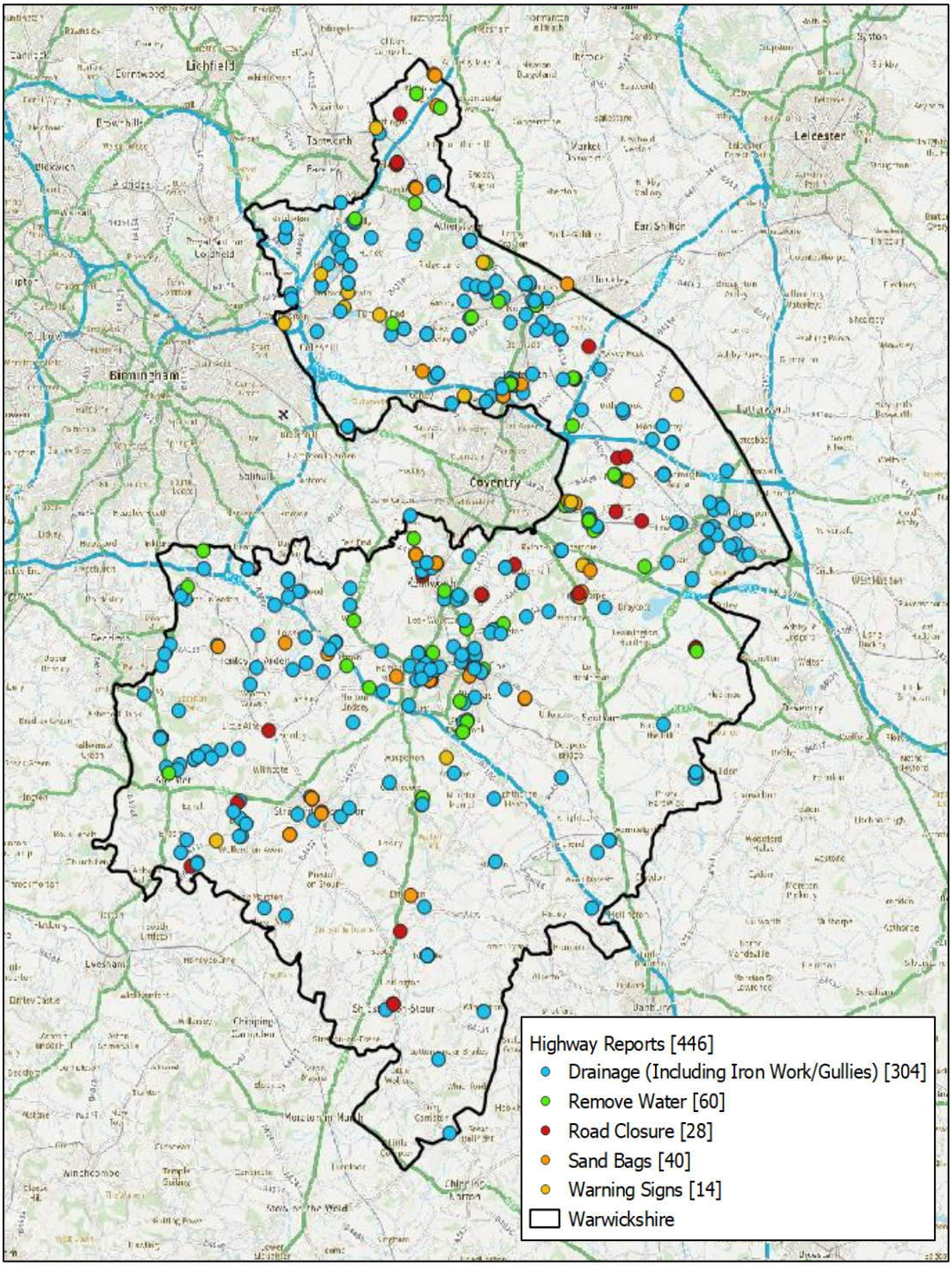


Figure 3: Map of Warwickshire showing the location of highway flood reports from Storm Henk.

Figure 4 shows the 28 locations where County Highways and the emergency services closed roads across the county.

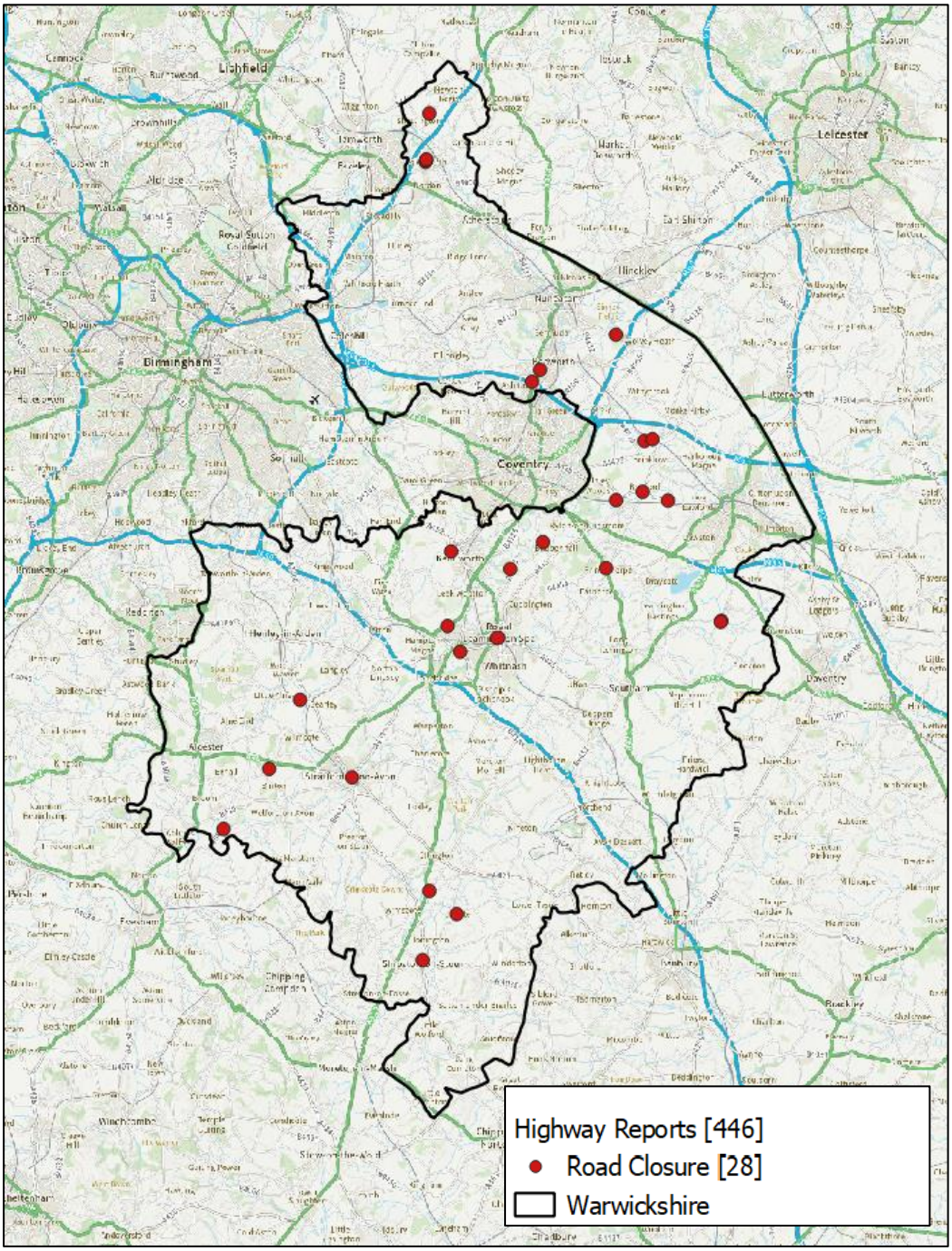


Figure 4: Map of Warwickshire showing the location of road closures during Storm Henk.

5 KEY CONCLUSIONS OF THE INVESTIGATION

5.1 Source of flooding

The wet conditions prior to January 2024 exacerbated flooding impacts resulting from Storm Henk. Many locations suffered from surface water flooding due to rain falling on saturated ground and generating overland flows. Water levels in rivers and ordinary watercourses also reacted rapidly to the rainfall. It should be noted that many locations flooded from multiple sources and therefore investigations into the impacts and causes were complex.

5.2 Gathering data for the investigation

Following the flood event, WCC staff attended many locations across the county where flooding had been reported. This was to gather information on the extent of flooding and offer support and guidance to those affected. This was often with the support of representatives from partner organisations such as the Environment Agency, County Highways and the district and borough councils. This collaborative approach assisted in reaching a wider audience to confirm flooded properties and provide varied support.

WCC officers also issued questionnaires to residents via post or during site visits to gather additional data and provide evidence of confirmed internal property flooding.

5.3 Summary of investigations

Flooding occurred in many different locations across Warwickshire with varying circumstances and conditions. Therefore the flooding in Warwickshire cannot be attributed to one single cause. However out of the 42 locations included in this report, 31 of them experienced surface water flooding. This was therefore the most common source of flooding following Storm Henk.

Source of Flooding	Number of locations affected by this source
Surface Water	31
Ordinary Watercourse	4
Main River	13
Sewer	5
Other	3

Table 2:Number of flooded locations affected by different sources of flooding. It should be noted that the total number in the table will exceed 42 because some locations experienced flooding from more than one source.

The appendices detail the site specific sources of flooding for each location. Most of the locations investigated are associated with flood risk areas from rivers, surface water or both. This is according to Environment Agency flood risk mapping. Many of the locations had therefore experienced flooding before, but not to the extent of impacts experienced during January 2024.

Recommendations have also been provided for each location in the appendices to the relevant risk management authorities. These may be to investigate further into the causes of flooding or to help reduce the risk in future. Many recommendations have already been actioned or are in progress to improve understanding and resilience for the future. However it is possible that not all recommendations will be taken forward for various reasons such as funding availability or reliance on third parties.

5.4 Government flood recovery grants

Following wide-scale flooding in England in 2015-2016, the Government developed a package of measures that could be deployed. This was called the Flood Recovery Framework (FRF) and designed to help meet immediate recovery needs of communities and businesses. The core package of support has been developed by the Department for Levelling Up, Housing and Communities (DLUHC) and the Department for Business, Energy and Industrial Strategy (BEIS), to serve as a framework for flood recovery funding. Additional support schemes have been made available to run alongside the (FRF) and include the Defra - Property Flood Resilience (PFR) Scheme and the Defra – Farm Recovery Scheme, which have been set up by the Department for Environment, Food and Rural Affairs (DEFRA).

The Flood Recovery Framework (FRF) was triggered on 06 January 2024 in response to the severe flooding events that occurred as a result of Storm Henk, with impacts occurring between 02 and 12 January eligible to be counted. Warwickshire County Council met the eligibility thresholds for scheme support following the reporting of more than 50 properties internally flooding as a direct result of Storm Henk between the dates of 2 January 2024 and 12 January 2024. The following schemes were made available:

The core-grant schemes package comprised of: a community recovery grant; a business recovery grant; a council tax discounts scheme; and a business rates relief scheme. These schemes were administered by Local District and Borough Councils based on eligibility.

The Defra – Property Flood Resilience (PFR) Repair Grant Scheme is currently being administered by Warwickshire County Council (WCC) on behalf of DEFRA.

The purpose of the Scheme is to assist property owners to improve the flood resilience of their individual properties when they repair them after a flood. The outcome from this funding should be that if flooding were to reoccur, damage levels would be considerably lower, and property owners and businesses could return to their properties much more quickly. Up to £5,000 inclusive of Value Added Tax (VAT) is available per property to make their homes more flood resilient. In order to access the grant, a property survey is required to identify where the flooding came from, and the best PFR measures to limit the impacts of future flood events. In line with the guidelines published by DEFRA. the cost of the survey can be claimed as part of the grant up to a value of £800 inclusive of VAT, which will be deducted from the overall £5,000 funding allocation.

Following strict guidelines for grant delivery published by DEFRA, WCC have developed a guidance and application pack that sets out the process that must be followed to provide property and business owners with the grant funding. These have been sent out to eligible property and business owners within Warwickshire. Applications are now being received and further detailed information is currently being provided to applicants at each stage of the process.

6 APPENDICES A-K: LOCATION REPORTS

Appendix A: Ash Green
Appendix B: Brandon
Appendix C: Bretford
Appendix D: Coughton
Appendix E: Grandborough
Appendix F: Polesworth
Appendix G: Princethorpe
Appendix H: Stoneleigh
Appendix I: Stretton
Appendix J: Wolston
Appendix K: Summary Table of Sites

Warwickshire County Council S19 FWMA Flood Investigation

Ash Green (Tudor Court), Nuneaton and Bedworth BC

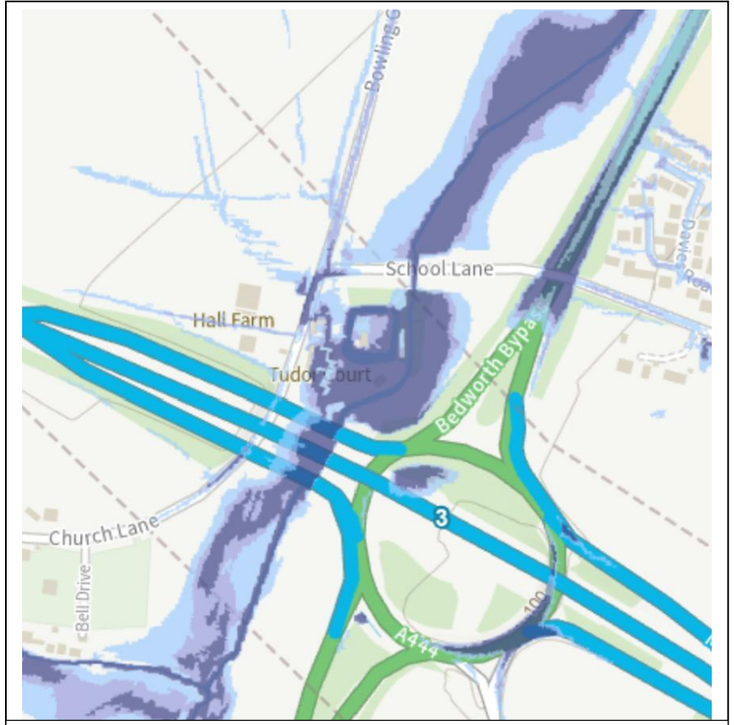
Appendix A

What was affected?

Properties internally flooded	3
Properties externally flooded	3
Critical Infrastructure flooded	0

Source of flooding

Surface water	✓
Sewers	✗
Main river	✓
Ordinary watercourse	✗
Other	✗



Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

Tudor Court is a small hamlet situated on the outskirts of Bedworth and approximately 5 miles north of Coventry City Centre.

The River Sowe (an environment agency designated Main River) runs behind the properties in Tudor Court along the eastern boundary as it flows south towards Coventry before joining the River Avon. The river is an open channel except for where the river flows beneath School Lane bridge.

Church Lane, Bowling Green Lane and School Lane are all areas of adopted highway which drain into the River Sowe via a series of highways gullies. Both Church Lane and Bowling Green Lane are shown on the surface water map to be flow routes for surface water during flood events

There are no Severn Trent Water (STW) sewers along Church Lane or Bowling Green Lane.

What happened here on 2nd January 2024?

It was reported that a large volume of surface water was flowing off the field to the west of Bowling Green Lane on to the highway before trying to find its way to the river which is situated behind the properties at Tudor Court at a lower topography. The unprecedented volume of water on the carriageway also caused the highway system to reach capacity and surcharge.

The LLFA confirmed that 3 properties internally flooded and a further 3 properties experienced external flooding to gardens and outbuildings. There is believed to be additional properties however the LLFA received no further reports.

A number of properties actively attempted to prevent floodwaters from entering their properties during Storm Henk with the use of sandbags and pumping water from around the properties. Without these intervention measures the number of internally flooded properties would likely have been higher.

The properties were affected by surface water runoff from the highway in the morning of the 2nd of January before being further affected by a secondary fluvial event in the evening as the River Sowe levels increased and eventually burst its banks.

The junction of Church Lane, Bowling Green Lane and School Lane was closed by County Highways and the police as the road became unpassable due to large volume of floodwaters. Prior to the road closure the flooding was accelerated by vehicles travelling along Church Lane causing bow waves to travel up and over the curb towards the properties in Tudor Court

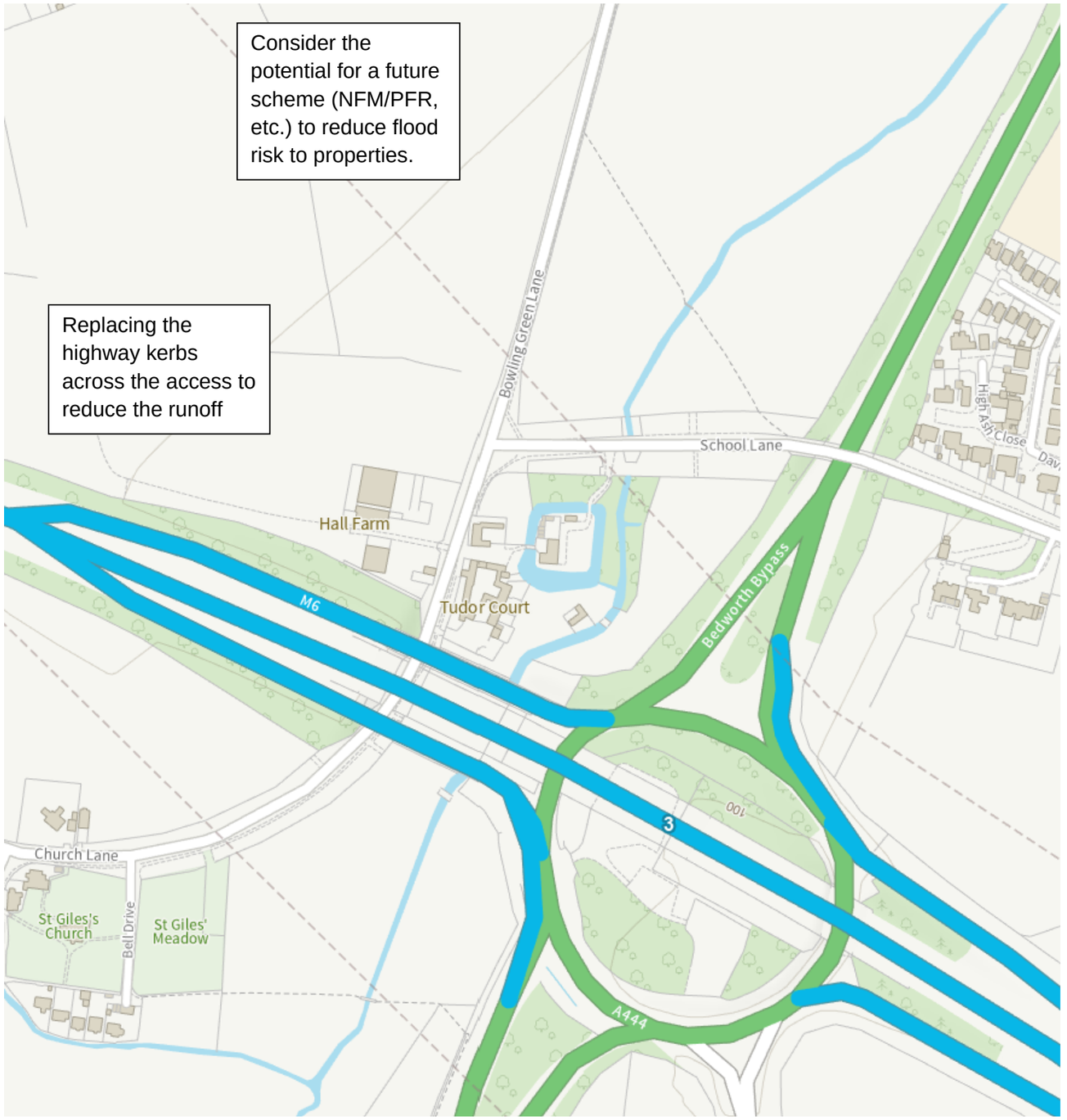
Is there a history of flooding in this location?

The LLFA have one historic report of flooding within the vicinity of Tudor Court. In November 2012, 8 properties were reported to have experienced internal flooding on Church Lane with additional properties experiencing garden and land flooding.

Church Lane, Bowling Green Lane, and School Lane are all known to experience highway flooding, with road closures in force due to the road being impassable.

No.	Action	Responsible party	Progress
1	Provide advice to residents that have been internally flooded from this flood event	LLFA	Completed
2	Set up a framework for the Property Flood Resilience (PFR) grant funding and work with community to administer the grants	LLFA	Ongoing
3	Undertake routine maintenance works as and when required	Environment Agency / Riparian Landowners	Ongoing
4	Ensure that cyclic highway gully cleansing is scheduled and undertaken at an appropriate interval across adoptable highway along Church Lane and Bowling Green Lane	County Highways	Ongoing
5	Work alongside County Highways to better manage road closures during flood events	LLFA / County Highways	Ongoing
6	Replacing damaged kerbs across the access to Tudor Court to reduce surface water run off towards the properties.	County Highways	Ongoing
7	Replacing corroded or damaged gully lids and manhole covers	County Highways	Ongoing

What are the future opportunities that may reduce flood risk in this location?



WCC Section 19 Flood Investigation

Brandon, Rugby Borough

Appendix B

What was affected?

Residential properties internally flooded	0
Commercial properties internally flooded	1
Properties externally flooded	5+

Source of flooding

Surface water	✓
Sewers	✓
Main river	✗
Ordinary watercourse	✓
Other	✓

Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

The settlement of Brandon is situated in Rugby borough near to the boundary with Coventry. An ordinary watercourse enters the settlement from agricultural land to the North East as open channel, before being culverted at the A428 Rugby Road and subsequently entering the STW surface water sewer at Avondale Road, which ultimately discharges to the River Avon at Castle Mount Riding School.

The River Avon separates the settlements of Brandon and Wolston, flowing broadly North East to South West. Both previous and subsequent floods to the 2nd of January event, have occurred during periods with and without fluvial flooding to the Avon. As such any influence of the River Avon on the flooding in Brandon village is not discussed further In this report.

The main areas of noted flooding occur to the highway at Rugby Road, Avondale road and Station Road. Generally, property thresholds are above the observed flood level, some significantly so, and the majority of flooding is contained within land with highway status.

What happened here on 2nd January 2024?

Following significant rainfall the capacity of the culverted watercourse on the A428 Rugby Road and STW surface water sewer on Avondale Road/Station Road, was exceeded. This resulted in the overtopping of the watercourse and surcharge of the surface water sewer, leading to flows entering the highway. The topography of the land and highway resulted in flows pooling at the junction of Rugby Road and Avondale Road, before reaching a sufficient level to overtop into Avondale Road and flowing towards Station Road, resulting in a road closure.

Overland flows were unable to re-enter the drainage network through highway gullies connected to the surface water sewer, as this had reach capacity and was noted to be surcharging along with the foul sewers.

Flood waters subsequently entered one business on Station Road by both breaching the property threshold and from surcharge from drains, affecting both the cellar and ground floor trading space. The business having unfortunately halted trading due to a series of successive flood events previously.

Flood waters will have also prevented residents of Rugby Road, Avondale Road and Station Road from leaving their properties and resulted in significant disruption on the highway.

Flood depths at Station Road exceeded the wade depths (the depth of water that a car can pass through without taking on water) of most vehicles, with at least one vehicle becoming abandoned through water damage. Flood depths on Rugby Road and Station Road were within the wade depths of some vehicles, however those with low wade depths would struggle, with a large number of road users choosing not to risk vehicle damage and finding alternate routes.

Is there a history of flooding in this location?

At the point of publication the business reports 11 flood events during the winter of 23/24, though it is noted that some of these will have been limited to the cellar and prevented safe access and egress from the site.

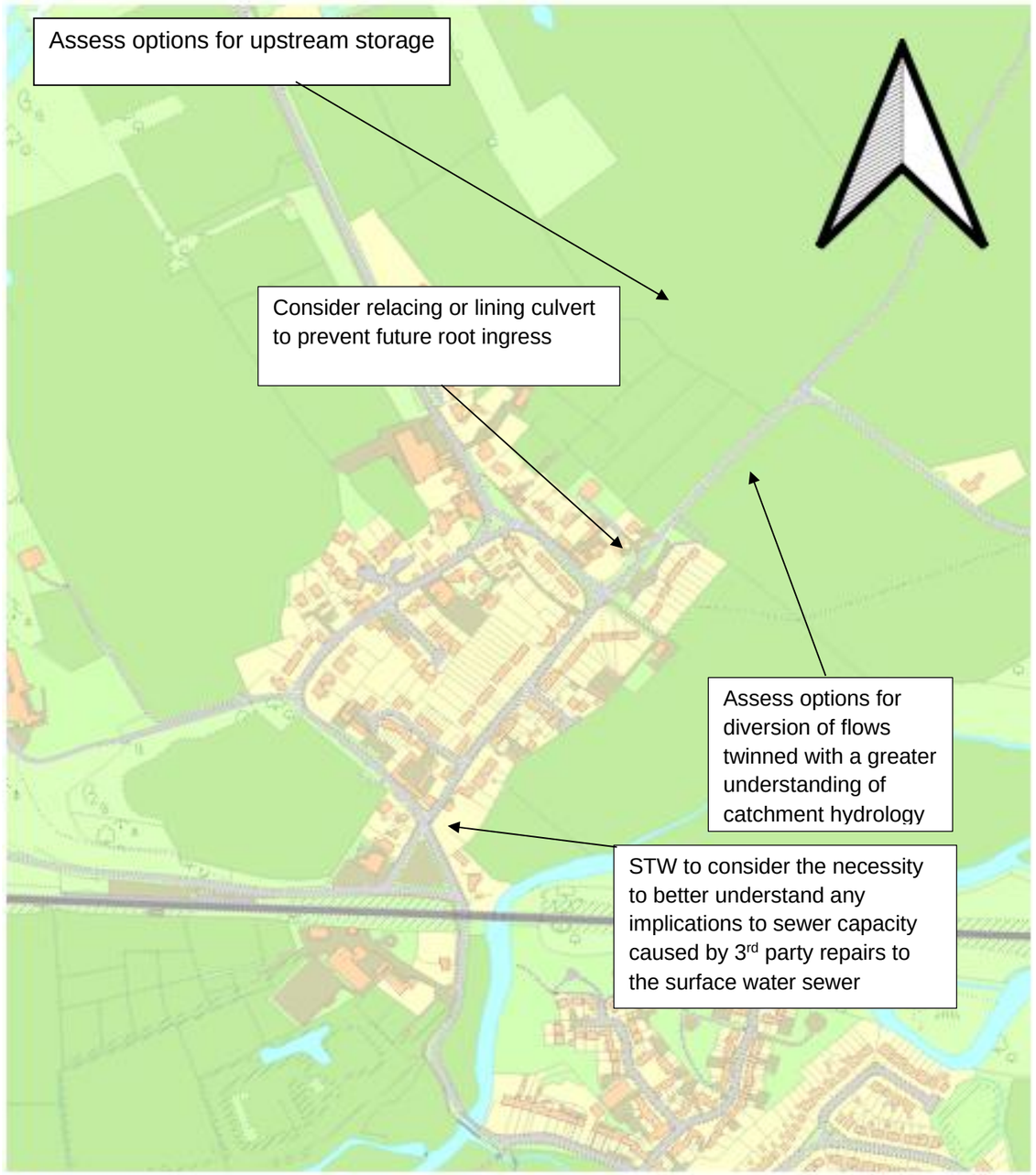
The first reported flooding to the business was reported in November 2019, where it is noted that Warwickshire suffered widespread flooding.

Records of highways flooding held by the LLFA span back to 2012, though anecdotal reports suggest that the highways has flooded during extreme events for decades.

What actions are being taken?

No.	Action	Responsible authority	Progress
1	WCC Highways commissioned a CCTV and jetting survey of the highway system and some limited sections of the STW surface water sewer. This investigation found that roots have infiltrated a joint in the pipe, creating a restriction to flows and impeding the capacity of the system. Defects (root mass) on highways CCTV report to resolved.	WCC Highways	Complete
2	Following the flood event Severn Trent Water conducted a CCTV survey of the surface water sewer network and found no major blockages or restrictions to flow, but did note the downstream end of the system near to outfall was holding water and preventing a full survey. This was initially attributed to flooding from the River Avon, but subsequently found to be a result of a poorly graded channel at the point of outfall. This has resulted in the outfall of the surface water sewer being permanently surcharged and negatively impacting upon the capacity and effectiveness of the surface water sewer. Open channel at outfall of surface water sewer to be regraded to ensure the free flow of water.	Landowner	Ongoing
3	WCC Highways commissioned a CCTV and jetting survey of the highway system and some limited sections of the STW surface water sewer. This investigation identified a blockage within the STW surface water sewer, believed to have formed post the Storm Henk event. Defects (blockage) on surface water sewer to removed	STW	Complete
4	Complete survey of surface water sewer to outfall once channel works are completed.	STW	Ongoing
5	Investigate diversion of ordinary watercourse and routing of flows away from surface water sewer and main settlement.	WCC Highways WCC FRM	Ongoing

What are the future opportunities that may reduce flood risk here?



What was affected?

Properties internally flooded	4
Properties externally flooded	2
Critical Infrastructure flooded	0

Source of flooding

Surface water	✓
Sewers	✓
Main river	✓
Ordinary watercourse	✗
Other	✓

Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

The River Avon flows to south of the village. There is an unnamed ordinary watercourse flowing in a southerly direction, under Kings Newnham Lane, to its confluence with the River Avon just upstream of Bretford.

WCC Highways and Severn Trent Water drainage systems both outfall into the River Avon and are therefore affected by high flows in the River when the outfalls are restricted and cannot freely discharge.

Highway drainage along the A428 feeds to the STW sewer network and outfalls into the field to the west and east of the bridge.

A flow path off fields and along a track is situated on the junction of the A428 and B4455, this is a known surface water flow path that has previously resulted in flooding to the highway.

What happened here on 2nd-12th January 2024?

During 2nd – 12th January heavy rainfall overwhelmed the drainage network along the A428 (both highway drainage and STW surface water) causing internal flooding to two properties. Water coming north along the road pooled up around the outside of the properties eventually getting inside through the walls and floors.

Given that the River Avon is likely to be in high flow at the time it is likely that the drainage network (highway/sewer) was unable to outfall due to high flows within the river, exacerbating the flood waters along the road.

North of the main village along Fosse Way properties were affected by both water from the highway and surface water flowing off fields at the back of the properties. Two properties internally flooded and a further two were externally flooded. The externally flooded properties both used sandbags to stop water entering the property with one also pumping to remove water from around the property. Had property owners not taken these extra measures the flooding would have exceeded thresholds contributing to internal flooding at both properties.

The highway drainage system along Fosse Way was surcharged leading to the flooding of the properties and water across the highway.

Is there a history of flooding in this location?

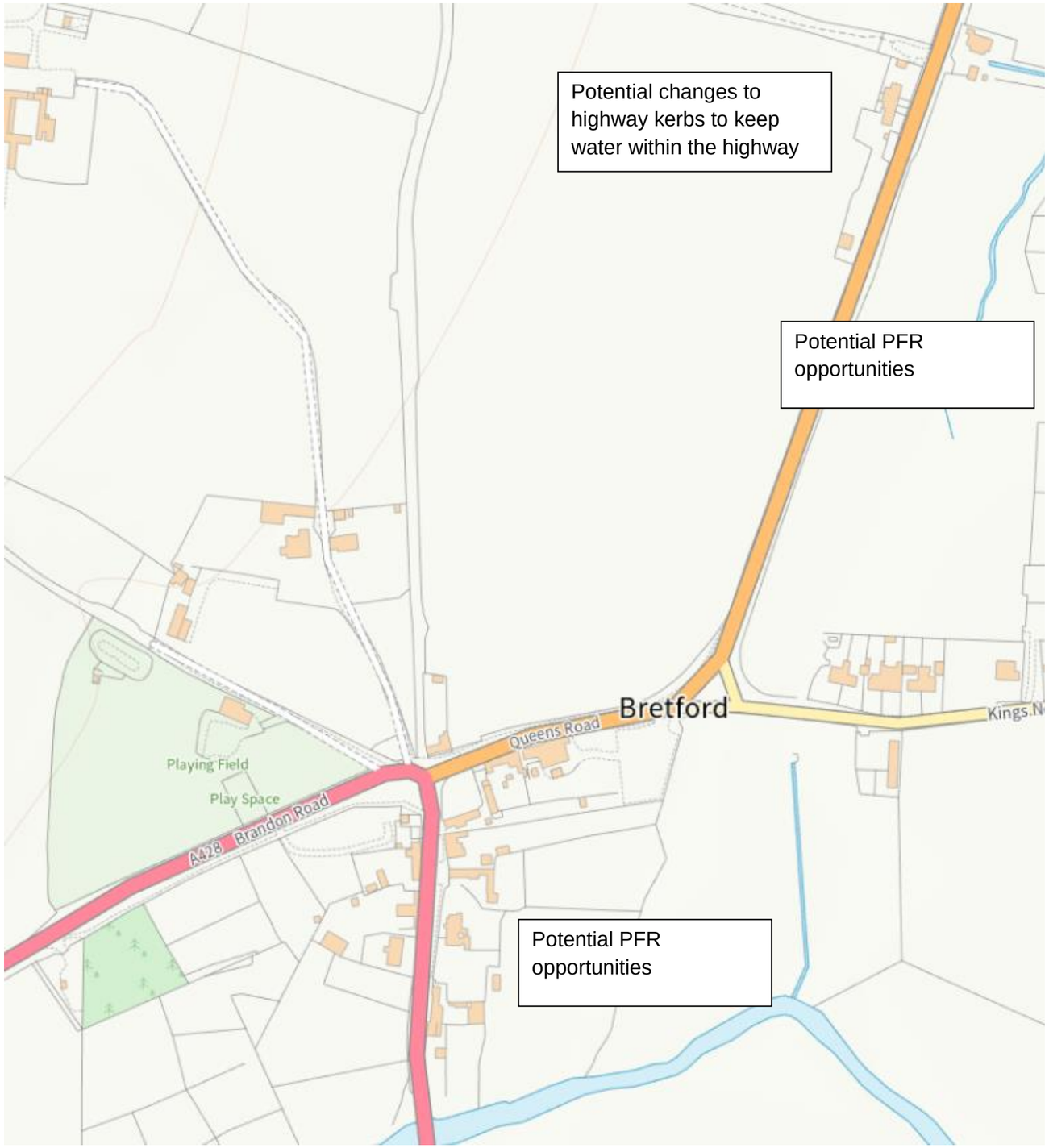
The LLFA have no records of property flooding during past events, however it is expected that properties may have flooded before.

There are highway flooding records from 2019 events leading to road closures along the A428

What actions are being taken?

No.	Action	Responsible party	Progress
1	Set up a framework for the Property Flood Resilience (PFR) grant funding and work with community to administer the grants	LLFA	Ongoing
2	Consider the potential for a scheme using PFR for the properties that flooded	LLFA	Ongoing
3	Ensure the outfall for the sewer network, including non return valve, is kept clear, cyclic cleansing required	STW	Ongoing

What are the future opportunities that may reduce flood risk in this location?



Warwickshire County Council S19 FWMA Flood Investigation

Coughton, Stratford District

Appendix D

What was affected?

Properties internally flooded	3
Properties externally flooded	2
Critical Infrastructure flooded	0

Source of flooding

Surface water	✓
Sewers	✓
Main river	✓
Ordinary watercourse	✓
Other	✓

Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

The village of Coughton is situated in Stratford District Council around 2 miles north of Alcester. Flooding in the village occurs due to a mixture of surface water flowing off higher land and overwhelmed highway drainage systems.

The main surface water flow path to affect the village flows along a large agricultural field flowing downhill to reach the properties at the bottom with some flowing along the edge of the bottom field to flood out on to Coughton Lane. Part of this flow path also heads off the field to flow along Sambourne Lane.

During heavy rainfall the surface water flow paths, from off of the field, along Sambourne Lane and Coughton Lane cause the existing highway drainage systems to reach capacity, becoming surcharged and leading to further flood risk to properties.

Rising groundwater is also an issue within the village.

A Severn Trent Water combined sewer system travels along Sambourne Lane to the north of the village, alongside a system on Coughton Lane, with both systems connecting to the main sewer run underneath Birmingham Road.

What happened here on 2nd-12th January 2024?

Following heavy rainfall in the local area flooding occurred to several properties within the village. Water along Sambourne Lane came down the hill and followed the camber of the road around the bend flooding properties on the A435 from the front, these properties sit with a threshold lower than road. Water flowed down the surface water flow path on the field behind the properties down the private driveway to exasperate the flood water coming off the highway.

The flood routes above caused the external flooding of 2 properties. These properties avoided internal flooding due to action from residents (clearing out drains, use of sandbags, etc.). If these actions had not been taken then flooding for the properties in question, and several other properties within the village, would have been much worse.

A further flow path of surface water overwhelmed the drainage system south of the village along the Birmingham Road to then internally flood two properties. Both of these properties' thresholds sit well below the level of the highway.

Is there a history of flooding in this location?

The LLFA hold some historic reports of property and highway flooding dating back to 1998, but it is very likely a previous flooding occurred before this.
Flooding is recorded as occurring on the following dates:

- June 2016 – 1 property internally flooded
- November 2019 - 3 properties internally flooded
- February 2020 - 2 properties internally flooded
- October 2023 (Storm Babet) – 6 properties internally flooded and 1 property externally flooded

What actions are being taken?

No.	Action	Responsible authority	Progress
1	National Trust to explore options to manage flows originating from land owned by themselves.	National Trust	Ongoing
2	Ensure that highway cyclic gully cleansing is scheduled and undertaken at an appropriate interval across adoptable highway within Coughton.	WCC Highways	Ongoing
3	Offer advice to residents that have been internally flooded from this flood event.	LLFA	Completed
4	Consideration to altering highway and kerb levels to improve highway drainage.	WCC Highways	Ongoing
5	Highways to look to install ACO drains within the highway outside of affected properties to provide additional drainage.	WCC Highways	Completed
6	Set up a framework for the Property Flood Resilience (PFR) grant funding and work with community to administer grants	LLFA	Ongoing

What are the future opportunities that may reduce flood risk in this location?

Warwickshire County Council S19 FWMA Flood Investigation

Grandborough, Rugby Borough

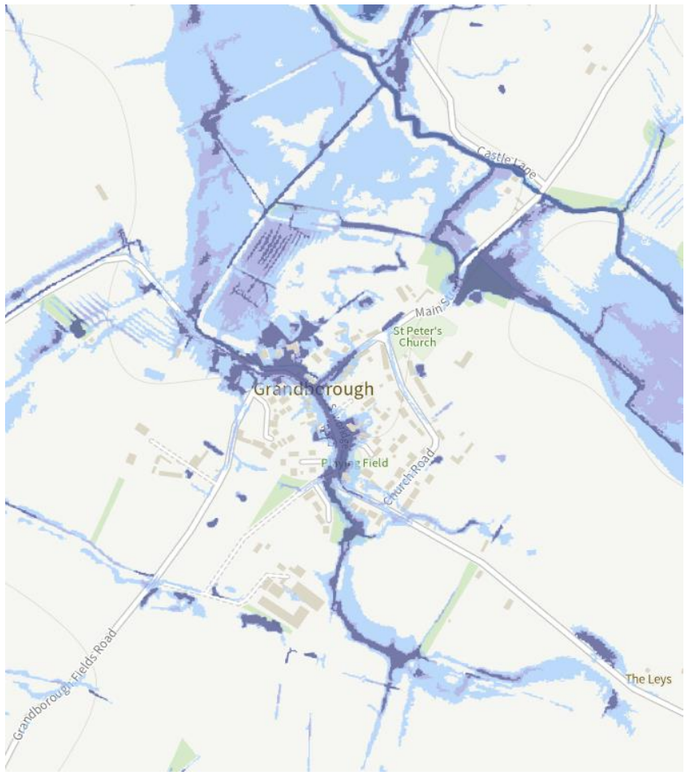
Appendix E

What was affected?

Properties internally flooded	1
Properties externally flooded	0
Critical Infrastructure flooded	0

Source of flooding

Surface water	✗
Sewers	✗
Main river	✓
Ordinary watercourse	✓
Other	✓



Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

- The village of Grandborough is situated in Rugby Borough, around 5 miles south of Rugby itself.
- The predominant surface water flow path is south-north through the village, passing along Sawbridge Road.
- Short sections of open watercourse are present, opposite Grange Farm Close, Hockley Close and adjacent to the Shoulder of Mutton Public House. Watercourse flow in a northerly direction in line with topography and surface water flow paths.
  - Severn Trent Water asset data indicates a culverted watercourse provides connectivity northwards along Sawbridge Road and outfalling into the ditches in front of The Willows / Orchard End, Hill Road.
- Across the wider village, the Severn Trent Water network is a separate system (foul & surface water sewers). However the surface water network is limited.
  - Short sections are found:
    - Along the highway in front of Gilbert House/Southview Cottages which discharges into the open watercourse opposite Hockley Close.
    - Running through Quorn Cottage and along Main Street – the discharge location of this is unclear.
    - Along Aikman Green
  - Along Sawbridge Road, no surface water sewers are present, instead it is assumed the culverted watercourse forms the backbone of this drainage system.

What happened here on 2nd-12th January 2024?

- Surface water followed the known flow paths as mentioned above, leading to internal flooding of 1 commercial property.

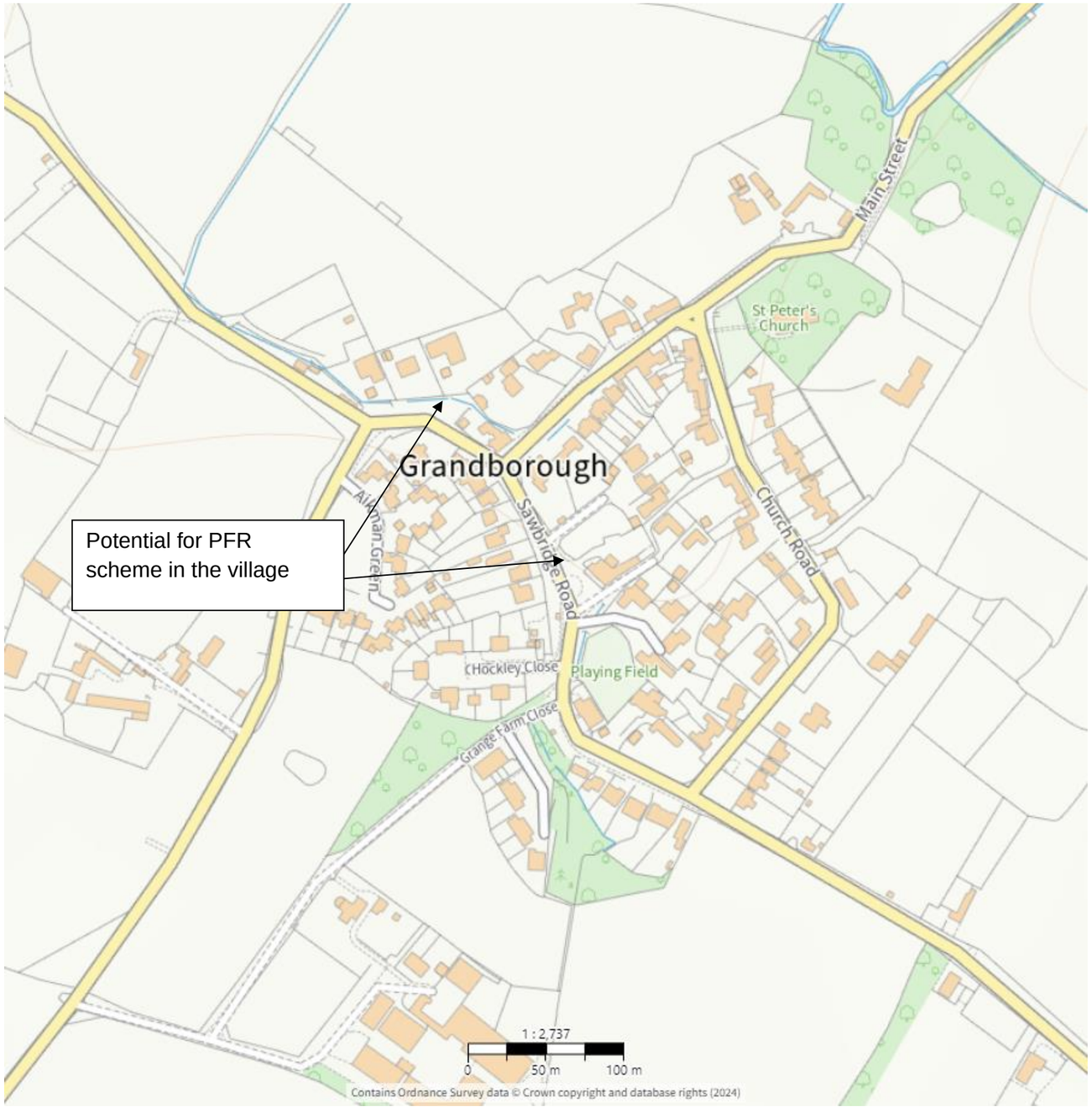
Is there a history of flooding in this location?

- Various historic reports, dating back to recorded 1998, but likely a previous history before this
- Summer 2007
- November 2019
- December 2020
- October 2023 – Storm Babet

What actions are being taken?

No.	Action	Responsible authority	Progress
1	Ensure that highway cyclic gully cleansing is scheduled and undertaken at an appropriate interval across adoptable highway within Grandborough.	WCC Highways	Ongoing/Frequency increased
2	Consideration to the implementation of PFR scheme for affected properties.	LLFA	Ongoing
3	Further investigation into Ordinary Watercourse culvert and other assets	LLFA	Ongoing

What are the future opportunities that may reduce flood risk in this location?



Warwickshire County Council S19 FWMA Flood Investigation

Polesworth, Tamworth, North Warwickshire Borough

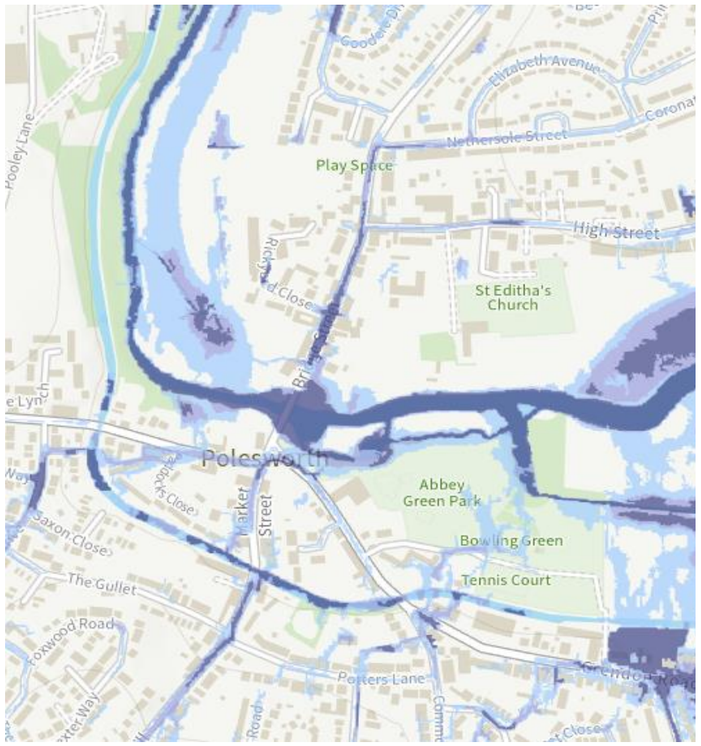
Appendix F

What was affected?

Properties internally flooded	4
Properties externally flooded	0
Critical Infrastructure flooded	0
Businesses internally flooded	13

Source of flooding

Surface water	✓
Sewers	✓
Main river	✓
Ordinary watercourse	✗
Other	✓



Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

The village of Polesworth is situated in the North Warwickshire Borough and is located around 6 miles from Atherstone. The River Anker runs through the village.

The main crossroad within Polesworth, which connects roads such as Tamworth Road (the B5000), Market Street and Bridge Street is classified as adopted highway. This means that the roads and associated highway drainage network fall under the responsibility of Warwickshire County Council's County Highways team. This highway network runs through the centre of the village via a series of highway gullies before discharging into the River Anker, which is a designated Environment Agency Main River.

There is also a Severn Trent Water (STW) surface water sewer that collects surface water across the village, with several outfalls discharging into the River Anker. Where the sewer system discharges into the River Anker, outfalls are all situated within the vicinity of the Bridge Street bridge. Each outfall takes water from a small catchment of the village centre, with a separate outfall discharging south of Bridge Street in comparison to several outfalls discharging surface water from Bridge Street itself and surrounding roads situated north.

There is also a separate STW foul sewer that runs throughout the village, including across Bridge Street which takes foul effluent to a STW Sewage Treatment Works located east of Polesworth.

What happened here on 2nd January 2024?

During the winter months of 2023-2024, high levels of rainfall were recorded across Warwickshire, contributing to grounds becoming saturated. Preceding January, within the month of December, as recorded by Hydromaster, a total of 147.16mm of rain fell on the catchment of Polesworth which also includes areas such as Dordon and Austrey. Between 1st and 5th of January 2024, a total of 29.48mm of further rain fell on to the already saturated catchment. As a result of heavy rainfall, an EA Flood Alert was also issued for the River Anker at Polesworth on 2nd January 2024 stating immediate action was required due to rising river levels. The alert also stated that flooding was expected for roads including Bridge Street, Market Street, Grendon Road, Tamworth Road, Rowland Avenue and Pooley View.

As stated above, both the highway drainage system and STW surface water sewers within the village centre discharge into the River Anker. Due to rising river levels, the outfalls to these systems became submerged, meaning that both systems were unable to discharge surface water into the River Anker as freely as usual. Due to this, both the highway drainage system and surface water sewer surcharged. This could be seen by records of surcharging manholes. As systems surcharged due to capacity being exceeded and without the ability to discharge freely into the River Anker, this resulted in highway flooding. Reports of highway flooding were noted largely within the centre of Polesworth, at the crossroad connecting Tamworth Road to Market Street and Bridge Street. Highway flooding was also reported along Market Street.

Whilst the River Anker flooded from within its banks, resulting in flooding to surrounding open space such as Abbey Green Park, the area flooded is classified as Flood Zone 3 by the EA according to their Flood Map for Planning. The WCC FRM team did not receive reports of internal flooding as a result of direct impact of the River Anker. The internal flood reports received were largely located on Market Street. The effects of highway flooding were exacerbated by bow waves caused by cars being driven through the flood water despite attempted road closures and diversions by members of the public, resulting in water entering largely from the front of several businesses and properties. At least one car was abandoned due to water damage as a result of attempting to drive through flood water.

Is there a history of flooding in this location?

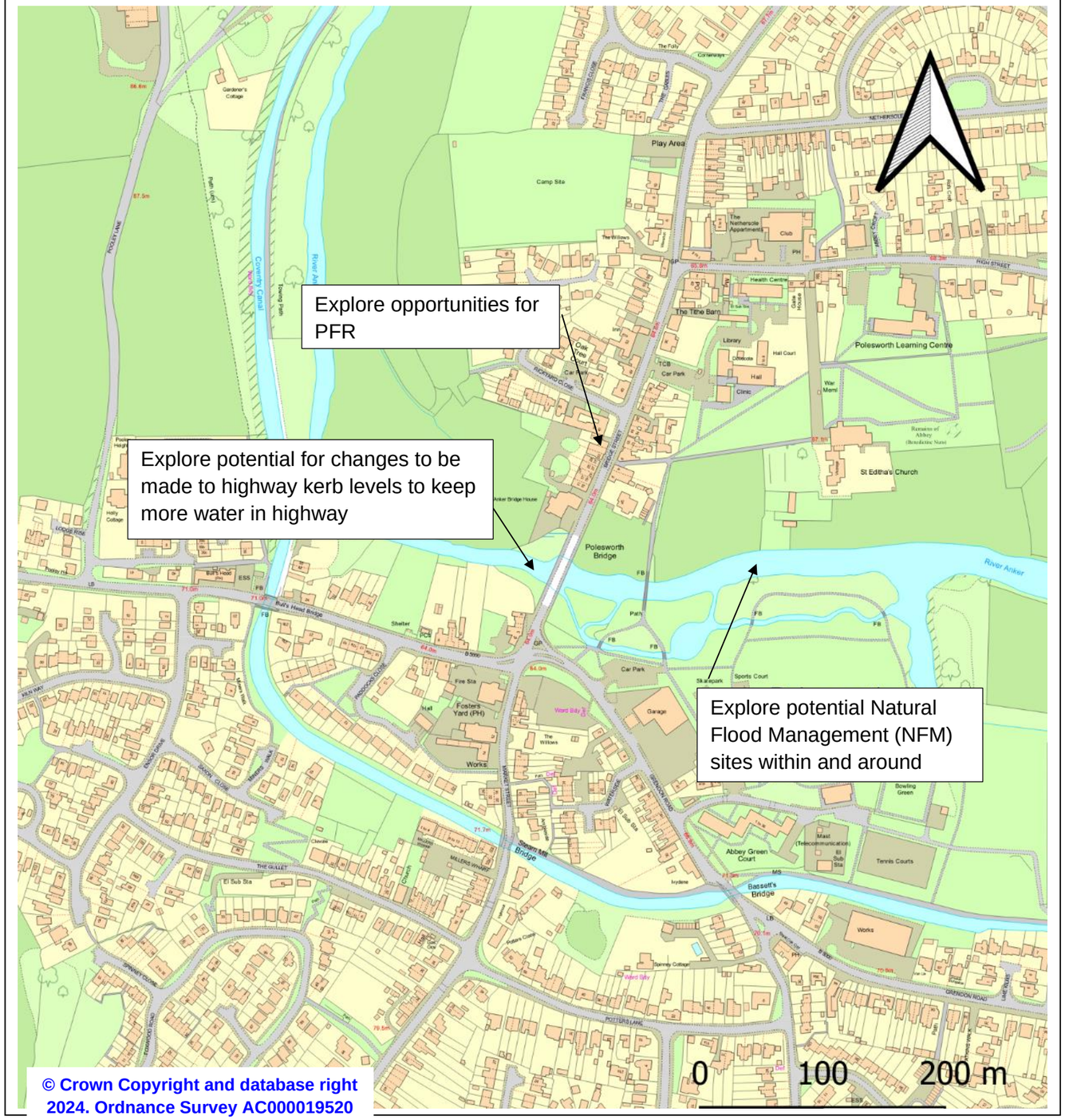
The FRM team have been made aware of the following historic flood reports:

- Internal property flooding and highway flooding in November 2012
- Highway flooding in February 2016
- Highway flooding in September 2019
- External property flooding in June 2020
- Highway flooding in November 2023

What actions are being taken?

No.	Action	Responsible party	Progress
1	Polesworth Flood Action Group (FLAG) to be formed and an Emergency Flood Action Plan created	Interested Polesworth residents and business owners (FLAG members)	Ongoing
2	Work with Highways to better manage road closures/driver behaviour	LLFA/Highways/Parish Council	Ongoing
3	Ensure River Anker is maintained as required and associated flood alarms are triggered at suitable thresholds	Environment Agency	Ongoing
4	Set up a framework for the Property Flood Resilience (PFR) grant funding and work with community to administer grants	LLFA	Ongoing
5	Consider the potential for a PFR scheme for the properties and businesses that flooded internally	LLFA	Ongoing
6	Cyclic cleansing of the highway network and STW surface water sewer, also ensuring outfalls are kept clear	Highways/Severn Trent Water	Ongoing
7	Offer advice to residents and businesses who have been internally flooded from this event	LLFA	Complete

What are the future opportunities that may reduce flood risk in this location?



Warwickshire County Council S19 FWMA Flood Investigation

Princethorpe, Rugby Borough

Appendix G

What was affected?

Properties internally flooded	5
Properties externally flooded	2+
Critical Infrastructure flooded	0

Source of flooding

Surface water	✓
Sewers	✓
Main river	✓
Ordinary watercourse	✓
Other	✗

Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

The village of Princethorpe is located 6.5miles southwest of Rugby.

There is an unnamed ordinary watercourse that flows alongside Sheep Dip Lane, crossing beneath the A423 via a culvert and then flows parallel to the north of the B4453 Leamington Road, before crossing to the south via 2 culverts and once again flowing parallel to Leamington Road before leaving the village and flowing across open fields. The un-named watercourse has a catchment of 9.48km2 extending upstream of the village to the A45 and associated flood zones, with driveways to properties crossing the watercourse in many instances.

Surface water also runs down Leamington Road from the A423 when the capacity of the highway drainage is exceeded due to the topography. This surface water is then unable to re-enter the watercourse in high flows and floods Leamington Road. The properties and the primary school are sometimes cut-off by the flooding on the highway and from the watercourse.

What happened here on 2nd-12th January 2024?

During the 2nd – 12th January, water gathered along the Leamington Road, breaching property thresholds causing internal flooding. Flooding was exacerbated by drivers creating bow waves as they tried to get through water.

Reports from residents during this event also indicated surface water flowing from fields behind properties and coming through trying to find its way to the watercourse, again exacerbating the flooding to properties.

In total 5 properties internally flooded and 2 further properties flooded externally (potentially more unreported).

The watercourse at the front of the school burst its banks spilling out onto the highway. The school was on holiday during the event, had it been during term time access to the school would have been restricted forcing a school closure. The school grounds themselves were not affected by flooding as it is situated on higher ground to Leamington Road.

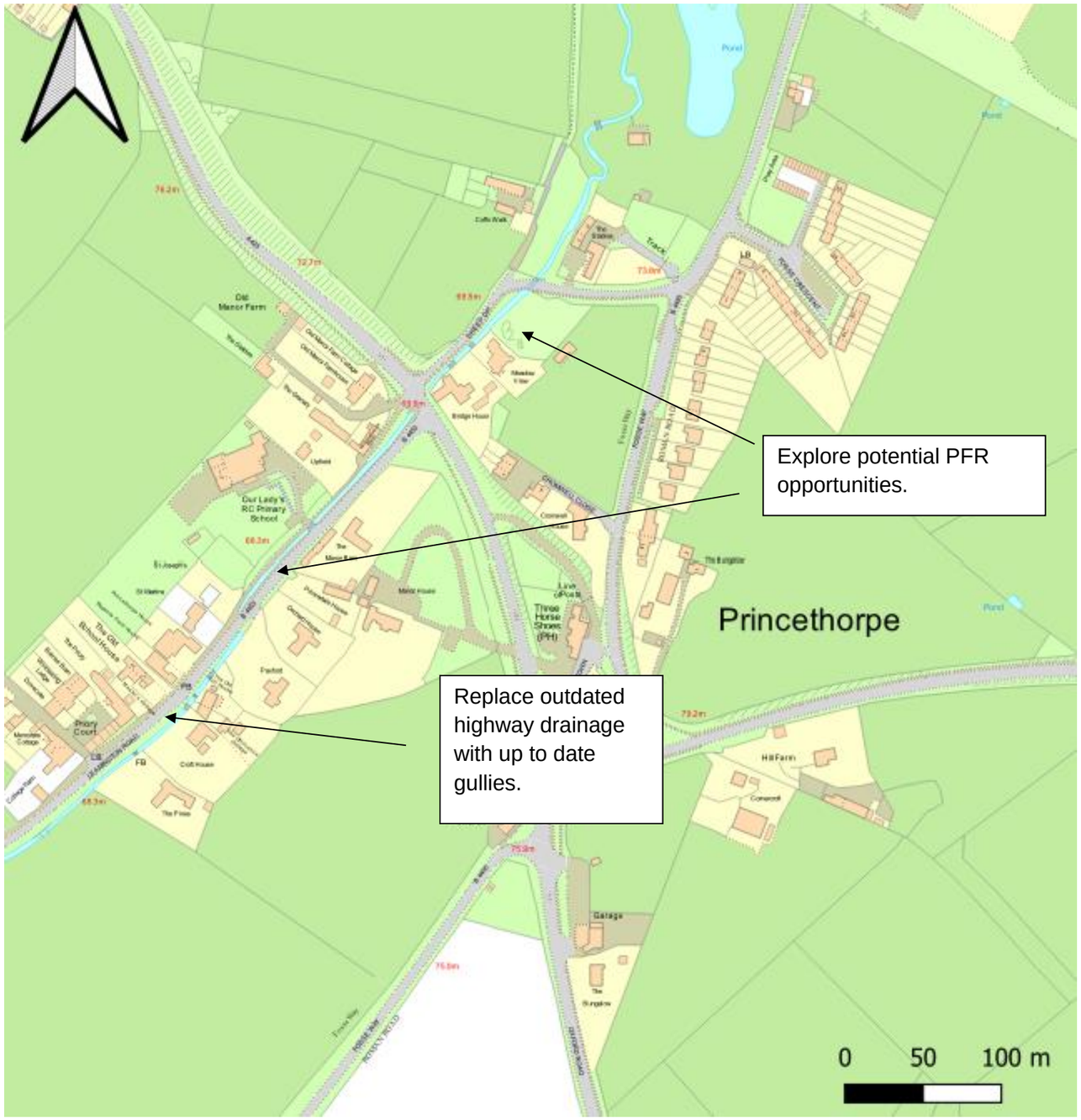
Is there a history of flooding in this location?

The LLFA hold records of highway flooding in 2012, external property/highway flooding in 2016 and 2019 and further highway flooding in 2020.

What actions are being taken?

No.	Action	Responsible party	Progress
1	Undertake any required watercourse maintenance as and when required	Highways/Landowners	Ongoing
2	Work with Highways to better manage road closures/driver behaviour	LLFA/WCC Highways/FLAG	Ongoing
3	Set up a framework for the Property Flood Resilience (PFR) grant funding and work with community to administer the grants	LLFA	Ongoing
4	Ensure that highway cyclic gully cleansing is scheduled and undertaken at an appropriate interval.	WCC Highways	Ongoing
5	Monitor and maintain as required the culvert outside the school	WCC Structures	Ongoing
6	Work with the school and FLAG to prepare an emergency flood action plan	LLFA/FLAG/School	Ongoing
7	Keep trash screen located next to STW pumping station clear and free flowing	STW	Ongoing
8	Offer advice to residents and businesses who have been internally flooded from this event	LLFA	Complete

What are the future opportunities that may reduce flood risk in this location?



S19 FWMA Flood

Stoneleigh, Warwick District.

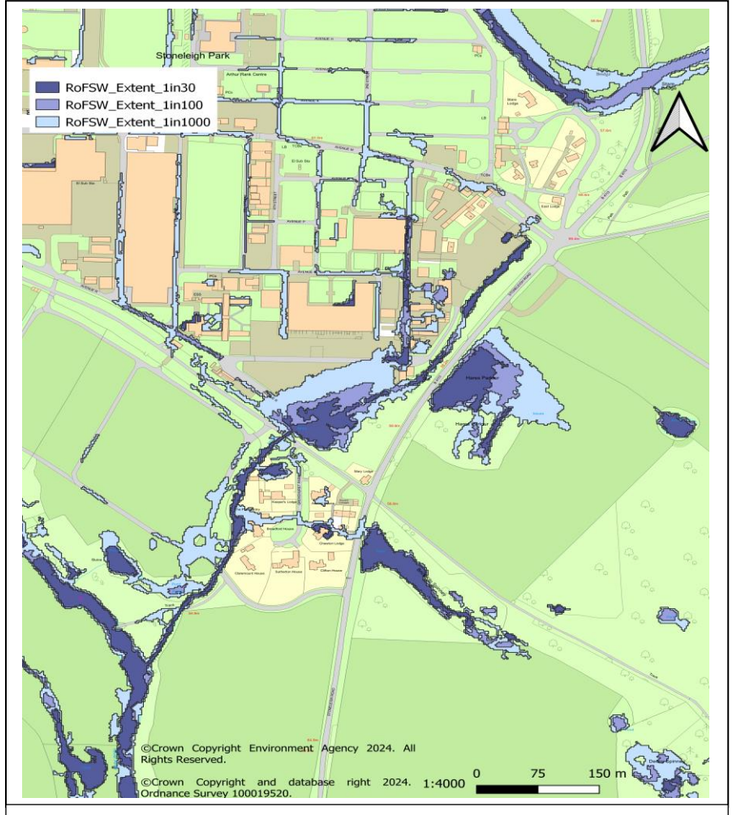
Appendix H

What was affected?

Properties internally flooded	2
Properties externally flooded	2
Critical Infrastructure flooded	0

Source of flooding

Surface water	✓
Sewers	✓
Main river	✓
Ordinary watercourse	✓
Other	✓



Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

- Stoneleigh is a village in Warwick district, Warwickshire, England, situated approximately 4.5 miles to the south of Coventry and 5.5 miles to the north of Leamington Spa. Positioned on the River Sowe, the village is around 600 yards (0.34 miles) northeast of the point where the River Sowe meets the River Avon.
- The River Avon and River Sowe, which are classified as main rivers, play a key role in the drainage system of the area. The River Sowe flows to the east of Stoneleigh generally in a northward direction.
- The area of in which flooding was observed in Stoneleigh during Storm Henk, is located where an existing 300mm highway drainage culvert conveys water from an unnamed ditch course and from a pond situated on land lying to the east of the highway under the carriageway and into a private surface water systems serving multiple properties.

What happened here on 2nd January 2024?

- During November 2023, Stoneleigh received 51.6mm of rainfall, followed by 117.27mm in December and 42.20mm from 1st to 7th January 2024. This prolonged period of heavy precipitation caused the ground in and around Stoneleigh to become heavily saturated.
- During the first week of January 2024, a pond within a section of land adjacent to the highway overflowed onto the carriageway due to the saturated conditions. Despite road closure signs, vehicles continued driving through the flooded area, generating waves that exacerbated water flowing under fences and into residential gardens and properties.
- Despite the pond situated on the adjacent land retaining high amount of volume of water, the surrounding surface water drainage systems were also overwhelmed by the high volume of runoff from the excessive rainfall. This led to the systems surcharging and being unable to effectively drain the area. Warwickshire County Council (WCC) Highways, when in attendance onsite during the flooding, identified a buried manhole cover downstream located outside of the highway extent. When uncovered this was exhibiting the emergence of water, suggesting the presence of potential capacity constraints further downstream of this private manhole.
- Whilst onsite during the flooding, WCC Highways arranged for the jetting of their drainage systems and HS2 attended from their nearby site and attempted to remove flood water with a number of tankers. WCC highways jetting identified and removed an amount of debris within the culvert, the HS2 tankers were unable to keep up the volume of water entering the highway.
- As a result, two residential properties suffered internal flooding, and a section of the highway had to be closed due to the significant depth of standing water on the road. The Environment Agency issued a Flood Alerts for the River Sowe and River Avon in the Stoneleigh area, warning of potential flooding.

Is there a history of flooding in this location?

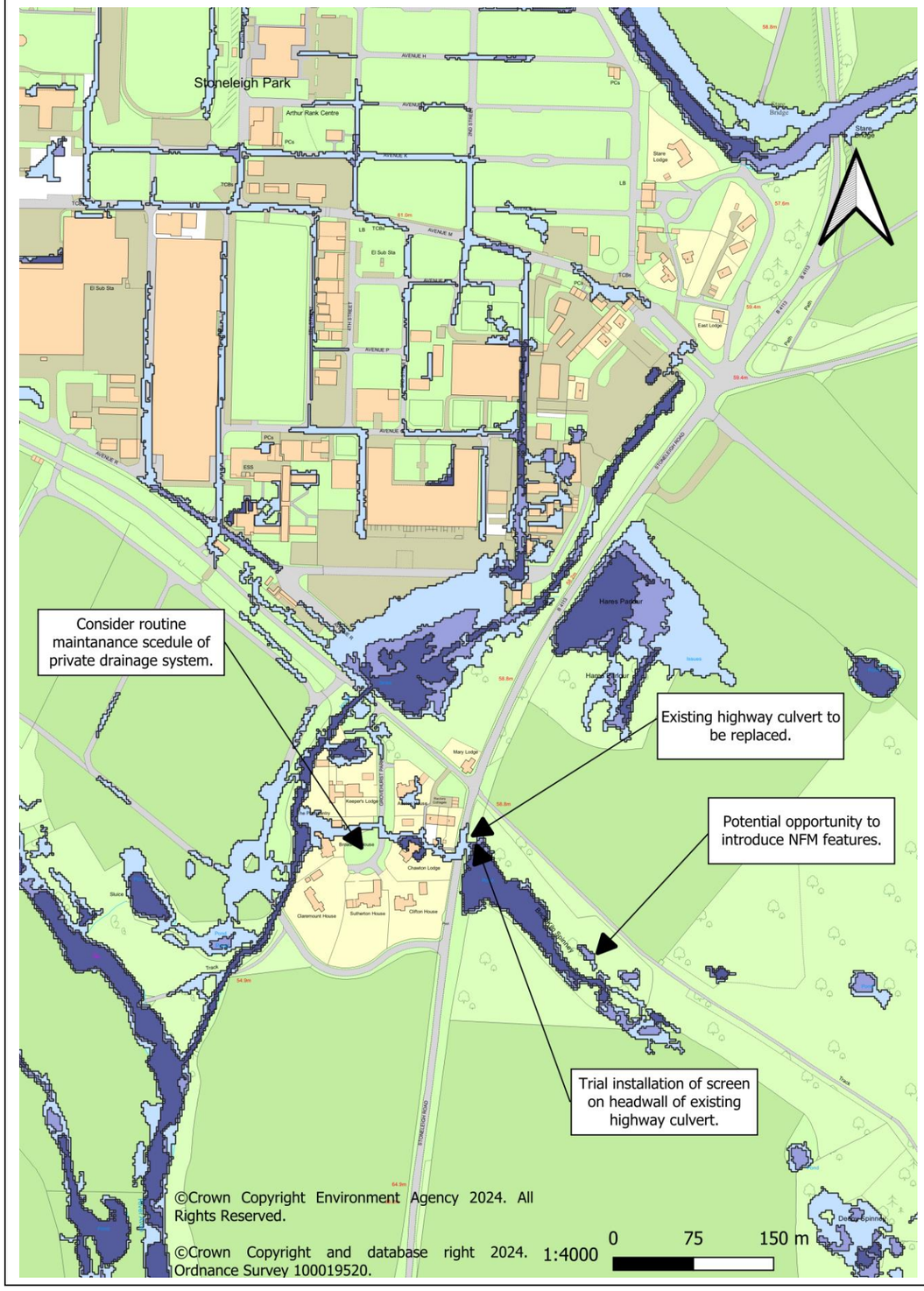
The Lead Local Flood Authority (LLFA) has records of flooding for Stoneleigh in 2020, where multiple properties narrowly avoided internal flooding due to bow waves generated by vehicles driving through standing water on the highway. The LLFA also received three additional reports of highway flooding in Stoneleigh that same year.

Historic records show occurrences of flooding in the wider settlement within Stoneleigh in 1998 and 2012.

What actions are being taken?

No.	Action	Responsible party	Progress
1	The properties that suffered internal flooding during Storm Henk have been added to the list of affected residences eligible to receive central government funding for recovery and repairs.	LLFA/Residents	Ongoing
2	A site visit was conducted to inspect the drainage system and adjacent pond /watercourses.	LLFA/ WCC Highways/ Stoneleigh Abbey	Completed
3	Stoneleigh Abbey to limit the amount of dead wood that could be mobilised and washed into the culvert through good forestry practises.	Stoneleigh Abbey	Ongoing
4	Following the flooding incident, a meeting was held with relevant parties to discuss steps moving forward.	LLFA/ WCC Highways/ Stoneleigh Abbey	Completed
5	Replacement of existing 300mm highway culvert.	WCC Highways	Ongoing
6	Trial installation of a headwall screen on the highway culvert will proceed after obtaining land drainage consent from Warwickshire County Council.	WCC Highways	Ongoing
7	Maintenance of drainage system within Grovehurst Park to ensure free flow of water.	Residents / Riparian Landowners	Ongoing

What are the future opportunities that may reduce flood risk in this location?



Warwickshire County Council S19 FWMA Flood Investigation

Stretton-on-Dunsmore, Rugby Borough

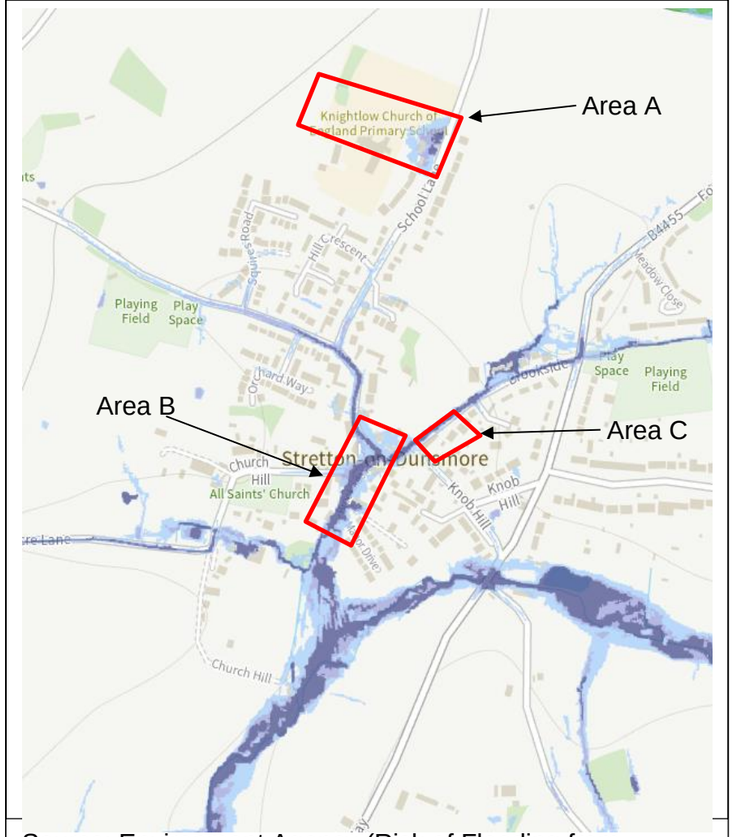
Appendix I

What was affected?

Properties internally flooded	4
Properties externally flooded	3+
Critical Infrastructure flooded	1
Businesses internally flooded	1

Source of flooding

Surface water	✓
Sewers	✓
Main river	✓
Ordinary watercourse	✓
Other	✓



Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

Stretton-on-Dunsmore in located approximately 5 miles southwest of Rugby within Warwickshire and falls within Rugby Borough.

The general topography of the village rises to the north and northwest, and slopes down to the grassy centre of the village, where there exists a brook that passes through the village. The flooding mechanisms that exist in the village are linked to extreme events, where the brook breaks its banks and begins flowing onto the highway adjacent. The topography of the village also plays a role in the surface water mechanisms present, as indicated by the surface water flood maps, as the surface water flow routes are channelled within the highways of Plott and School Lane, which is a steep hill down to the village centre. The brook flows south towards Princethorpe as it exits the village, and this side of the village is generally lower lying than towards the north. Towards the far north end of the village, the surface water maps indicate a large outline towards the top end of School Lane, as surface water from the fields to the north of Stretton flow towards School Lane as it slowly attempts to make its way to the brook.

The Severn Trent Water sewer system is split into separate surface water and foul sewer networks. The surface water sewer network collects surface water from across the village, before directing the water and discharging it into the brook mentioned above. Foul sewerage is collected via the foul sewer network and is directed towards the sewage pumping station south of the village.

What happened here on 2nd January 2024?

Preceding January and therefore Storm Henk, within the month of December as recorded by Hydromaster, a total of 104.38mm rain fell on the catchment encompassing Stretton-on-Dunsmore. Between 1st and 5th of January 2024, a further 31.30mm of rain fell onto the already saturated catchment. Due to the catchment being already saturated, an increase in both surface water runoff and a quick fluvial response from the brook was witnessed as the ground was unable to absorb the further rainfall that fell. As highlighted on the Surface Water Flood Map adjacent, there were three main areas impacted. These areas are identified as Area A, Area B & Area C.

Area A was impacted by overland flows from the fields to the north, rather than mechanisms as described above. The flow of surface water in this area resulted in the internal flooding of one property and one critical infrastructure (School). It is also a possibility that these fields and highway ditches serve drainage from the A45 to the north, and residents reported a potential blockage in the drainage system causing water to back up. However, this blockage reportedly cleared during the event and therefore the presence of a blockage could not be confirmed.

Area B was impacted by both the brook breaking its banks and surface water flow from the north channelled within the highway contributing to the flooding that was experienced. Whilst the exceedance flow path was generally maintained within the highway, this did result in the flooding of 3 properties internally. Some residents had raised concerns about the condition of the watercourse as it exits the village to the south, potentially causing constrictions on the flow.

In Area C, internal commercial flooding occurred, with overland flow from the rear of the building causing water to breach the building. Flooding within this area was reported to have caused minimal damage and disruption.

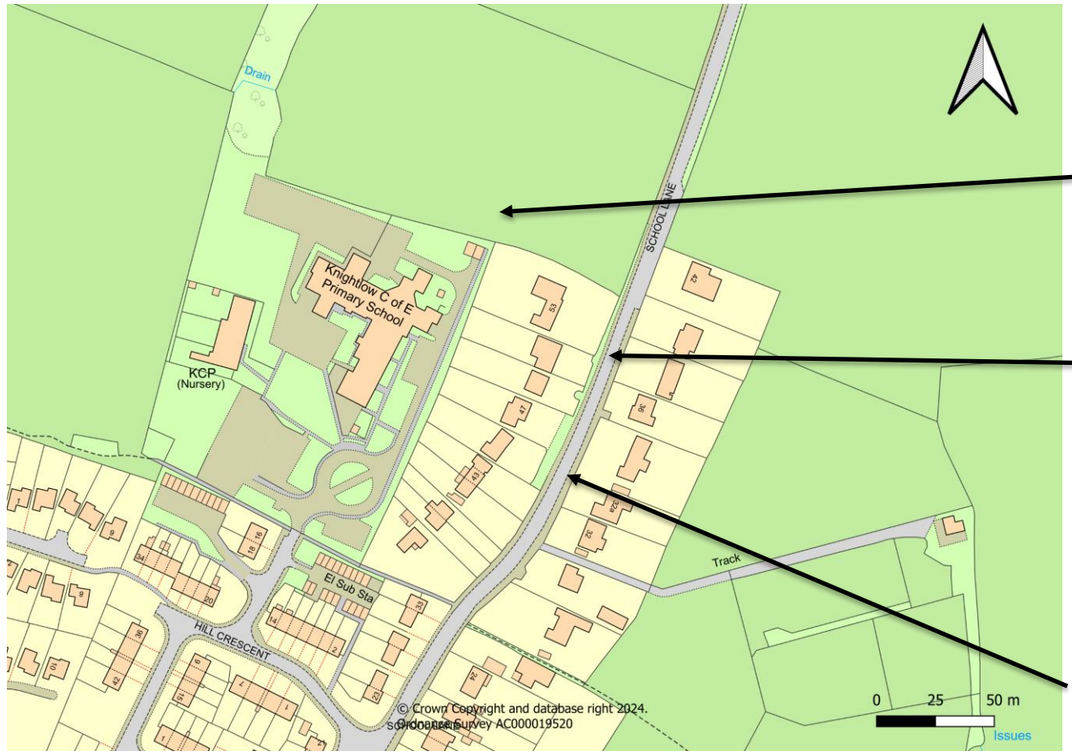
Is there a history of flooding in this location?

- 22/11/2012 - Highway
- 14/11/2019 – Highway
- Flooding has occurred in Stretton-on-Dunsmore that predates WCC records.

What actions are being taken?

No.	Action	Responsible party	Progress
1	Set up a framework for the Property Flood Resilience (PFR) grant funding and work with community to administer the grants	LLFA	Ongoing
2	Offer advice to residents that have been internally flooded from this flood event.	LLFA	Completed
3	Inspection to be undertaken of the brook downstream of the village.	LLFA	Ongoing
4	Ensure that highway cyclic gully cleansing is scheduled and undertaken at an appropriate interval.	County Highways	Ongoing
5	CCTV and survey of system upstream along School Lane	LLFA	Ongoing

What are the future opportunities that may reduce flood risk in this location?

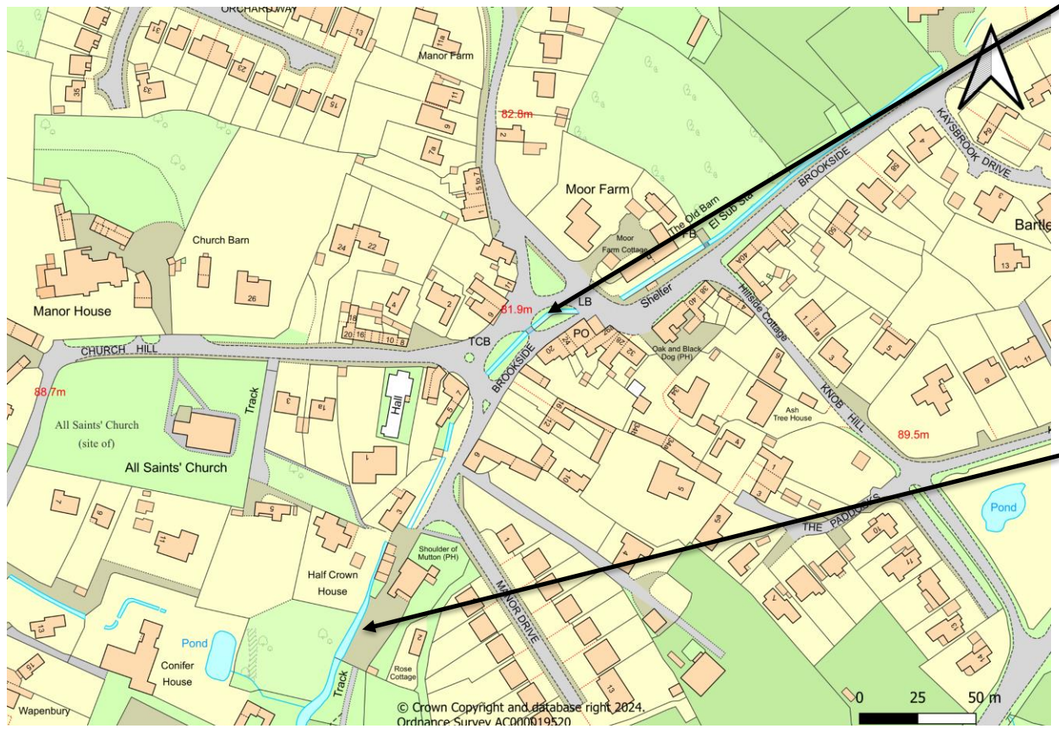


Consideration given to implementation of a cut off ditch

CCTV and survey of system upstream along School Lane

Recommendation – Parish Council to have community flood action plan.

Consideration to the implementation of PFR



Proactive and preventative maintenance of the brook downstream of the village.

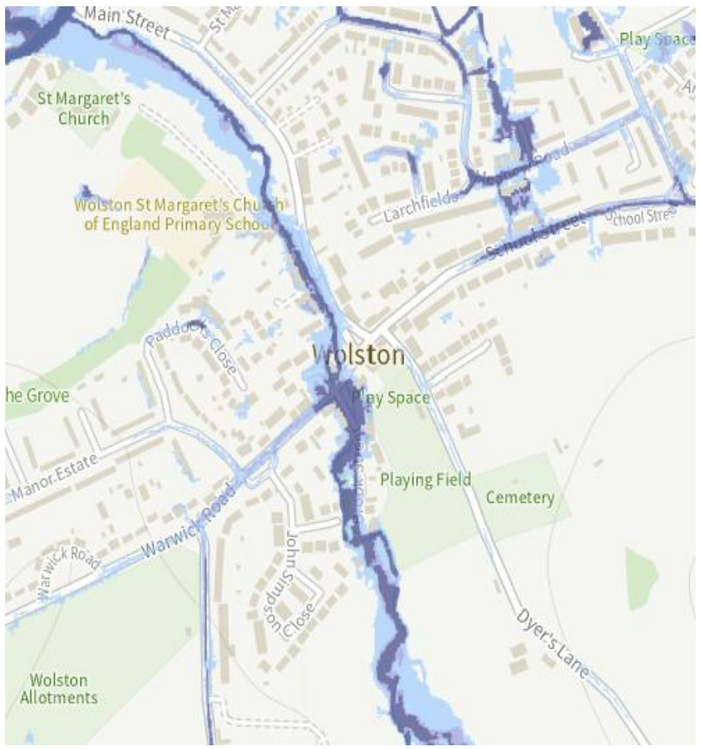
Wolston, Rugby Borough

What was affected?

Properties internally flooded	16
Properties externally flooded	11
Critical Infrastructure flooded	0
Businesses internally flooded	1

Source of flooding

Surface water	✓
Sewers	✓
Main river	✓
Ordinary watercourse	✓
Other	✓



Source: Environment Agency (Risk of Flooding from Surface Water, main river mapping). Note this is modelled information indicative of the main risk areas. Darker blues indicate higher risk.

How does the existing system operate?

The village of Wolston is situated in Rugby Borough around 6 miles west of Rugby town centre.

Main Street and Brook Street are both areas of adopted highway which drain into an unnamed brook (Environment Agency designated Main River) which runs through the centre of the village via a series of highway gullies. This unnamed brook ultimately discharges into the River Avon.

There is a Severn Trent Water (STW) surface water sewer the runs beneath Main Street which takes flows from two separate surface water sewers originating from Warwick Road and School Street/Lammas Court. This system ultimately discharges into the unnamed brook further downstream of Main Street just before the bridge prior to crossing over into Brandon.

There is also a STW foul sewer running beneath Main Street taking a large amount of foul effluent from Wolston over the bridge and to a STW pumping station located in close proximity to Castle Lodge.

What happened here on 2nd January 2024?

During the month of December 2023, a total of 129.93mm of rain fall on the catchment in and around Wolston causing Wolston and the surrounding catchment to become saturated. A further 31.12mm of rain fell in Wolston between the 1st and 5th January 2024. Subsequently, an EA Flood Alert was issued for the River Avon at Marston and Wolston on the 2nd of January 2024 specifically referencing potential flooding on Main Street.

The unnamed brook that runs adjacent to Main Street and Brook Street ultimately outfalls to the River Avon and as a result of the heavy rainfall in December 2023 and early January 2024, the levels in the River Avon were extremely high resulting in flows backing up in the brook and eventually leading to the brook bursting it's banks and internally flooding 16 residential properties and 1 commercial business.

The highway drainage network on Main/Brook Street discharges into the unnamed brook however given the brook levels were higher than the invert level of the gully outfall pipes in the brook, the highway drainage network was unable to discharge into the brook as it normally would therefore causing them to surcharge. The STW surface water system present in Main Street outfalls into the unnamed brook further downstream and just before the bridge and given brook levels were high, the STW system could also not outfall causing their system to surcharge.

In close proximity to the new Spitfire Development site, an incident occurred in which a STW water main burst causing flows to run to the lowest point in the village (Main Street). The Spitfire Development site is currently in construction and has not yet connected the surface water drainage system to the site wide attenuation basin therefore any flows originating on the site were not attenuated within the site boundary and therefore ran off site and down to the centre of the village.

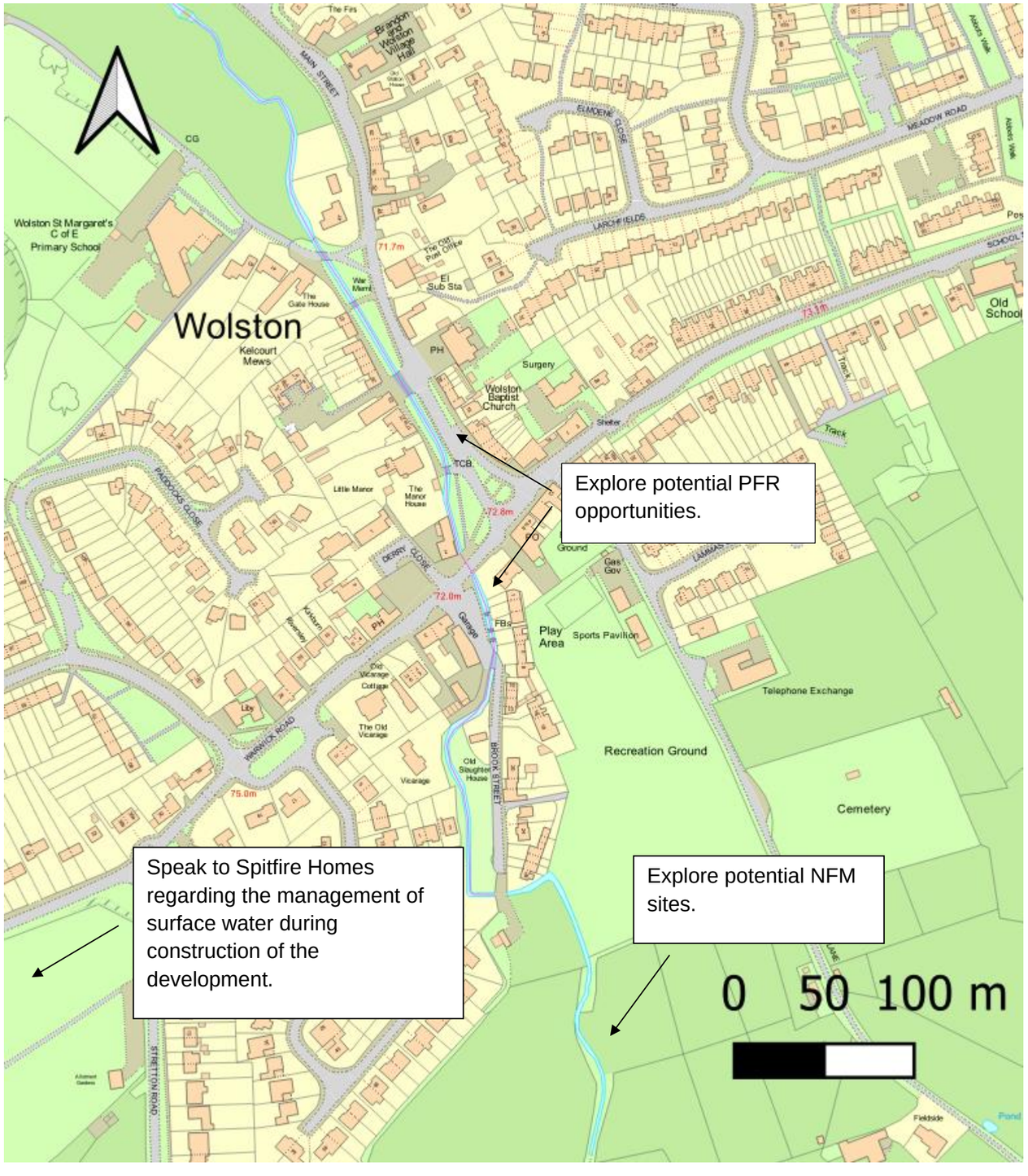
Is there a history of flooding in this location?

The LLFA holds several records of flooding in Wolston (Main Street) in 2012, 2016, 2019 and 2020 with the majority of these reports being either highway flooding or highway road closures. The LLFA also holds a record of external property flooding to one property on Main Street in March 2016. Avon Bridge is known to frequently flood resulting in road closures however, this has not been known to affect property.

What actions are being taken?

No.	Action	Responsible party	Progress
1	Set up central government Property Flood Resilience (PFR) Grant Scheme framework and work with the community to administer the relevant funding	LLFA/Residents	Ongoing
2	Work to put together an RFCC application for a potential funding bid	EA	Ongoing
3	Undertake appropriate watercourse maintenance	Landowners/WCC Highways	Ongoing
4	Identify sites which may be suitable for potential NFM works upstream of Wolston	FLAG	Ongoing
5	Ensure that highway cyclic gully cleansing is scheduled at an appropriate interval	WCC Highways	Ongoing/Frequency Increased
6	Offer advice to residents that have been internally flooded from this event	LLFA	Complete
7	Undertake work to put an Emergency Flood Action Plan in place for Wolston	FLAG	Ongoing
8	Speak to Spitfire Homes regarding the management of surface water during construction of the development	FLAG	Ongoing

What are the future opportunities that may reduce flood risk in this location?



APPENDIX K: SUMMARY TABLE OF SITES

Town / locality	Street name	Source/s of flooding	No. of properties internally flooded	Description of flooding	Is there a history of flooding?	Recommendations	RMA responsible for taking recommendations forward	Status
Austrey	Appleby Hill.	Surface water	1	Appleby Hill, in the village of Austrey, Atherstone, experienced flooding due to surface water runoff following heavy rain. Runoff originated in surrounding fields, entering one property through doors, the washing machine outlet, and the brickwork.	The village of Austrey has a history of flooding incidents on record.	NWBC provided suggestion to resident on protection measures to property.	WCC LLFA	Complete
Baginton	Chantry Heath Lane	Surface water	1	The Chantries region in Baginton experienced severe flooding due to saturated ground, surface water runoff and blocked external drains.	The Baginton/Stoneleigh area has experienced multiple flood events, with records showing incidents across multiple years.	WCC Highways to conduct CCTV survey to identify suspected pipe collapse, then carry out repairs.	WCC Highways	Ongoing
Bidford on Avon	High Street	Main River	1	The saturated ground conditions, combined with intense rainfall and proximity to a main river, led to internal flooding for a resident in Bidford.	We have data of flooding recorded in across multiple years historically.	Property affected captured on government grant funding list.	WCC LLFA	Complete
Eathorpe	Main Street	Surface Water	1	Building experienced flooding with 1" of water reported internally. Customer indicates an incorrectly installed flood barrier, and a seized pump may have contributed to the incident.	There are various records of flooding in Eathorpe historically.	Customer informed of potential recovery grant.	WCC LLFA	Complete

Town / locality	Street name	Source/s of flooding	No. of properties internally flooded	Description of flooding	Is there a history of flooding?	Recommendations	RMA responsible for taking recommendations forward	Status
Fenny Compton	Northend Road	Surface Water	1	The property affected is situated between multiple field ditches which convey a large area of surface water from agricultural fields. The saturated ground conditions, combined with intense rainfall led to the surrounding ditches to back up and a reported 30 cm of water internally flooded the property.	No previous records of flooding on Northend Road, however multiple reports are on record for the wider area within Fenny Compton.	WCC Highways requested to carry inspection of culvert beneath highways.	WCC Highways	Ongoing
Grendon	Southeast of Spon Lane	Surface water	1	The saturated ground conditions, combined with intense rainfall led to internal flooding.	Multiple reports are on record for Spon Lane, Fenny Compton.	Customer informed of potential recovery grant.	WCC LLFA	Complete
Grendon	Spon Lane	Surface water	2	Multiple locations along Spon Lane faced flooding during storm Henk. At a business, deployment delay of flood barriers resulted in shallow water ingress that was quickly addressed. A separate residence on Spon Lane experienced internal flooding. Property Flood Resilience (PFR) measures including flood doors had been previously installed at the property due to previous flooding. Seepage from under flood doors in addition to permeation through walls and floors resulted in internal flooding of up to 5-6 inches in some areas of the ground floor.	Multiple reports are on record for Spon Lane, Grendon.	Ongoing discussions are being held with residents at this location about the potential of joining the local Flood Action Group.	WCC LLFA	Ongoing
Ilmington	Back Street	Surface water	1	One residential property in Ilmington experienced internal flooding, with 5 inches of water in two rooms.	There are no previous records of flooding on back street however	Contractors to issue CCTV jetting job raised and to lodge a partially blocked culvert.	WCC LLFA	Complete

Town / locality	Street name	Source/s of flooding	No. of properties internally flooded	Description of flooding	Is there a history of flooding?	Recommendations	RMA responsible for taking recommendations forward	Status
				Resident suspects recent changes to upstream drainage system contributed to increased groundwater flow and flooding.	there are number of historic flood reports in wider catchment of Ilmington.			
Kingsbury	Bodymoor Heath lane	Surface water	1	Flooding was reported to buildings at the water park site, which houses multiple businesses. We received confirmation of flooding to office spaces which resulted in 24-hour closure. Some other businesses operating on the site were also flooded and flooding to site access prevented trading and resulted in lost revenue for those not directly flooded.	There is a single historic of flooding in 2020 for the Kingsbury Water park. Within the Kingsbury area as a whole there a multiple records of flood reports.	No further actions required.	WCC LLFA	Complete
Leamington Spa	Lansdowne Circus.	Surface water	1	A residential property at Lansdowne Circus, Leamington Spa experienced internal flooding during heavy rainfall through storm Henk. The resident reported approximately 1cm of water entering internal living spaces. The resident suspects the water entry was due to a lack of proper damp-proof course and tanking, allowing waterlogged topsoil on the clay subsoil to escape sideways rather than downward.	No previous records of flooding on Lansdowne Circus, however multiple historic reports within the wider Leamington Spa area.	Ground water guidance document provided to resident and property affected captured on government grant funding list.	WCC LLFA	Complete
Long Itchington	The Model Village	Surface water	1	Internal flooding occurred at the Model Village, Long Itchington, following excessive rainfall experienced during storm Henk. The adjacent field flooded, eventually leading water to enter a building, with a depth of approximately 2.5cm. It was reported that the surrounding field being inundated contributed to the internal flooding.	We have a historic report of flooding at the Model Village in 2020.	No further actions required.	WCC LLFA	Complete

Town / locality	Street name	Source/s of flooding	No. of properties internally flooded	Description of flooding	Is there a history of flooding?	Recommendations	RMA responsible for taking recommendations forward	Status
Long Itchington	Marton Road	Surface water	2	Heavy rain caused surface water runoff from the adjacent fields to flow towards properties on Mill Lane. This resulted in internal flooding to two properties and garden flooding to further properties. Residents reported floodwater entering through doorways and airbricks, with some needing to temporarily vacate their homes. The source of the flooding is believed to be associated with the watercourse located behind the affected properties.	Two historic records of flooding on Marton Road from 1998. There are various records of flooding across the wider area of Long Itchington.	No further actions required.	WCC LLFA	Complete
Luddington	Luddington Road	Surface water	1	An ingress of water resulted in approximately 2 inches of flooding across most of the ground floor within a property on Luddington Road. The resident is unaware of any blockages or issues within the property that may have worsened the flooding and believes the heavy rainfall from Storm Henk is the primary cause.	There are multiple historic flood reports along Luddington Road, most recently from 2019.	Discussed flood recovery grant and PFR and blue pages link emailed to customer.	WCC LLFA	Complete
Nuneaton	Weddington Road	Surface water	4	Storm-related heavy rain caused significant flooding along Weddington Road. Businesses and properties experienced floodwater inundation. The river Anker burst its banks, impacting a sports club (extensive damage to courts, changing rooms, flooring etc.) and another location with pitches and external areas flooded (damage to electrics and internal rooms). Runoff from a ditch caused ground floor flooding in two properties. Fire crews were deployed to pump out water at some locations.	There are historic reports of flooding both on Weddington Road and within the wider Nuneaton area.	No further actions required.	WCC LLFA	Complete
Rugby	Parkfield road	Surface water	1	Heavy rain during storm Henk caused flooding at a business on Parkfield Road, Rugby. Fire crews	Various historic flood reports within wider area.	No further actions required.	WCC LLFA	Complete

Town / locality	Street name	Source/s of flooding	No. of properties internally flooded	Description of flooding	Is there a history of flooding?	Recommendations	RMA responsible for taking recommendations forward	Status
				were called to pump out water from a flooded outbuilding used by the business.				
Rugby	Swift Valley Park	Surface water	1	Heavy rain during storm Henk led to the river Swift in Rugby and the surrounding ordinary watercourses to burst their banks leading to highway flooding and a nearby commercial business flooding internally and externally.	No historic reports of flooding within the industrial park, however multiple reports on record for the wider area of Rugby.	WCC highways requested to carry out inspection of culvert beneath highways. Riparian Landowners requested to inspect and maintain surrounding ditches.	WCC Highways	Complete
Rugby	Cord lane	Surface Water	1	During storm Henk one property on Cord Lane, Easenhall, Rugby was flooded internally. Surface water runoff from fields and overwhelmed drainage on the lane, caused floodwater to enter the resident's front garden and flow over a dropped kerb. This resulted in water ingress through floorboards, inundating approximately eight inches beneath the suspended floors in five rooms of the property.	No historic report of property flooding within the village of Easenhall.	WCC Highways have raised an order to have all gullies, manholes and outlets to be jetted	WCC Highways	Ongoing
Rugby	Elliot’s field retail park.	Surface water	2	During Storm Henk there was internal flooding at commercial premises within Elliott's Field Retail Park on Leicester Road. This resulted in damage to stock in some of the commercial businesses.	No historic records on flooding at Elliot’s retail park.	No further actions required.	WCC LLFA	Complete
Rugby	Coventry Road, Marton, Rugby	Surface water	1	A property on Coventry Road, Marton reported during Storm Henk internal ingress of surface water. While floodwater did not enter the property in large quantities, a combination of high-water levels on the road and speeding traffic caused spray to wash in through the doorway, leading to approximately 1cm of water in the main living area.	Multiple historic flooding reports captured within the immediate area of Coventry Rd, Marton, Rugby.	No further actions required.	WCC LLFA	Complete

Town / locality	Street name	Source/s of flooding	No. of properties internally flooded	Description of flooding	Is there a history of flooding?	Recommendations	RMA responsible for taking recommendations forward	Status
Stratford upon Avon	Bridge Foot	Main River	1	Rising floodwaters from the adjacent river Avon inundated a business on Bridge Foot Road. The business reportedly experienced internal flooding, cellar flooding, and external flooding. Although flood protection barriers were available on site, it was reported they were not deployed during the storm.	No historic reports recorded on Bridge Foot Road, however multiple reports on record for the wider catchment.	No further actions required.	WCC LLFA	Complete
Stratford upon Avon	A439 Warwick Road.	Main River	2	Persistent heavy rain during Storm Henk saturated the ground and caused the river Avon to rise. This resulted in two dwellings adjacent to Warwick Road, Stratford Upon Avon flooding. Residents were displaced for more than 48 hours due to the flooding.	Multiple reports on record further south on Warwick Road, during storm Henk.	No further actions required.	WCC LLFA	Complete
Stratford upon Avon	Swans Nest	Main River	1	Heavy rains associated with storm Henk caused the river Avon to overflow, impacting a business on Swans Nest, Stratford-upon-Avon. The resulting floodwaters significantly damaged the kiosk, equipment storage area, and forced the business to close for up to ten days	No historic reports recorded on Swans Nest, however multiple reports on record for the wider catchment.	No further actions required.	WCC LLFA	Complete
Stratford upon Avon	Tiddington Road	Main River	1	Tiddington Road, Stratford-upon-Avon, situated close to the river Avon, became a scene of significant flooding during Storm Henk. Floodwaters reached a height of 2.72 meters, inundating multiple spaces and buildings within a caravan park, impacting residents and park facilities.	Multiple historic reports recorded on Tiddington Road and multiple reports on record for the wider catchment.	No further actions required.	WCC LLFA	Complete
Stratford upon Avon	Swans Nest (Sports club)	Main River	1	The prolonged rainfall during storm Henk caused extensive flooding to land and buildings to the south of Swans Nest, Stratford-upon-Avon. Persistent heavy rain saturated the ground and led the nearby river to overflow its banks. Floodwaters	No historic reports recorded on Swans Nest, however multiple reports on record for the wider catchment.	No further actions required.	WCC LLFA	Complete

Town / locality	Street name	Source/s of flooding	No. of properties internally flooded	Description of flooding	Is there a history of flooding?	Recommendations	RMA responsible for taking recommendations forward	Status
				inundated various parts of a sports complex, with reported depths ranging from a few centimetres to nearly a meter. The report also suggests floodwater may have entered the building through the drains.				
Warwick	Mill Street	Surface water	1	During storm Henk flooding was reported at one property on Mill Street, Warwick. The resident reported approximately one inch of floodwater in the main living area, along with one to three feet of water within the back garden. The report attributes the flooding to a combination of factors: heavy rainfall and the properties position at the bottom of the road.	No historic records of flooding on Mill Street Warwick.	Property affected captured on government grant funding list.	WCC LLFA	Complete
Warwick	Bridge End	Main River	1	During storm Henk flooding at a property on Bridge End, Warwick was recorded. The river Avon burst its banks, overflowing gardens upstream and flooding the street. Floodwaters entered the property through the garage doors (approximately knee-deep) and the floor (between 15-30cm), impacting the ground floor. The water then flowed through the house and exited through the rear doors.	There are multiple historic reports of flooding on Bridge End, Warwick.	Property affected captured on government grant funding list.	WCC LLFA	Complete
Warwick	Lynton close	Surface water	1	Two properties on a Lynton Close, Warwick were reported as flooded. A site visit confirmed flooding at one address, with another confirmed via email and photos. While efforts were made to pump water away from potentially affected properties, floodwater impacted the hallway, half of the living room, and a cupboard in one residence, displacing the occupants for 11 days.	There are multiple reports of flooding on Lynton Close, Warwick.	Property affected captured on government grant funding list.	WCC LLFA	Complete

Town / locality	Street name	Source/s of flooding	No. of properties internally flooded	Description of flooding	Is there a history of flooding?	Recommendations	RMA responsible for taking recommendations forward	Status
Warwick	Yarningale Lane	Surface water	1	During storm Henk internal flooding was reported to one property on Yarningale Lane, Claverdon, Warwick. The resident reported approximately 5-6cm of floodwater on the ground floor, which persisted for a week. This is the first time the property has flooded in the resident's 30 years of living there.	No historic records of flooding on Yarningale, Warwick.	Property affected captured on government grant funding list.	WCC LLFA	Complete
Welford on Avon	Binton road	Main River	1	Storm Henk caused flooding from the adjacent river Avon to a property on Binton Road. While the main house escaped internal flooding, the garage and annex sustained flooding, with water depths reaching 2-3 feet. The residents required evacuation for four nights. The report identified the source of flooding as the main river.	Multiple reports on record within the surrounding area.	Property affected captured on government grant funding list.	WCC LLFA	Complete
Welford on Avon	Binton Road (Business)	Main River	1	Heavy rain during storm Henk caused floodwater from the nearby river Avon to enter a business on Binton Road. While the water ingress was minimal, it resulted in the closure of the premise for approximately two and a half days.	Multiple reports on record within the surrounding area.	Business affected captured on government grant funding list.	WCC LLFA	Complete
Wellesbourne	Newbold road	Surface water	2	Wellesbourne's Newbold Road faced floodwater during Storm Henk, impacting at two properties. The report suggests groundwater may have been a contributing factor, with rising water levels observed in a nearby well and adjacent field. Additionally, overflow from Newbold Brook further upstream is mentioned to have contributed to the flooding.	Multiple reports on record within the surrounding area.	Properties affected captured on government grant funding list.	WCC LLFA	Complete
Wootton Wawen	Grey Mill Lane	Main River	1	Situated beside the river Alne, one property on Grey Mill Lane, experienced flooding during Storm Henk. The rising river overwhelmed existing flood defences, causing water to enter the dining room and hall.	No historic records of flooding on Grey Mill Lane, Wootton Wawen.	Property affected captured on government grant funding list.	WCC LLFA	Complete

Town / locality	Street name	Source/s of flooding	No. of properties internally flooded	Description of flooding	Is there a history of flooding?	Recommendations	RMA responsible for taking recommendations forward	Status

7 APPENDIX L – GLOSSARY OF TERMS

Return Period	This is a technical measure used to indicate how rare and extreme a given rainfall event is. Generally light showers resulting in small water volumes are quite common whereas heavy or prolonged rainfall events resulting in very large volumes of water are rarer. On this basis, the return period quantifies this by giving the probability of a given rainfall event occurring in any given year. For instance, a 1 in 2year event has a 50% or 1 in 2 chance of occurring in any given year and is therefore quite common and unremarkable. A 1 in 100year return period has a 1% or 1in100 chance of occurring in any year and is therefore rarer and more impactful.
Critical infrastructure	Infrastructure which is considered vital or indispensable to society, the economy, public health or the environment, and where the failure or destruction would have large impact. Examples include hospitals, communications, electricity sub-stations, water treatment works, transport infrastructure and reservoirs.
Department for Environment, Food and Rural Affairs (Defra)	The government department responsible for policy and regulations on environmental, food and rural issues. This includes all aspects of flood risk management.
Environment Agency (EA)	See Appendix D.
External flooding	Flooding of areas of property that are not under the definition of internal flooding. Examples include gardens, driveways, parking areas and outbuildings such as sheds and garages.
Flood Risk Management (FRM)	FRM aims to reduce the likelihood and/or the impact of floods. This typically includes the following elements: prevention, protection, preparedness, response and recovery. In the context of this report, FRM also refers to the team at WCC which undertakes the LLFA role.
Exceedance flows	Excess surface water flow that occurs when the capacity of the drainage system is exceeded.
Flood and Water Management Act 2010 (FWMA)	Legislation which came into effect in April 2010. The Act takes forward a number of recommendations from the Pitt Review into the 2007 floods and placed new responsibilities on the Environment Agency, local authorities and property developers (amongst others) to manage the risk of flooding.

Internal flooding	Flooding of habitable living or business areas of a property. This does not include gardens and outbuildings such as sheds, garages etc. and not normally basements and porches.
Lead Local Flood Authority (LLFA)	See Appendix D.
Main River	Watercourses designated as 'main' are generally the larger arterial watercourses, as shown on the Statutory Main Rivers Map. The Environment Agency has permissive powers, but not a duty, to carry out maintenance, improvement or construction work on designated main rivers.
Ordinary watercourse	A watercourse that is not a designated Main River. On ordinary watercourses the LLFA have permissive powers, but not a duty, to carry out maintenance, improvement or construction work.
Pluvial or surface water flooding	Caused by rainfall exceeding the capacity of the ground or drainage system and occurs due to water ponding on or flowing over the ground surface before it reaches a drain or watercourse.
Property Flood Resilience (PFR) measures	Measures that are designed to keep flood water out of properties and businesses, and could include flood barriers and doors, non-return valves and airbrick covers. Sometimes also known as Property Level Resilience (PLR).
Riparian landowners	Someone who owns land or property adjacent to a watercourse. Under common law, a riparian owner has a duty to maintain the watercourse and allow flow to pass through freely.
Risk management authority (RMA)	An authority which is defined as such in the Flood & Water Management Act 2010. Such authorities have powers that they can use to carry out their flood and coastal erosion risk management responsibilities. See Appendix I for a summary of these responsibilities.
Risk of Flooding from Surface Water map (RoFSW)	National-scale long-term risk mapping on gov.uk website showing the areas of England at risk of flooding from surface water. Extent, velocity and depth information is available for a range of flood probabilities.
Section 19 Flood Investigation	An investigation of a flood event by the Lead Local Flood Authority under Section 19 of the Flood and Water Management Act 2010.
Severn Trent Water (STW)	See Appendix D.

Warwickshire County Council (WCC)	See Appendix D.

APPENDIX M – RISK MANAGEMENT AUTHORITIES

Risk Management Authorities (RMAs) have defined roles and responsibilities with regards to flood risk management, as defined within the Flood and Water Management Act 2010.

All RMAs under the Flood and Water Management Act (2010) have a responsibility to cooperate and coordinate with regards to their flood risk management functions, including raising awareness of flood risk and the sharing of information.

The section below outlines the key roles and responsibilities of the RMAs relevant to this Section 19 flood investigation.

7.1.1 Environment Agency

The Environment Agency (EA) is responsible for taking a strategic overview of the management of all sources of flooding and coastal erosion in England and Wales. They have prepared strategic plans which set out how to manage risk, provide evidence (for example, their online flood maps), and provide advice to the Government.

They provide support to the other RMAs through the development of risk management skills and provide a framework to support local delivery. The EA also has operational responsibility for managing the risk of coastal erosion and flooding from main rivers, reservoirs and the sea. Main Rivers are defined through an agreed map which is updated annually. These tend to be the larger rivers in the country.

The EA are category 1 responders regarding flood risk (Civil Contingencies Act 2004). They are required to warn and inform of flood risk.

7.1.2 Water and sewerage companies

Severn Trent Water (STW) holds responsibility for managing risks of flooding from water supply and sewerage within the majority of Warwickshire. Thames Water have a small area of responsibility in the south of the county.

Water and sewerage companies (WaSCs) as category 2 responders to national emergencies placing on them duties to share information with other responders in an appropriate manner. They are also responsible for managing risks associated with assets or processes that may cause or be affected by flooding.

Relevant actions include the inspection, maintenance, repair and any works to their water and sewerage assets which typically includes pipes, manholes, attenuation tanks or other infrastructure such as pumping stations.

7.1.3 Warwickshire County Council as Lead Local Flood Authority

Lead Local Flood Authorities (LLFA) have the lead operational role in managing the risk of flooding from surface water and groundwater.

Flood risk management functions include (but are not limited to); the provision of a Local Flood Risk Management Strategy (LFRMS) and Surface Water Management

Plan, designation and maintenance of a register of structures or features that have a significant effect on flood risk, consenting and enforcement works on Ordinary Watercourses, undertaking works to mitigate surface water and groundwater flooding and undertaking Section 19 investigations.

The LLFA are a statutory consultee on major planning applications for surface water drainage. By working with developers and local planning authorities, the LLFA role is to ensure that runoff arising from major development sites is appropriately managed to avoid increasing flood risk.

As a Category 1 Responder under the Civil Contingencies Act the LLFA as a local authority plays a leading role in emergency planning and recovery after a flood event and has plans in place to respond to emergencies, and control or reduce their impact.

7.1.4 Warwickshire County Council as Highway Authority

WCC also has responsibilities as a Highways Authority which may relate to flooding. Highway authorities are responsible for providing and managing highway drainage which may include provision of roadside drains/ditches and must ensure that road projects do not increase flood risk.

The Highways Authority has a duty under the Highways Act 1980 to maintain existing highways drainage. They also have powers to improve drainage systems but no duty to do so.

Highway drainage systems are designed to take highway surface water. Highway drainage systems are not designed as “storm drains”, and do not have the capacity for the level of rainfall from an extreme flash flood.

7.1.5 District and Borough Councils

District and Borough Councils can carry out flood risk management works on ordinary watercourses. Through the planning processes, they control development in their area, ensuring that flood risks are effectively managed. This includes the development of plans and strategies to limit or mitigate development in flood risk areas.

Within Warwickshire there are 5 district/borough councils: Stratford-on-Avon District Council, Warwick District Council, Rugby Borough Council, Nuneaton and Bedworth Borough Council, North Warwickshire Borough Council.

7.1.6 Landowners

Landowners have riparian responsibilities under the Flood and Water Management Act (2010) to maintain and undertake any necessary works on assets on their land (with consent from the relevant RMA) which may have an effect on flood risk including watercourses and drainage assets.

Further information on riparian responsibilities is available on www.gov.uk/guidance/owningawatercourse