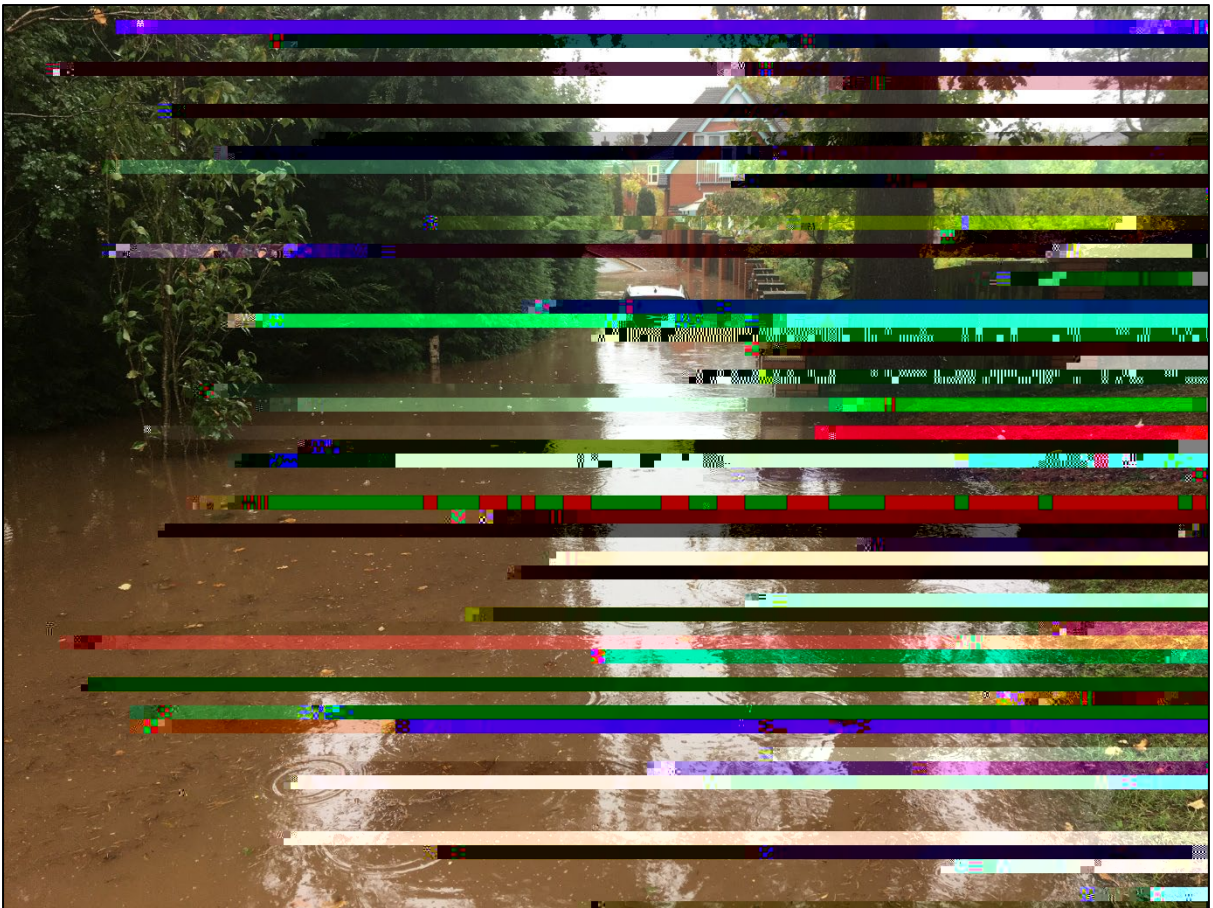


Hagley Flood Event s October and November 2019



Investigation Report

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1. Introduction

On 26th and 27th October 2019 there was flooding reported across the country, the Midlands and across Worcestershire after a moderate rainfall event. In Hagley there were four properties internally flooded in Chestnut Drive.

On 14th and 15th November 2019 there was a similar story, with another moderate rainfall event causing a great deal of disruption and further flooding. In Hagley there were six properties internally flooded near Market Way.

A combination of organisations, local councillors and the local community worked together to respond to the initial flood event emergencies and then to deal with the ongoing recovery process.

This report summarises the investigation carried out by Worcestershire County Council, as the designated Lead Local Flood Authority, under its statutory duty within section 106(2)(b) of the Flood and Water Management Act 2010 (FWMA) (2010 c. 43) (AMCID 4 BDC -30.35 -1.33 m32 Td(t)t30.56 Td(.or,932 T

2. Background

2.1 Location

The village and parish of Hagley lies between Kidderminster to the west, Stourbridge to the north, Birmingham to the east and Bromsgrove to the south in the northern tip of Worcestershire within Bromsgrove District. The village, with a population of around 7,000 people, is surrounded by countryside.



Figure 1. Location map : red outline is Chestnut Drive; purple outline is Market Way

2.2 Local watercourse and drainage

Hagley drains from east to west via various arms of the Gallows Brook as shown in Figure 2.¹

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Figure 2. Catchments (shaded green, orange and purple) and watercourses (blue) in and around Hagley.

A close-up of the watercourses and culverts near Market Way is shown in Figure 3. The northern arm of the Gallows Brook drains the area shown in green in Figure 2, which is around 3.5 km². The portion of this catchment upstream of Market Way is around 1.8 km² in area.

Market Way is located near the confluence of two watercourses, both part of the Gallows Brook watercourse system. One culverted (piped) watercourse comes down the A456 and discharges in front of the properties. The other watercourse comes from Hagley Hall estate and discharges at the back of the properties, mainly in an open fashion with the exception of a twin culvert underneath a private garden on Market Way. The two watercourses meet in the road (A456) in front of the Wychbury Inn.

Surface water runoff from the properties discharges into a piped system that connects to the Highway Drainage system present underneath Market Way. This system discharges into the northern watercourse underneath the A456. There is no surface water sewer system in the area.

1

Figure 3. Culverts and watercourses near Market Way

After passing Market Way, the watercourse tracks west towards the railway line and then south, passing through two culverts

Figure 5. Close-up of watercourses and culverts near the Greenway

The northern arm of the Gallows Brook is labelled 'A'. The first confluence is with the small unnamed tributary (labelled 'B') at The Oasis, which drains a very small catchment area of around 0.06 km² shown in purple in Figures 2 and 4. This watercourse had been dry for decades prior to the early 2000s when South Staffs Water ceased to abstract and utilise groundwater in the area. It then has two confluences with the eastern arm of the Gallows Brook which drains an area of 1.85 km

flooding internally have been rare, so the flood events of October and November 2019 stand out. A scheme was installed by Severn Trent in 2017 to address sewer and surface water flooding issues, particularly in the vicinity of Worcester Road.

The recorded history of flooding in Market Way goes back as far as 1998. There was flooding recorded in both September and December 1998, although it is unknown whether this was internal property flooding. Bromsgrove District Council received further reports of external flooding on Market Way in June 2012 and June 2019.

2.6 First responders

The emergency events were also responded to by Hereford & Worcester Fire & Rescue Service.

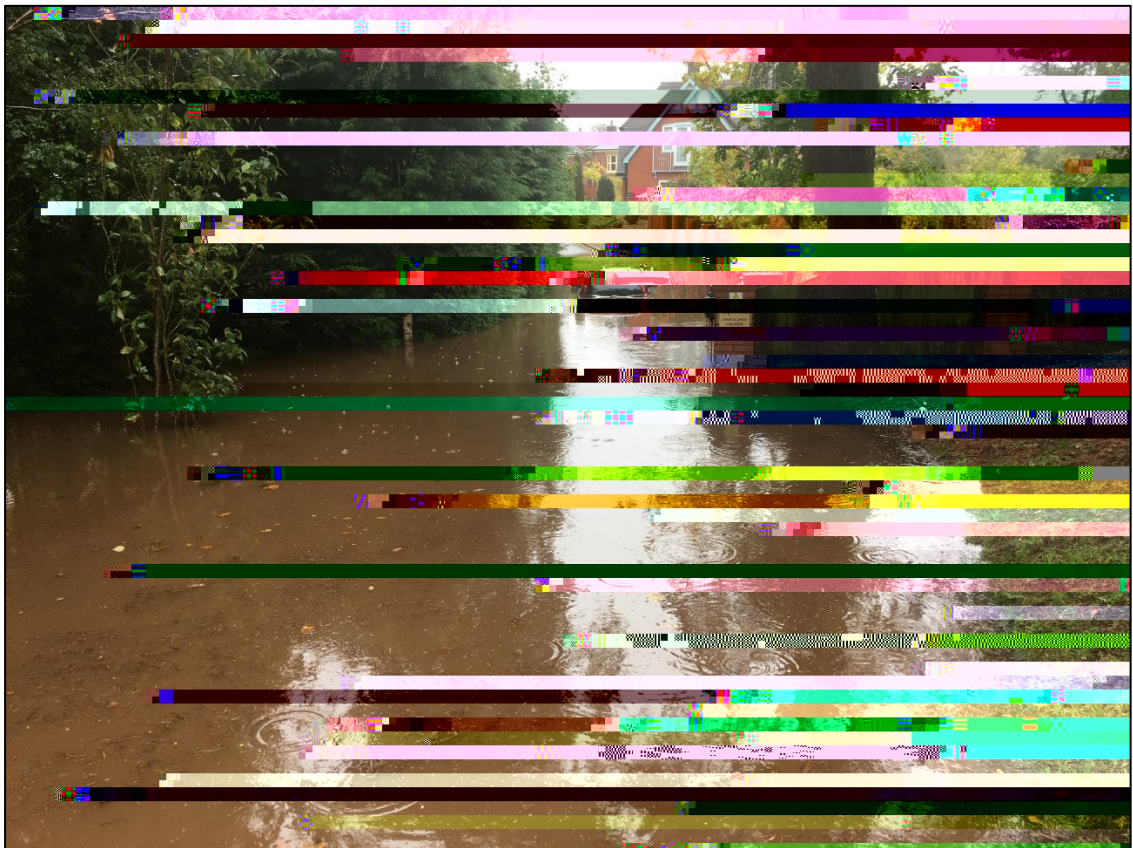


Photo taken during the October flood event from The Oasis access road.

3. Flood event

3.1 Weather / rainfall data

Although neither the October nor November rainfall events were extreme (neither was a storm named by the Met Office for example), both caused significant flooding across Worcestershire and much of the country. The reason for this lies in the antecedent conditions: moderate rainfall on saturated catchments meant that a large proportion of the rain became surface water runoff, making areas of soil and grass behave more like tarmac. The National River Flow Archive reported that the June to October period in the Severn-Trent region in 2019 was the wettest on record (since records began in 1910). As a result, exceptionally high river flows were recorded in the Midlands on 25th and 26th October, as well as many incidences of surface water flooding, resulting from rainfall totals of 80-120mm in the Severn catchment. Nearly double the long-term average rainfall fell on the Severn catchment in October. On 27th October there were more than 300 Flood Alerts and Flood Warnings in place for England and Wales.

In November 2019, after all the rainfall in October, the soils were even more saturated across the Severn catchment. On 7th November a low-pressure system stalled over central England and high rainfall totals were recorded, and there were over 150 Flood Alerts and Flood Warnings in place for England and Wales. Overall it was the fifth wettest autumn in England and Wales since 1766.

Rain gauge data for the event was gathered from the Environment Agency and Severn Trent. The location of the nearest rain gauges to the Hagley catchments are shown in Figure 6.

Figure 6: Location of rain-gauges relative to the Hagley catchments

The nearest rain-gauges to the East, West and South are Waseley Hills, Trimpley and Hartlebury. The rainfall recorded at each of these gauges at 15 minute intervals for the October and November events is shown in Figures 7 and 8 and reproduced in Appendix B

Figure 7: Recorded rainfall at Waseley Hills (or) Trimpley and Hartlebury

Figure 8: Recorded rainfall at Waseley Hills, Trimpley and Hartlebury on 13th and 14th November 2019

Analysing these rainfall events using the Duration Depth Frequency model to assess the rainfall event return periods, which is the method normally adopted in flood hydrology, would result in low return periods for both events. For both events the rainfall in any 15 minute interval rarely exceeds 1mm. However, both hyetographs demonstrate that in both the October and November events there was a sustained period of rainfall, which we know took place on a saturated catchment, and it is this which resulted in the runoff exceeding the infiltration capacity of the soils and the drainage capacity of the infrastructure in many parts of the country, and the resultant flooding. The fact that the Chestnut Drive culvert blocked had a significant impact on the flooding experienced in this location. The c 0.006 Tw T^{-5} (h)(pac)14 (10 (.c10 (hy1nd i)6 id Td(i)6 (nor)1 (e 7 (an()-10 (r)(9 0 Tdā w)6 (e hi)6 aC)6 (her)7Tu12 (ant)2 (f)2 (l)6 (oo6 (

mental wellbeing is impossible to accurately measure or articulate, not least because for many it is ongoing. Some residents were forced to relocate in order to allow repairs to be carried out to their properties.

The economic impact of the flood event will include property and infrastructure repairs and replacement, response and recovery efforts and development and implementation of future flood risk and impact reduction measures. This is likely to exceed a quarter of a million pounds.

4.2.2 Resident feedback

Feedback from residents has been sought and gathered in a number of ways including the following.

- Discussions with individuals during the emergency response.
- Discussions with individuals during visits to properties.
- Discussions between local councillors and residents.
- Via social media.
- Directly via correspondence with the Risk Management Authorities.
- At the public meeting with residents and councillors on 4th November 2019.

Much of the specific feedback was responded to and acted upon immediately but more general feedback has been fed into the investigation process and it is reflected in this report.

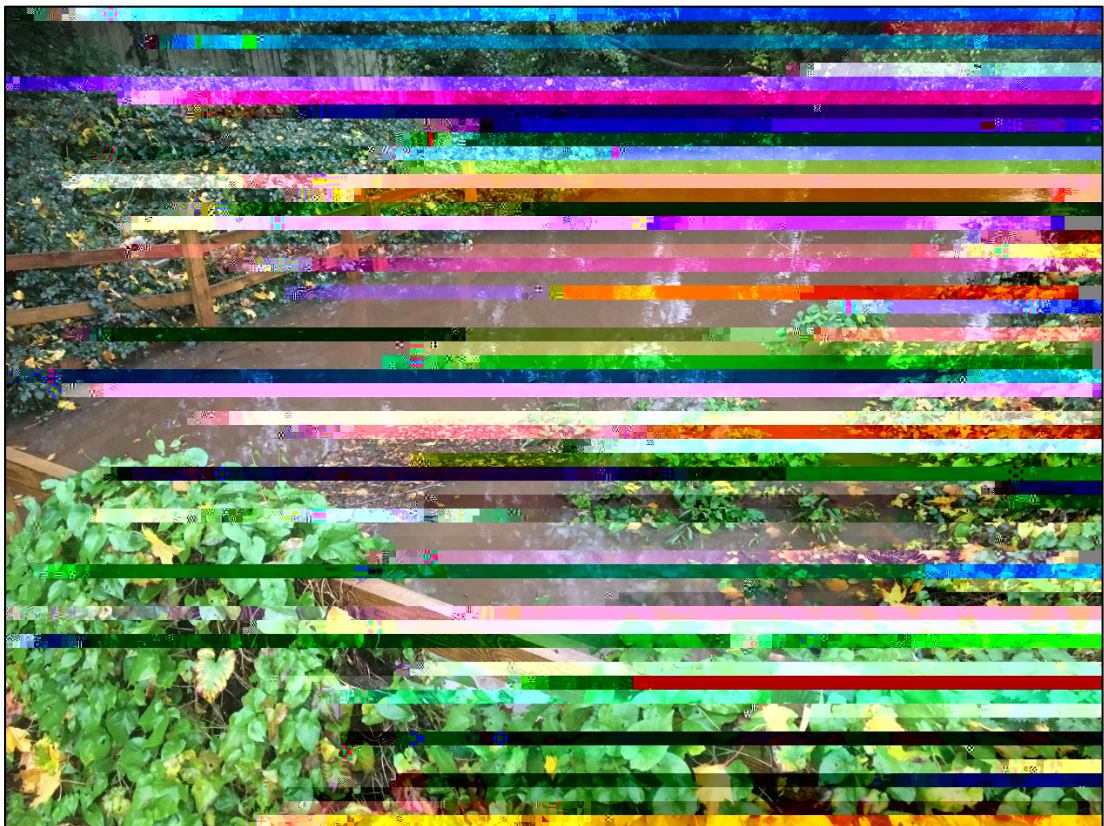


Photo taken during the October flood event looking over The Greenway culvert towards Chestnut Drive.

5. Drainage infrastructure & watercourse investigation

Immediately after the flood events Worcestershire County Council, North Worcestershire Water Management, the Environment Agency and Severn Trent Water Ltd

6. Key issues and lessons learned

A number of issues and learning points have emerged from the flood event via the Local Resilience Forum de-brief, discussions with other Risk Management Authorities and feedback from residents. The key points include the following.

6.1 Response & Recovery

The widespread flooding across Worcestershire in both October and November meant that resources

Replacing the twin culvert at Market Way with a single larger culvert would increase the conveyance.

Well designed, installed and maintained trash screens in the right locations may help to reduce the risk of culverts blocking in the future.

Well designed, installed and maintained warning systems will help to reduce the impacts of future flooding.

An active Flood Action Group with a flood resilience plan developed in liaison with the Parish Council, District Council, County Council,

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7. Key recommendations

The following key recommendations have emerged from the flood event response debrief for the October and November flood events across Worcestershire, from the investigation and from community feedback. The actions associated with these are in the Action Plan in Appendix F. Some of these are specifically relevant to Hagley whilst others are relevant to flood risk management across Worcestershire.

	Recommendation	Lead
Response & Recovery		
KR1	Produce standard advice and support materials for distribution to impacted communities during future surface water flooding events	Worcestershire County Council
KR2	In future surface water flood events always	

8. Next steps

1. Discuss this report and its key recommendations with partners, stakeholders and particularly the impacted

9.

Appendix A –Flood & Water Management Act (2010)

s19 duty to investigate flooding

Worcestershire County Council, within its role as Lead Local Flood Authority, has a duty to investigate flood events it deems to be 'significant' as detailed in Section 19 of Part 3 of the Flood and Water Management Act (2010) as follows:

Section 19

1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate –

- (a) which risk management authorities have relevant flood risk management functions, and
- (b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to flood.

2) Where an authority carries out an investigation under subsection 1) it must –

- (a) publish the results of its investigations; and
- (b) notify any relevant risk management authorities.

Worcestershire County Council Triggers

All flood events will be investigated informally but flood events resulting in one or more of the following impacts will normally be formally investigated under the Flood & Water Management Act:

Danger to life

10 or more properties internally flooded

10 or more businesses severely disrupted

1 or more pieces of critical infrastructure severely impacted

A formal investigation under the Flood & Water Management Act might also be triggered if there is one or more of the following:

Very frequent flooding

Impact on particularly vulnerable people

Severe economic disruption

Significant environmental impact

Requests of a significant weight

Appendix B– Recorded rainfall hyetographs near Hagley from October and November flood events

Appendix G– Flood Zone 2 near Chestnut Drive

Appendix D— Flooding Mechanism near Market Way

Appendix E –Flood events response and recovery timelines

The timelines below focus on the activity in Hagley. Alongside these events in Hagley there was also the wider County Council and partners' responses to flooding across Worcestershire and the county-wide co-ordination of this response and recovery by WCC

12.54	Environment Agency informed that surface water flooding developing on Chestnut Drive.
13.25	Call to fire service
13.41	Fire Service arrives on site. Informed EA at 14.02
14.32	Fire Service Stop message "ELECTRICS IN PROPERTY ISOLATED, AWAITING ARRIVAL OF ENV AGCY, ADVICE GIVEN TO RESIDENTS"
14.00 – 15.00	Response from public services - more sandbags arrived as homes in Chestnut Drive begin to flood.
	Cllrs May and Daisley on site talking to residents.
	Two officers from EA Field Team arrived on site to assess the situation.
	WCC Highways arrived on site to assess situation.
	Surface water flooding occurring in The Greenway.
	Gardens in Willow Close now have approximately 4 ft of flood water and rising. Real threat to homes becoming flooded if no action taken to remove blockage.
ca 15.00	Rainfall stops.
15.00 – 17.00	WCC Highways drains maintenance vehicles on site attempting to flush culvert and drains. Fire service (called 15.53, arr. 16.20) on site dealing with flooded homes in Chestnut Drive.
	Bromsgrove District Council staff out on site
ca 17.00	Over-pumping of water from culvert area into watercourse commenced. Fire Service pumps support with blocked culvert.
ca 18.00	Worcestershire County Council Highways bring two larger pumps on site.
ca 19.00	Over-pumping with larger pumps works and water levels stabilised upstream in The Oasis and Willow Close.

06.00	Water levels in gardens at Willow Close approximately 1 foot.
10.00	Watercourse back within its channel but Chestnut Drive culvert still blocked.
10.00 onwards	Pumping continued throughout the morning. Culvert unblocked by WCC Highways' jetting crew during the course of the day. Fire service left at 13.21
Monday 28 th October onwards	Actions Post -flooding
Monday 28 th October	WCC inform Severn Trent regarding the flooding.
October 2019 onwards	Severn Trent checked surface water sewers and flap valves on outfalls in the area to make sure that no debris had been deposited from the culverts.

October 2019
onwards

The National Flood Forum, wum, wuM.04 Tr and g (l)6 (s)(ar)7 (.48 reT refm7

Jan 2020 onwards	Further discussions have been held with Ground Solutions, the owners of the Chestnut Drive culvert and the open space upstream of it.
Feb 2020	Debris from the open space between The Greenway and Chestnut Drive removed.
Feb 2020	The grille at the downstream outlet of the Greenway culvert removed by Ground Solutions in response to the recommendations of the multi-agency group.
Feb 2020 onwards	The investigation team has begun to explore the wider upstream catchment in order to identify potential interventions to slow and hold back the flow.

November Flood Event

Day / time	Event / activity
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	utilised to cleanse and survey the piped drainage systems in the area. No excessive amounts of silt or debris are found, and no defects either.
November 2019 onwards	Liaison starts with the respective landowners regarding potential measures that might impact their assets. Tentative work starts to assess the (technical) feasibility and associated costs of potential measures. As a short-term, no regret measure, an overland flow route is constructed on top of the twin culvert that should allow any excess water to flow back into the southern watercourse, keeping the flood water away from the houses.

Appendix F– Action Plan from Hagley Investigation and Recovery Group

Appendix G– Potential measures to reduce flood risk near Market Way