



Flood Investigation Report

BUCKTHORN WAY, GREAT GLEN

23rd DECEMBER 2019

To discuss this report, please contact the Flood Risk Management Team by email flooding@leics.gov.uk or by phone 0116 305 0001

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1 EXECUTIVE SUMMARY

On the afternoon and evening of 23rd December 2019, 4 residential properties along Buckthorn Way were internally flooded and 1 further property was externally flooded. This flooding investigation found that this was not the first event of internal property flooding for these properties.

An anecdotally reported localised heavy rainfall event fell on the already heavily saturated catchment. This caused overland surface water to flow over the topography from the surrounding catchment mainly consisting of agricultural fields following land height towards the highway and private drives where this built up before breaching the front doors of residential properties on the Stretton Glen development.

1.1 SUMMARY OF FLOOD SOURCES

| | | | |
|-----------------------------|-------------------------------------|-------------------------|--------------------------|
| Ordinary Watercourse | <input type="checkbox"/> | Public Sewer | <input type="checkbox"/> |
| Main River | <input type="checkbox"/> | Canal | <input type="checkbox"/> |
| Surface Water | <input checked="" type="checkbox"/> | Land Drainage | <input type="checkbox"/> |
| Groundwater | <input type="checkbox"/> | Highway Drainage | <input type="checkbox"/> |

1.2 RECEPTORS IMPACTED (NUMBER)

| Residential | Business | Other Buildings | Roads | Critical Infrastructure |
|------------------------------------|-----------------|------------------------|--------------|--------------------------------|
| 5 (4 internal + 1 external) | | | | |

2 INTRODUCTION

2.1 SECTION 19 INVESTIGATIONS – DUTY TO INVESTIGATE

Section 19 of the Flood and Water Management Act (FWMA) states:

- (1) *On becoming aware of a flood in its area, a Lead Local Flood Authority (LLFA) must, to the extent that it considers it necessary or appropriate, investigate:*
- a. *which Risk Management Authorities (RMAs) have relevant flood risk management functions, and*
 - b. *whether each of those RMAs has exercised, or is proposing to exercise, those functions in response to a flood event.*
- (2) *Where an authority carries out an investigation under section 1 (above) it must:*
- *publish the results of its investigation, and*
 - *notify any relevant RMAs.”*

2.2 FORMAL FLOOD INVESTIGATIONS CRITERIA

Leicestershire County Council, from herein referred to as “*The Council*”, identified local thresholds for formally investigating flood incidents across Leicestershire within the Local Flood Risk Management Strategy published in August 2015. This policy advises when a formal flood investigation should be undertaken, including where one or more of the thresholds in table 1 occurs as a result of a flooding incident.

A formal investigation into the flood incident on Buckthorn Way on the 23rd December 2019 has been undertaken as the event triggered the locally agreed flooding characteristics or discretionary items as indicated below:

Table 1: Locally Agreed Criteria for Formal Flood Investigations

| | |
|--|-------------------------------------|
| Mandatory Investigation | |
| Loss of life or serious injury | <input type="checkbox"/> |
| Critical infrastructure flooded or nearly flooded from unknown or multiple sources | <input type="checkbox"/> |
| Internal property flooding from unknown or multiple sources | <input type="checkbox"/> |
| Discretionary Investigation | |
| A number of properties have been flooded or nearly flooded | <input checked="" type="checkbox"/> |
| Other infrastructure flooded | <input type="checkbox"/> |
| Repeated instances | <input checked="" type="checkbox"/> |
| Investigation requested | <input type="checkbox"/> |
| Risk to health (foul water) | <input type="checkbox"/> |
| Environmental or ecologically important site affected | <input type="checkbox"/> |
| Depth/area/velocity of flooding a cause for concern | <input type="checkbox"/> |

2.3 RISK MANAGEMENT AUTHORITIES (RMAS)

The following RMAs were identified as relevant to the flooding in Buckthorn Way. Great Glen:

Leicestershire County Council – LLFA

Leicestershire County Council – Local Highways Authority

Harborough District Council - Local Planning Authority and Land Drainage Authority who can carry out flood risk management works on minor watercourses

Severn Trent Water Ltd (STW) - Statutory undertaker for public wastewater and freshwater assets along Buckthorn Way.

3 FLOOD INVESTIGATION

3.1 LOCATION AND SETTING

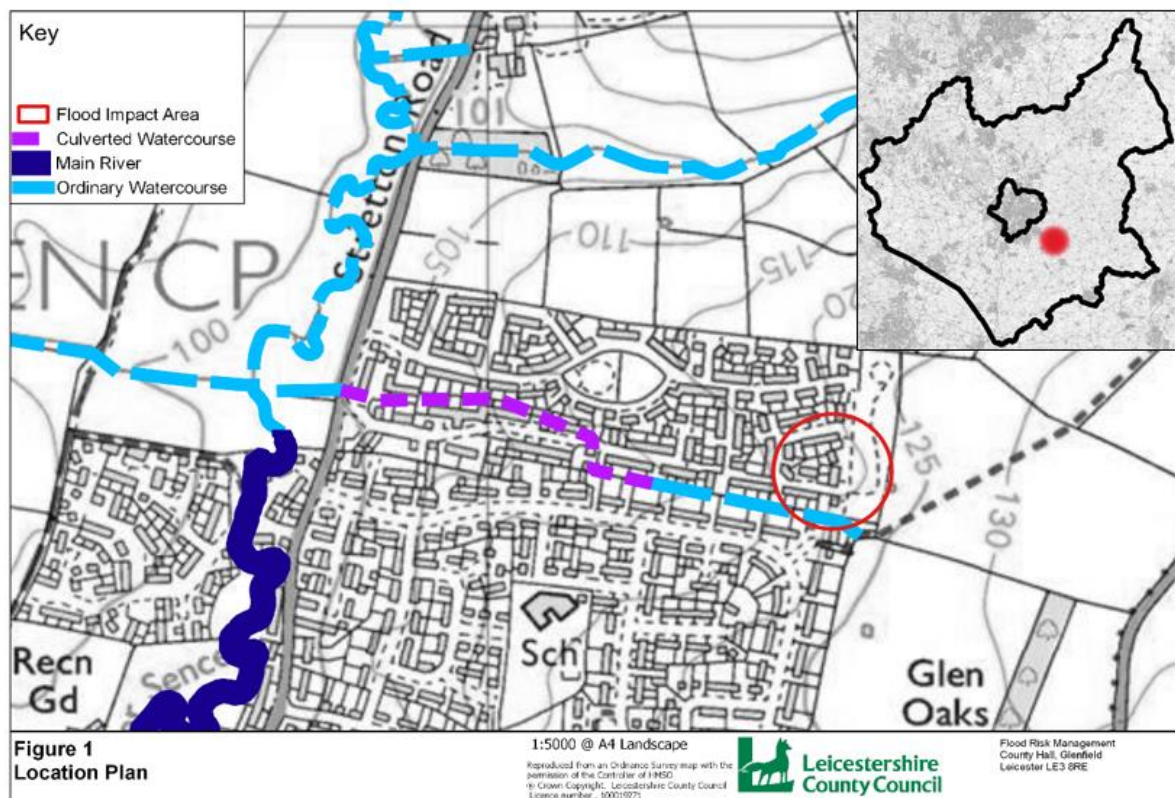
Buckthorn Way is located in Great Glen within the Harborough District, approximately 1km southeast of Leicester. Great Glen is located within a natural low point of the surrounding land, with Buckthorn Way located on a gradient with land falling from the east towards the centre of Great Glen. The geology of the site is predominantly mudstone which indicates that the sub-catchment area has relatively low ability for water to penetrate the surface easily.

The flood impact area is located to the eastern edge of a large development known as the Stretton Glen development and at the time of writing this report it is in phase 3 and therefore in its final stages of development.

3.2 LOCAL DRAINAGE

The flood impact area is located approximately 700m away from the nearest Main River, the River Sense, and the area is categorised as Flood Zone 1 (low risk to fluvial flooding).

There is a pond located approximately 55m east of the flood impact area adjacent to the public open space. There is currently no known outfall from this pond, and it is assumed that it is natural formed by environmental processes.



An unnamed ordinary watercourse exists to the south of the flood impact area which eventually flows through the Stretton Glen development site at OSGR 466257, 298428 in an 300mm diameter culvert. It then eventually discharges to the River Sense at

OSGR 465719 298585. This unnamed ordinary watercourse is not believed to be hydrologically linked to the flood impact area, Figure 1.

The surface water drainage system of the Stretton Glen development site drains in a westerly direction towards the River Sence. This system splits into two with northly sections of the site draining into the River Sence at ONSGR: 465799 298609, and southerly sections draining into the culverted section of the unnamed ordinary watercourse mentioned above. This system has not yet been adopted by a statutory undertaker for public wastewater (STW) at time of publishing this report, and therefore remains the responsibility of the developer (Miller Homes Limited). It is noted that highway gullies from the new development outfall into the surface water system, these are also currently unadopted.

The foul drainage network of the Stretton Glen development site drains in a similar westerly manner however it is noted that this system meets Stretton Road at the entrance to the new development (ONSGR: 465861 298627) before running in a southerly direction down Stretton Road to a foul attenuation tank and then eventually a pumping station (ONSGR: 465828 298490).

4 FLOODING INCIDENT ON 23RD DECEMBER 2019

The majority of the information supporting the description of the flooding incident is based on first-hand accounts and flood report information provided by affected residents.

4.1 PRIOR TO THE EVENT

The flooding which occurred in December 2019 was reported to the Council in December 2020 by Miller Homes Ltd (the developer of the site).

Prior to this report, the Council had been made aware of a flood event which affected one property on Buckthorn Way. This flooding to one property (reported in 2017) occurred on 01/02/2016, 06/03/2016 and 09/03/2016 and surface water was described to have run over the public open space in front of the properties building up in the highway and private drive then eventually entering internally through front doors. There is no step into the property therefore thresholds are low. It is understood that the developer had been made aware of this flooding at the time by the housing association and affected residents. In an attempt to alleviate the flooding and intercept these surface water flows the developer installed a boundary ditch and filter drain in the public open space which connects to the unadopted highway drainage.

As the source of the flooding was known and alleviation measures installed, the Council did not conduct a formal investigation into the early 2016 flooding events and the enquiry was closed. Between 2017 and December 2020 no further reports of flooding were received by the Council.

It was believed that the land drainage works (which included a boundary ditch, filter drain and land drains) installed by the developer in the public open space following the early 2016 flood events had removed the risk of the flooding, therefore it is likely that the affected residents took limited additional action prior to the next flood event.

There have been eight subsequent flooding events between 2017-2020 in a very similar manner that have occurred whereby the Council was not aware and so the alleviation measures have not resolved the flooding. The Council understands, following the 2016 flooding events, that some additional drainage had been installed in two of the affected properties gardens by the developer and the Housing Association had been providing affected residents with sandbags when particularly wet weather was due.

The affected homes are owned by the Housing Authority and are tenanted therefore it is unknown if there had been a change of tenants during the various flood events. New tenants may not have been aware of previous flooding concerns and so would have been unlikely to take any action in the event of bad weather.

4.2 FLOOD EVENT

It was anecdotally reported that on 23rd December 2019, surface water flowed over the fields beyond the eastern boundary of the site towards a pond which sits on the eastern site boundary, this surface water ran through the public open space towards the impacted residential properties in a westerly direction. The water followed the Stretton Glen development sites topography and built up in the front driveways of the property before breaching the properties through the front doors. This surface water flow path is illustrated in Photos 1 and 2.



Photo 1: Surface water flow path from the development site easterly boundary towards homes on Buckthorn Way (uphill view)



Photo 2: Surface water flow path from the development site easterly boundary towards homes on Buckthorn Way (downhill view)

Residents reported and captured video evidence of downpours of rain on the 23rd December 2019. It was reported that the ground was already extremely wet after prolonged periods of wet weather through the Autumn of 2019.

4.3 POST FLOOD EVENT

The Council was not aware of the flooding in the initial aftermath of the event and so it is not known what immediately happened or what actions took place to aid the recovery of the affected residents.

The Council was made aware of the flooding in December 2019 in December 2020, a year later. The Council subsequently began an investigation involving engagement with the affected residents including distributing flood report forms. It then became apparent that the area had been previously impacted by flooding in 2016, 2018 and 2019 due to similar mechanisms, surface water running over the public open space towards houses on Buckthorn Way.

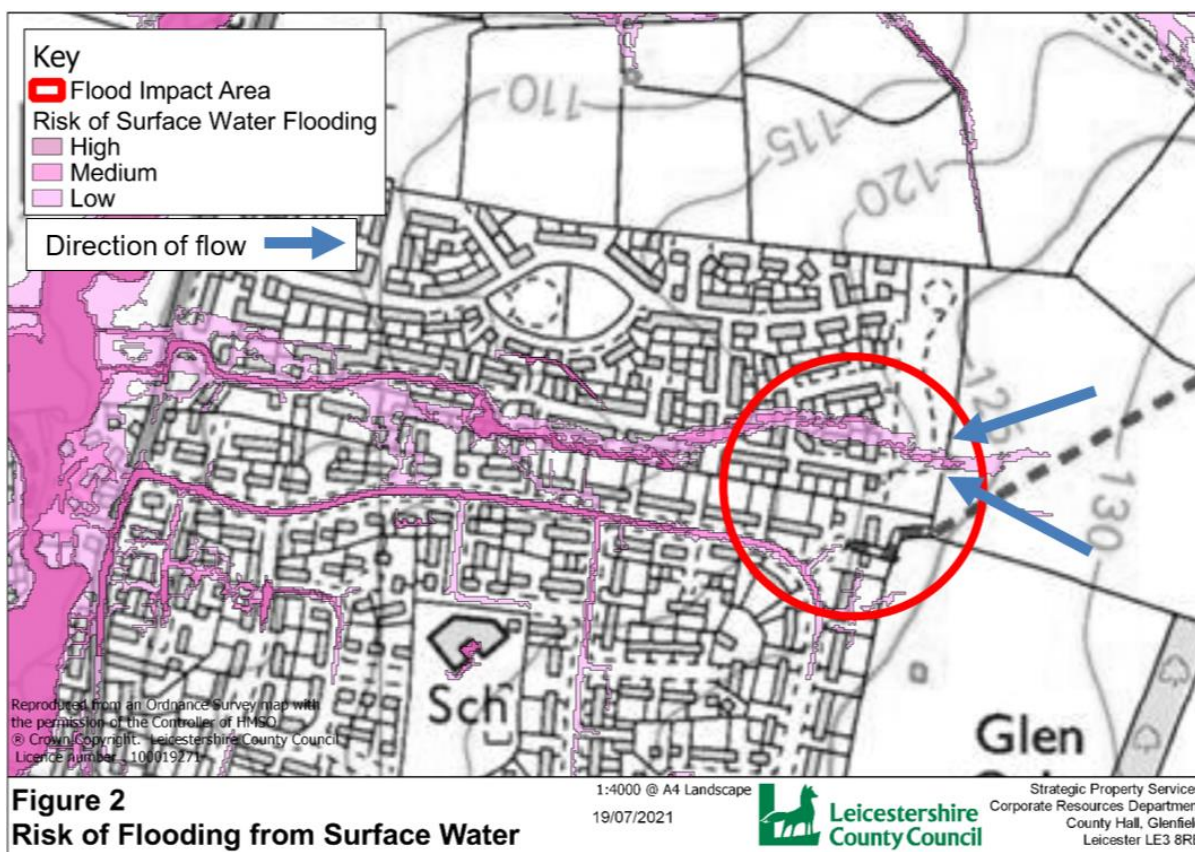
Through contact with the housing association (Platform Housing Group; the company who owns the affected properties) the Council was made aware that in total six properties had suffered internal flooding, four of which flooded on multiple occasions, and a further two properties had suffered from external property flooding since completion.

Affected property numbers and reported dates are listed below:

- February 2016 – 2 properties suffered internal flooding
- March 2016 – 1 property suffered internal flooding
- March 2018 – 1 property suffered internal flooding
- November 2019 – 1 property suffered internal flooding
- December 2019 (flood event reported) – 4 properties suffered internal flooding; 1 property suffered external flooding
- September 2020 – 1 property suffered internal flooding
- November 2020 – 1 property suffered internal flooding
- December 2020 – 1 property suffered internal flooding

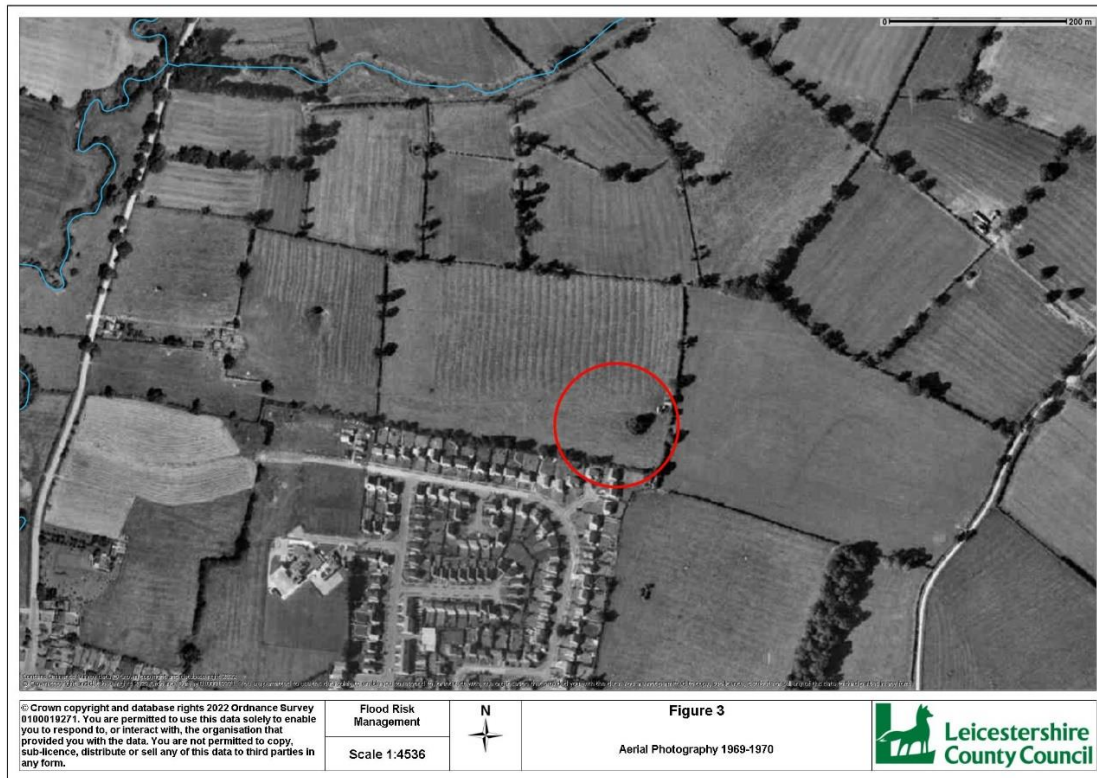
The housing association reported that they had provided affected properties sandbags on multiple occasions since 2016 however at least two homes were repeatedly being flooded to such an extent that tenants had to be moved elsewhere. It was also anecdotally reported that the developer had carried out works including installation additional ACO drainage in the gardens of two properties affected by flooding in 2016, one of these properties did not report further flooding however the other includes a property where the tenants had to vacate.

As part of the investigation, the Council has reviewed historic rainfall data available in close proximity to the Stretton Glen development site. The nearest gauge to the flood impact area is the Fleckney located approximately 4km south of Great Glen. A review of this historical rain data identified that a high rainfall event was recorded on 20/12/2019 and was then subsequently followed by minor rainfall events. This date shows that on the 20th December 2019 Fleckney rain gauge recorded its highest daily rainfall value in the days before the flooding of 17.2mm¹. The gauge shows it was followed by moderate rainfall which would have fallen onto an already saturated catchment. Residents and the housing association anecdotally report that the flooding occurred on the 23rd December 2019 despite rainfall at the Fleckney gauge showing only 0.2mm to fall on that day. Photos 1 and 2 were reportedly taken on the day of the flooding to support the residents' reports.



The Risk of Flooding from Surface Water Map (Figure 2) has been produced by the Environment Agency (EA) and is created using high level modelling which represents where water could flow and accumulate during certain rainfall events. This data available for the flood impact areas illustrates a low to medium risk of surface water flooding across the field adjacent to the affected properties, which supports the anecdotal reports of water flowing in this manner during the flood event. Land height data also indicates that the land adjacent to the flood impact area falls in a westerly direction, supporting that overland surface water would have followed this route.

¹ <https://www.gaugemap.co.uk/>



As part of this investigation the Council also reviewed aerial photography and historic maps to try to better understand the area. Aerial photography indicates a pond in the adjacent field to the flood impact area which has been infilled since the start of construction works on the Stretton Glen development. Aerial photography taken between 1968-1970 prior to the Stretton Glen development, Figure 3, shows areas in the field to the south-east of site where land is not cultivated. This un-cultivated band may suggest that land here is damp/boggy and therefore purposely not actively farmed.

Historical mapping (Figure 4) supports that there were several ponds on the adjacent field dating back over 50 years prior to the flood event. A review of British Geological Survey maps² illustrates that there are superficial deposits of colluvium (Clay, silt, sand & gravel) placed within the glacial deposits of Diamicton. The deposit of colluvium follows an almost identical path to the surface water flow path as seen in Figure 2 and in Photos 1 and 2. Colluvium is typically known as hillwash and refers to slope-foot deposits formed as the result of runoff and creep. These deposits may indicate an area of weakness and fissure which encourages subsurface flow. Therefore, groundwater may be able to rise more easily to the surface, exacerbating overland flow as the ground is already saturated. These deposits may also be linked to the occurrence of the ponds seen on historical mapping, as these were effectively springs during wetter periods which retain the water from overland flow until this can infiltrate when ground conditions begin to dry out.

² <https://mapapps.bgs.ac.uk/geologyofbritain/home.html>



Figure 4: Current aerial photography overlain with 1955 Ordnance Survey Map (Published in 1967) highlighting ponds recorded (circled in yellow)³

The ponds on the site (Figure 4) are also referenced in the Flood Risk Assessment (FRA) written in November 2008 submitted as part of the outline planning application in 2009 (09/00536/OUT). The FRA notes that the pond to the south-east was reported to be dry at the time of inspection.

It is likely that the surface water flow path shown in figure 2 was not identified prior to planning permission as it was never an issue when the area was agricultural fields. Surface water would have worked its way into ordinary watercourses, whereas since the site has been developed and watercourses have been altered this flow path now becomes trapped around the homes in the flood impact area.

The Council notes surrounding land and highway falls towards the affected properties on Buckthorn Way which further exacerbates their vulnerability to flooding from the surface water flow path.

In June 2021, the Council held a meeting with Harborough District Council regarding the original planning application for the site submitted in 2009 (09/00536/OUT). This application including later applications for discharge of conditions (10/01347/PCD in 2010) were made prior to the Council becoming statutory consultee on major planning applications for surface water matters. The statutory consultee for the application at the time was the Environment Agency who referenced the concern with lack of SuDS and water quality purposes however little reference was made towards flood risk. It is noted that this planning application was also submitted and granted permission prior to the completion of the surface water flooding data (shown in Figure 2, completed in December 2013) meaning that the flow path may not have been evident during the planning and construction of the development.

The developer has applied for retrospective planning permission for the land drain mentioned in section 4.1. The application (17/00460/FUL) submitted in March 2017 initially proposed connecting the land drain into private drainage which would drain to the STW surface water system. The Council commented on the planning application

³ <https://maps.nls.uk/geo/explore/#zoom=15&lat=52.75155&lon=-1.53048&layers=193&b=1>

recommending the developer to seek approval from the water company (STW) to gain permission for this connection. After no resolution or agreement was found the application was eventually withdrawn in November 2017 due to no suitable outfall. The developer agreed to backfill the ditch and reinstate the public open space as per the original planning permission. It was at this stage the developer highlighted the three flooding events to one property in 2016 to the Council, as mentioned in section 4.1. At the time of writing this report the land drain is connected to a proposed Council highway drain. The connection of this land drain to the unadopted highway drainage system has not been permitted and the Council, as the Highways Authority, is engaging with the developer to resolve this matter.

During the investigation it was brought to the Council's attention the belief that the pond on the eastern site boundary had connections to the unnamed ordinary watercourse to the south of the flood impact area. A site visit conducted on the 30th November 2021 was carried out to CCTV survey the culverted sections of this watercourse. And confirmed there is no evidence of any connectivity from the pond on the eastern boundary to this watercourse. Therefore, it is implicit that the culverted and infilled watercourse between Buckthorn Way and Coverside Road/Spinney View has no connection to the pond and surface water flow paths which resulted in the flooding seen in December 2019.

Although not hydraulically linked, during the site visit the Council also found the inlet of the section of culverted watercourse that enters the Stretton Glen development in the back garden of one of the properties on Coverside Road. It was identified that this inlet currently had no headwall (as shown in photo 3).



Photo 3: 300m culvert opening without a formal headwall which runs through the development site, as seen in purple on Figure 1

4.4 SUMMARY OF IMPACTS AND FINDINGS

The result of the combination of factors described below resulted in the ingress of storm flood water to seven residential properties on 23rd December 2019:

- Saturated and waterlogged ground from months of wet conditions prior to the event.
- An intense rainfall event occurred resulting in large volumes of water running over land.
- Excess flood water flowed overland from the pond over the public open space towards the flood impact area following the lie of the land. This water subsequently built up within the public highway and property frontages.
- Properties in the flood impact area are located at a low point compared to the surrounding land to the east and are directly susceptible to surface water flows paths.
- Property thresholds are low resulting in water ingress through the front doors of the properties once the water breached the highway kerbs.

Land drainage works carried out by the developer in the public open space may have slightly mitigated some of the impacts of flooding however this did not resolve the issue. This suggests the system is potentially undersized and there are further concerns regarding the silts that may be washed into the proposed highway system and unadopted surface water drainage.

It should be noted that there is no law that governs the management of surface water and landowners have no obligation to prevent surface water from running off their land and onto adjacent land.

5 RESPONSIBILITIES

5.1 LEAD LOCAL FLOOD AUTHORITY (LCC)

As the LLFA, the Council has the responsibility to co-ordinate the management of local flood risk and the interaction of RMAs across Leicestershire. For more information please refer to the Local Flood Risk Management Strategy.

5.2 BOROUGH/DISTRICT COUNCIL

Borough/District Councils have powers under Section 14 of the Land Drainage Act 1991 (LDA) to undertake flood risk management works on ordinary watercourses (excluding Main Rivers), where deemed necessary. Under Section 20 of the LDA, Borough/District Councils have the power (by agreement of any person and at their expense) to undertake drainage work which that person is entitled to carry out and maintain.

5.3 HIGHWAY AUTHORITY (LCC)

The Local Highway Authority has a duty to maintain the Highway under Section 41 of the Highways Act (1980). Section 100 states that the Council also has the responsibility and power to prevent water running onto the highway from adjoining land.

5.4 WATER COMPANY

Water and sewerage companies are responsible for managing flood risk related to surface water, foul water and combined sewer systems. Public sewers are designed to protect properties from flood risk in normal wet weather conditions. In extreme weather conditions however, there is a risk of these public sewers being overwhelmed resulting in sewer flooding.

5.5 RIPARIAN LANDOWNERS OF WATERCOURSES AND HOMEOWNERS

Riparian landowners have certain rights and responsibilities including:

- They must maintain the bed and banks of their watercourse, including the trees and shrubs growing on the banks.
- They must clear any debris, even if it did not originate from their land. This debris may be natural or man-made.
- They must keep any structures that they own clear of debris. These structures include (but are not limited to) culverts, trash screens, weirs and mill gates.

A full explanation of the rights and responsibilities of riparian ownership are given on the 'Owning a Watercourse' government webpage found at; <https://www.gov.uk/guidance/owning-a-watercourse>

Local residents and tenants who are aware that they are at risk of flooding should take action to ensure that they and their properties are protected.

Community resilience is important in providing information and support to each other if flooding is anticipated. Actions taken can include signing up to Flood Warning Direct (if available), nominating a community flood warden, producing a community flood plan, implementing property level protection and moving valuable items to higher ground. More permanent measures are also possible such as installing floodgates, raising electrical sockets, and fitting non-return valves on pipes.

6 RECOMMENDATIONS/ACTIONS

6.1 LEICESTERSHIRE COUNTY COUNCIL

The Council has agreed/completed the following actions:

| ACTION | TIMESCALE |
|--|-----------------------------------|
| Coordinate the flooding investigation and bring all agencies/ responsible bodies together to identify a way to help reduce the risk of flooding to the properties. | 12 months from report publication |

6.2 THE DEVELOPER (MILLER HOMES LIMITED)

The developer has completed/ agreed the following actions:

| ACTION | TIMESCALE |
|---|-----------------------------------|
| Installed land drain in public open space on Stretton Glen development in an attempt to prevent further flooding to properties. | Completed |
| To work with all agencies/ responsible bodies to identify a way to help reduce the risk of flooding to the properties | 12 months from report publication |
| To install a formal headwall on the entrance to the culverted system through the Stretton Glen development following obtaining permission from the homeowner on Coverside Road. | 6 months from report publication |

6.3 HARBOROUGH DISTRICT COUNCIL

| ACTION | TIMESCALE |
|---|-----------------------------------|
| To work with all agencies/responsible bodies to identify a way to help reduce the risk of flooding to the properties. | 12 months from report publication |

6.4 SEVERN TRENT WATER

| ACTION | TIMESCALE |
|---|---------------------------------------|
| To work with all agencies/responsible bodies to identify a way to help reduce the risk of flooding to the properties. | Completed prior to report publication |

STATUS OF REPORT AND DISCLAIMER

This report has been prepared as part of the Council'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 the Council when preparing this report, including, but not limited to those key assumptions noted in the report, including reliance on information provided by others.

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

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

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