

Derby City Council

Flood Investigation Report

Willowcroft Road, Spondon, 19th July 2014

Revision	Date	Details	Author	Checked and Approved By
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Executive Summary

This Flood Investigation Report has been produced by Derby City Council fulfilling duties under the Flood and Water Management Act (FWMA, 2010) as the Lead Local Flood Authority (LLFA) for the City of Derby.

Section 19 of the FWMA states that on becoming aware of a flood within their local area the LLFA should investigate the flooding event to an extent considered necessary or appropriate. The City Council has adopted a LLFA policy which stipulates locally agreed thresholds for undertaking a Section 19 flood investigation in Derby. Under these thresholds it has been deemed necessary to carry out a formal investigation into the flood incident which occurred on Willowcroft Road, Spondon on the afternoon of Saturday 19th July 2014.

Reports indicate that the flood event of 19th July 2014 resulted in internal flood damage of 7 properties as well as severe highway and external property flooding on Willowcroft Road, Spondon. The flooding was a resultant impact of an intense rainfall event onto area over a short period of time.

Whilst the City Council are aware that flooding, including internal property flooding occurred in other areas of Spondon, these appeared to represent more isolated cases of surface water flooding affecting a small number of properties within a nearby locality. This report focuses on Willowcroft Road as it has been identified that a cluster of properties were affected by the event within very close proximity. The causes of flooding identified in this report however can be applied to the majority of wider cases of surface water flooding in Spondon on the 19th July 2014.

The UK Flood Forecasting Centre (a working partnership between the Environment Agency and the Met Office) released a flood guidance statement indicating a yellow warning for surface water flooding at 10.30am on Wednesday 16th July 2014. This was upgraded to an amber warning at 10.30am on Friday 18th July 2014.

A rain gauge at Draycott (approximately 5km south east of Spondon) recorded 52.4mm of rainfall on the 19th July, equating to roughly the average monthly rainfall for July in a single day. More tellingly, the rain gauge recorded 17.2mm of rainfall in a period of 15 minutes from 3.30pm to 4.15pm.

There are a number of Risk Management Authorities (RMAs) that have relevant flood risk management responsibilities and functions in the affected area including:

- Derby City Council (a Land Drainage Authority under the Land Drainage Act (LDA) 1991 and the Highways Authority responsible for the associated highway drainage infrastructure in the area);
- Severn Trent Water (STW) (responsibility for maintaining public sewers and managing the risk of flooding from the public sewer network);
- Highways England (responsibility for managing flood risk and drainage on major trunk roads and motorways. However the Managing Agent Contactor for the A52 in the investigation area is A-one+);

The identified RMAs, and other groups, should continue to work together, sharing information and reports, with the aim of meeting the recommendations and actions contained in this report.

1. Introduction

1.1 Section 19 Investigations – Duty to Investigate

Section 19 of the FWMA states:

- (1) On becoming aware of a flood in its area, a LLFA must, to the extent that it considers it necessary or appropriate, investigate :
 - a. which 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:
 - a. publish the results of its investigation, and
 - b. notify any relevant RMAs.

1.2 Derby City's Locally Agreed Criteria for Formal Investigation

The City Council has identified local thresholds for formally investigating flood incidents within the city boundary within LLFA policy. Within this policy each characteristic of flooding has had a threshold pre-determined as to when a formal flood investigation will be triggered which are as follows:

- **Number of properties internally flooded** - An event where records or anecdotal evidence shows that five or more residential properties, or two or more non-residential properties (industrial/commercial) affecting employment, have been internally flooded within close proximity.
- **Critical infrastructure impacted by the flood** - An event which leads to a protracted impact on a key utility service (water, sewage treatment, electricity distribution, gas distribution, telecommunications, rail network, strategic road network) in excess of 12 hours before restoration of the service.

More information regarding the LLFA policy and local thresholds can be found by contacting the City Council Land Drainage and Flood Defence Team on flooddefence@derby.gov.uk.

A formal investigation into the flood incident at Willowcroft Road on 19th July 2014 has been undertaken because the event triggered one of the locally agreed flooding 'characteristics' as follows:

- A reported 7 residential properties were internally flooded on Willowcroft Road within close proximity of one another.

2. Local Information

2.1. Location

Spondon is situated on the outskirts of the city approximately 5km east of Derby (Figure 1) adjacent to the Derbyshire border. The village is bisected in an east/westerly direction by the A52 dual carriageway, a main trunk road connecting Derby with Nottingham. Aside from this, the main road and main access/egress routes of Spondon more locally are the A6096 (Dale Road) travelling north towards Ilkeston and Nottingham Road to the south which connects Spondon with neighbouring Borrowwash and Chaddesden. Spondon is primarily residential with the majority of surrounding land occupied by agricultural fields. However, isolated areas of commercial and industrial property are located in the centre of Spondon and to the south of Nottingham Road abutting the River Derwent and the railway line.

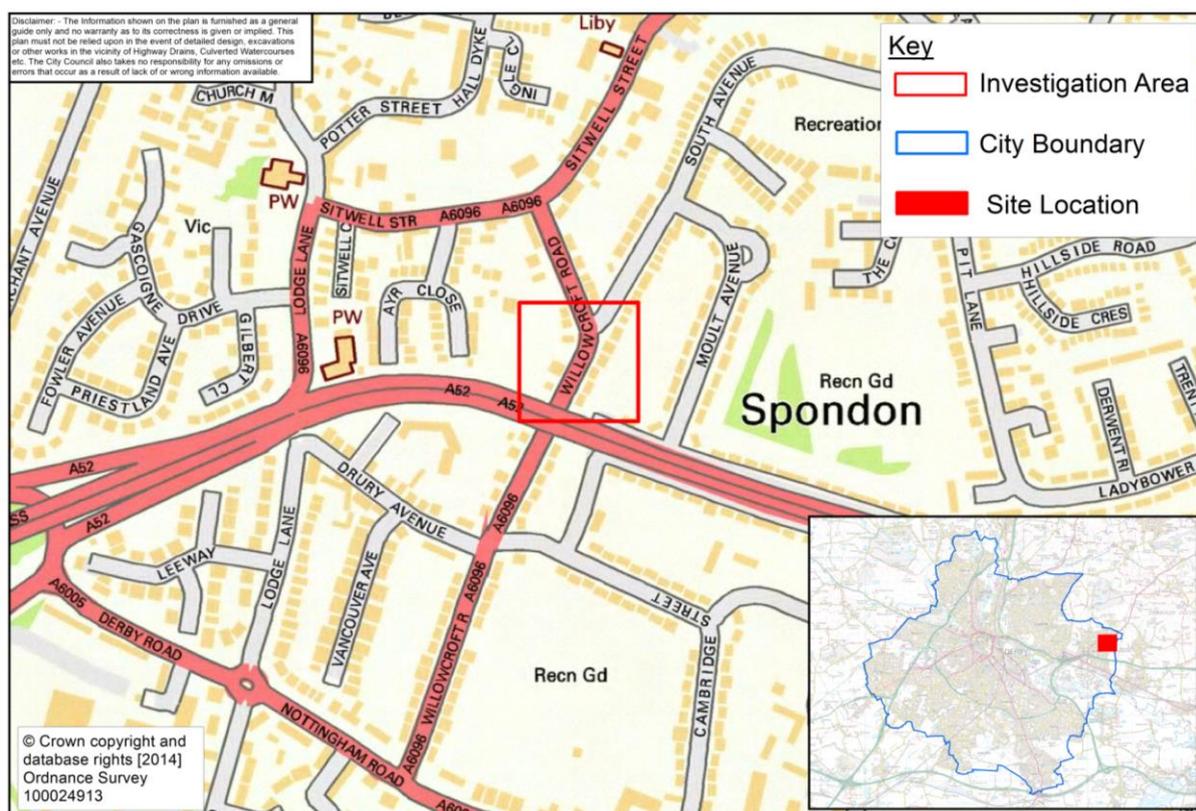


Figure 1: Location Plan for Spondon

Although many areas of Spondon were affected to some degree by the flooding event on 19th July 2014, including a number of internal properties flooding, the City Council has identified a significant cluster of reported internal property flooding incidents on Willowcroft Road which, as described above, trigger the thresholds for this official flooding investigation.

2.2. Local Drainage System

The area in question is characterised by residential urban development with a high proportion of impermeable paved surfaces. It is noted that a relatively high number of

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properties in the area have fully paved gardens and driveways. The highways adopted highways by Derby City Council as the Highways Authority are drained by traditional highway gullies.

The gullies as well as the roofs, driveways and other paved surfaces drain to public surface water sewers which are adopted by Severn Trent Water (STW). The area is served by a separate surface water system which is intended to keep foul water separate from surface water to avoid foul water flooding during intense rainfall events such as that of the 19th July 2014.

It has been identified upon inspection of Severn Trent Water sewer records that the separate surface water sewer system in the area conveys collected surface water from Willowcroft Road, down Willowcroft Road towards Nottingham Road in the south. From here, surface water enters the public surface water sewer network serving Nottingham Road and eventually discharges to the River Derwent approximately 1km to the south east of the investigation site.

The drainage system serving Willowcroft Road, including the investigation area, drains a large urban catchment to the north, accepting runoff from a large area of Spondon. This urban catchment includes large areas of Moor Street (A6096) and many other adjoining streets, stretching up to Dale Road in the far north east of the

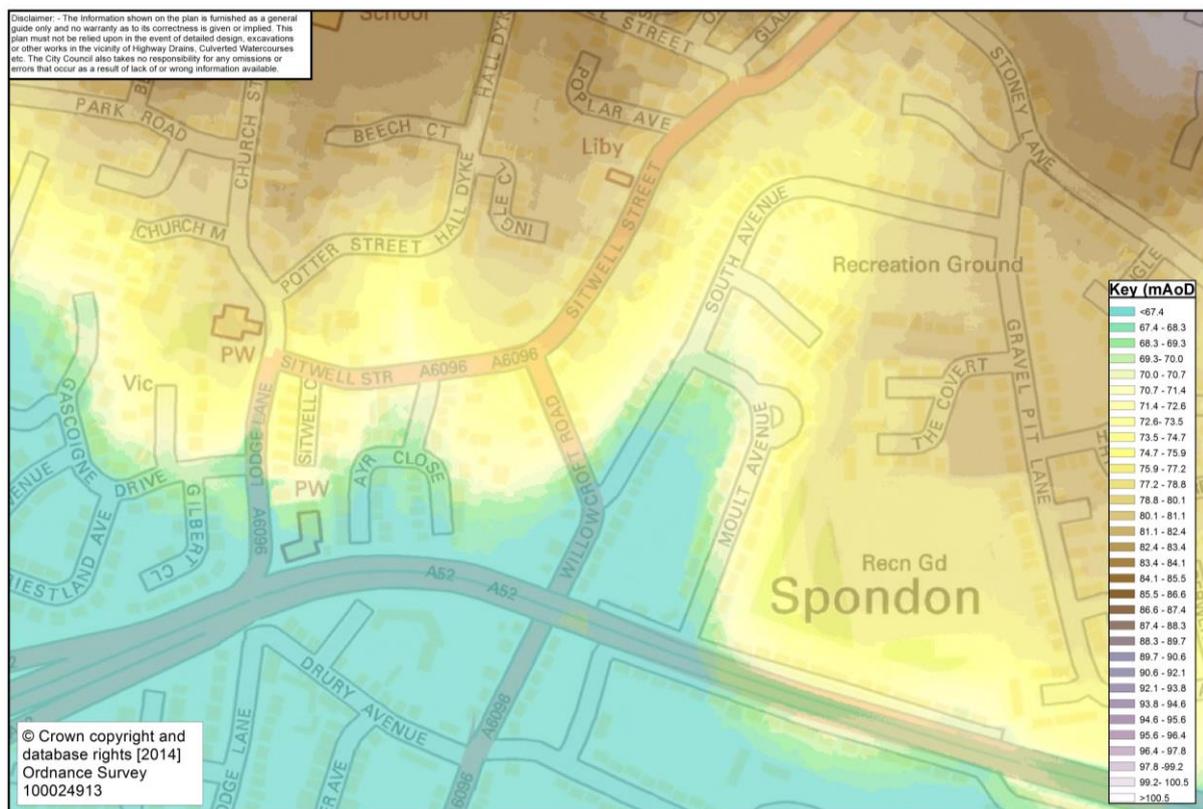


Figure 2: Local Topography of the Investigation Site

village of Spondon. This catchment equates to an unknown surface area of paved and impermeable surfaces that concentrate towards the study area and beyond to the south.

The direction of flow and the urban catchment contributing to this surface water system is largely defined by topography, which is illustrated locally in Figure 2. Figure 2 illustrates that topography generally falls from north to south, however more locally topography falls sharply down Willowcroft Road from the surrounding area, as identified by the sharp change in colour from orange (higher ground) to blue (lower ground) on Figure 2. As a result, the site can be viewed as being located on a natural flow path from the urbanised catchment above. As noted above, a large catchment of urban drainage drains by gravity towards Willowcroft Road and onwards to the south following this natural topography.

2.3. Historical Flood Information

Derby City Council hold a record of data relating to flooding in the city from all sources obtained from various sources. Prior to the events of the 19th July 2014, DCC held on record historical flood information for a number of locations in Spondon, however none of these were in the immediate vicinity of the area of this study. Recorded events were as follows:

- Two properties, one on Arnhem Terrace and one of Borrowfield Road, experienced garden flooding that was reported to originate from surface water from the carriageway in October 2013.
- Two properties were flooded internally from surface water flooding on Dale Road and a further property on Derby Road on 6th July 2012. Surface water flooding was widespread across all areas of Derby during this event, and there are further reported incidences of highway and garden flooding on Leeway, Moor End, Nottingham Road, Derby Road, Gravel Pit Lane and Sitwell Street in the Spondon area.
- Foul and surface water flooding was reported in July 2007 affecting a single garden on Locko Road, however Severn Trent Water are likely to have more complete records of foul water flooding across the area.
- A single property was affected by internal surface water flooding from the carriageway in July 2002, however it is understood this was an isolated event in the area.
- External property (garden) flooding was experienced by a small number of properties in Spondon, namely on Arnhem Terrace and Kirkleys Avenue, in May 1997 as a result of surface water/foul flooding.

Although no historical information was available prior to the event indicating that the investigation area had experienced flooding previously, following the event a number of longstanding residents recalled that there had been flooding to some properties in the area previously. It was cited that surface water flooding may have affected some properties in the investigation area in 1981 and 1986.

The records above were gathered from customer enquiries and reporting following each given event and do not necessarily represent an exhaustive list of past historical flooding in Spondon.

3. Flooding on the 19th July 2014

The majority of the information supporting the description of the flooding event is based on the reports and accounts from residents following the event. The information represents the best endeavours of the City Council to accurately attribute the sources, mechanisms and impacts of the flooding.

3.1 Information Prior to the Event

A Heavy Rainfall Alert from the Flood Forecasting Centre was issued on Friday 18th July 2014 at 6.54pm which warned that “a complex spell of thundery weather” could be expected over the weekend of 19th July 2014 “as very warm, humid air spreads north across much of England and Wales” from the near continent. It also warned that it was “expected that temperatures will increase sufficiently on Saturday afternoon (19th July) to generate ‘home grown’ severe thunderstorms across parts of the Midlands (i.e. thunderstorms that develop over the UK rather than are imported from France)”.

The conclusion of the Heavy Rainfall Alert was that the Midlands could see thunderstorms with rainfall accumulations of 30-40mm in 1 to 2 hours with a reasonable worst case of 60 to 80mm in 3 to 6 hours.

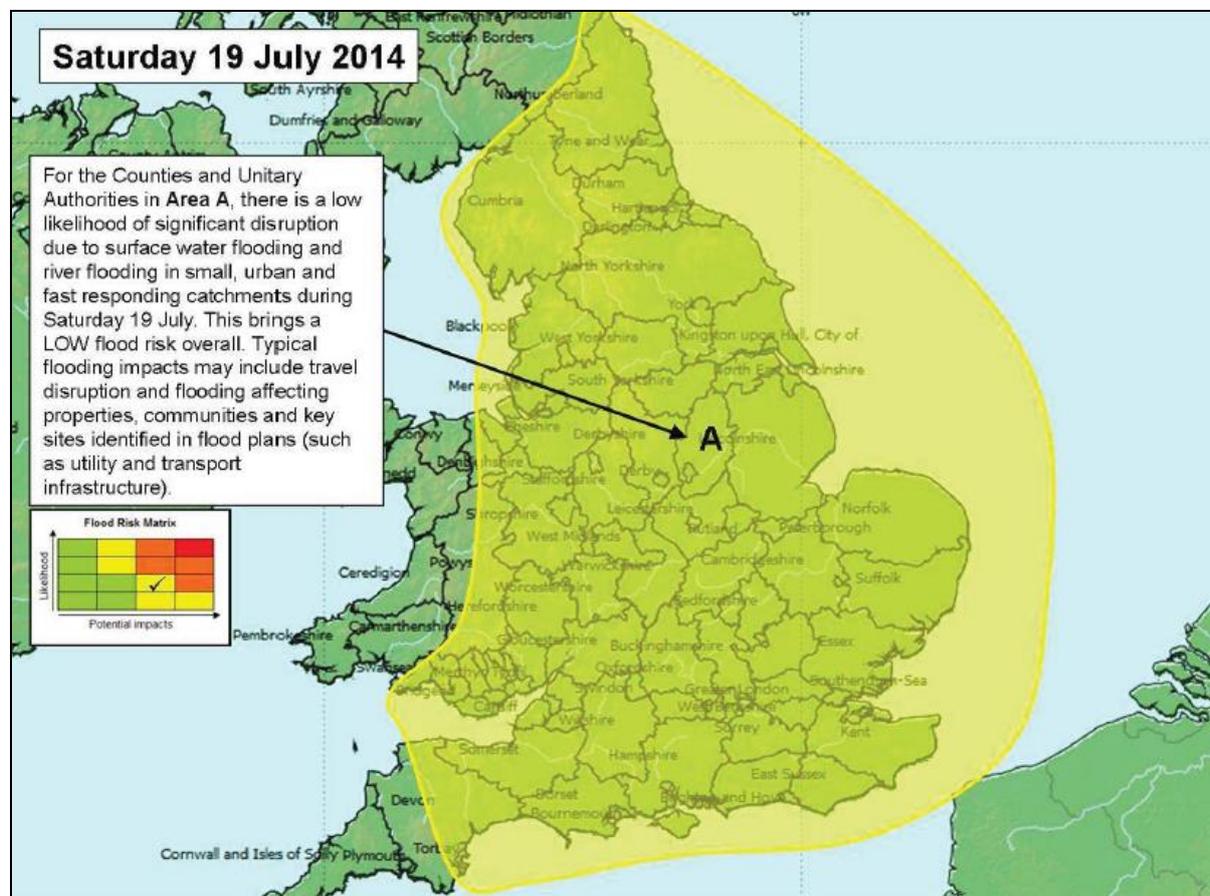


Figure 3: Extracted Figure from the Flood Forecasting Centre Flood Guidance Statement at 10.30am on Wednesday 16th July 2014

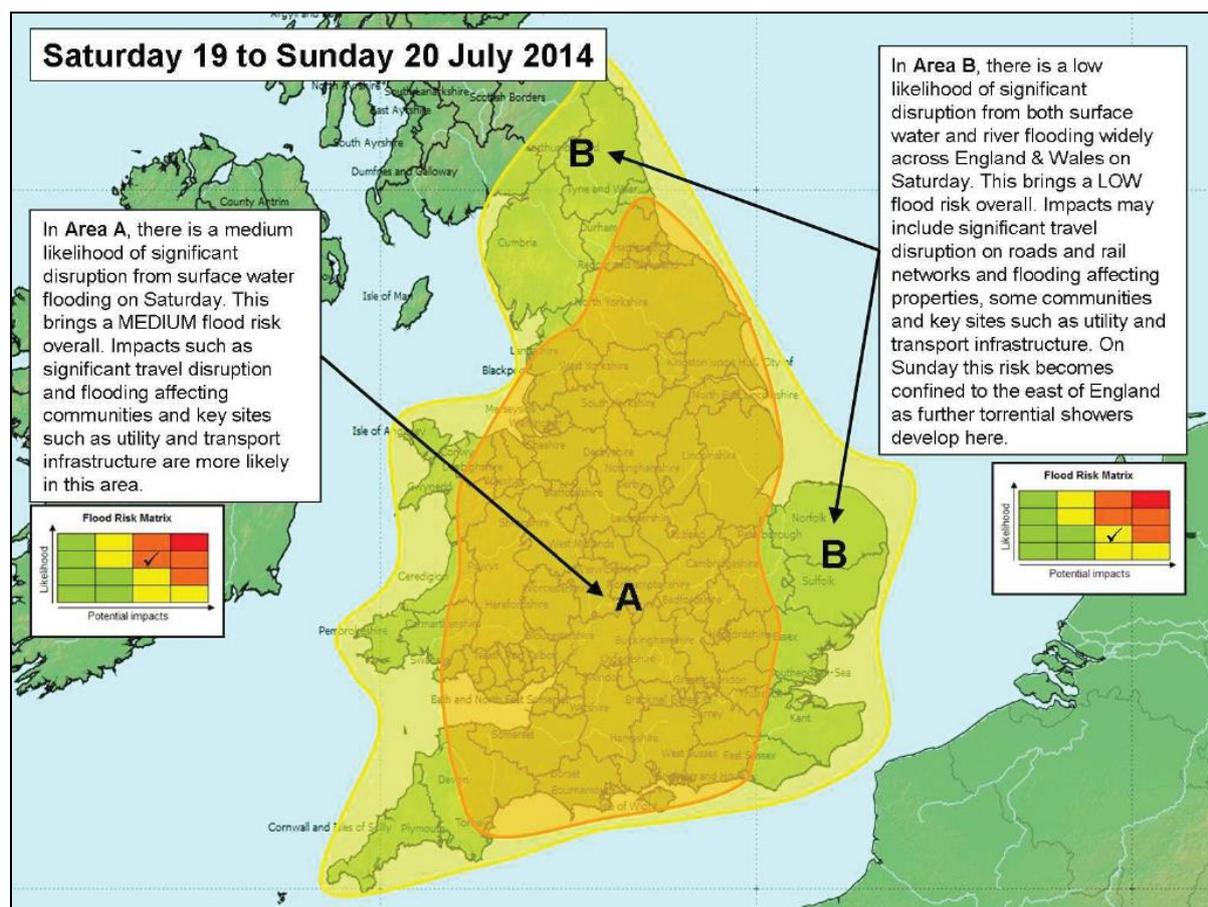


Figure 4: Extracted Figure from the Flood Forecasting Centre Flood Guidance Statement at 7.00am on Saturday 19th July 2014

Prior to the Heavy Rainfall Alert, the Flood Forecasting Centre issued a series of Flood Guidance Statements, the first of which was issued on Wednesday 16th July 2014 at 10.30am. This early flood guidance statement indicated that the majority of the country was under a “Yellow Warning” for rainfall for Saturday 19th July 2014 (See Figure 3 below) and advised that heavy, perhaps torrential, thunderstorms were expected. This Yellow Warning was reissued at 10.30am and 7.30pm on Thursday 17th July.

On Friday 18th July at 10.30am, the Flood Forecasting Centre issued an “Amber Warning” for the majority of England and Wales for Saturday 19th July 2014. The Amber Warning indicated that there was a medium likelihood of localised significant surface water flooding impacts for the day of the event. This Flood Guidance Statement warned of possible “surface water flooding to properties and parts of communities, particularly in urban areas”. Amber Warnings were reissued at 3.00pm on Friday 18th July and at 7.00am and 3.00pm on Saturday 19th July 2014.

In all cases, flood warnings covered the vast majority of England and Wales, indicating the uncertainty of the location of the worst impacts of the very isolated heavy storms predicted.

3.2 Description of the Event

The main impacts of the storm event took place in the late afternoon of the 19th July 2014. The peak impacts of the flooding occurred at around 3.30pm, where around 7 homes along Willowcroft Road north of the A52 experienced some depth of flood water in ground floor living areas of the properties. An undetermined number of properties in these areas also suffered severe external property flooding which in some cases may have been close to entering ground floor living areas.

Weather information in the weeks and months prior to the event indicates that temperatures were generally above average for June and July, with a series of localised, short and thundery downpours. Therefore watercourse levels at drainage outfalls were not expected to be especially high and are not considered a major contributor to this event.

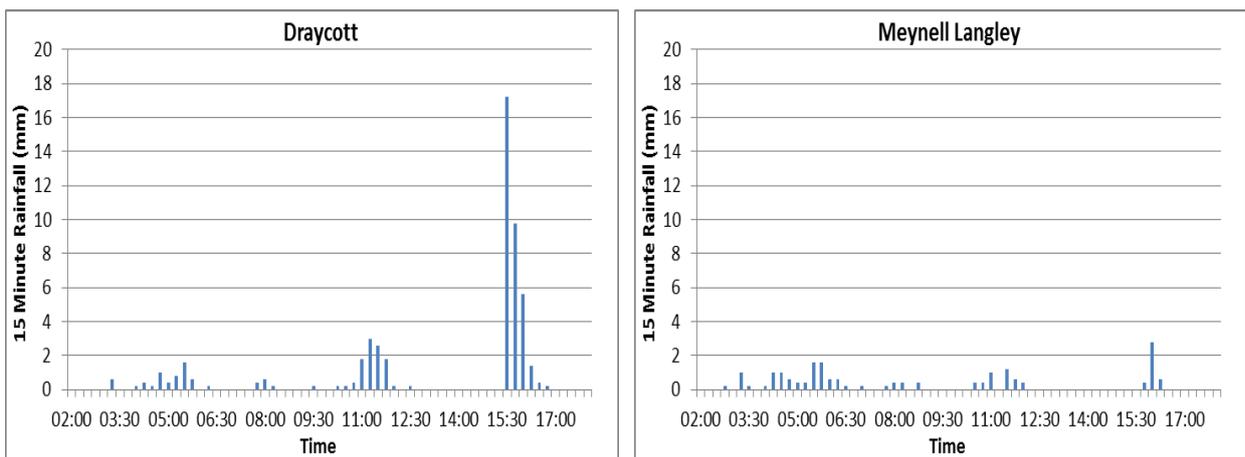


Figure 5: Comparison of 15 minute rainfall intervals on 19th July 2014 recorded at rain gauges at Draycott (4.5km south east of Spondon) and Meynell Langley (12km west of Spondon) (Data Source: Environment Agency)

Figure 5 illustrates the rainfall recorded on 19th July 2014 at two rain gauges located near to the investigation site; Draycott approximately 4.5km south east of Spondon and Meynell Langley approximately 12km west of Spondon. Data was supplied by the Environment Agency shortly following the event. In the absence of a known rain gauge in Spondon, the Draycott rain gauge is the closest source of rainfall data available for this

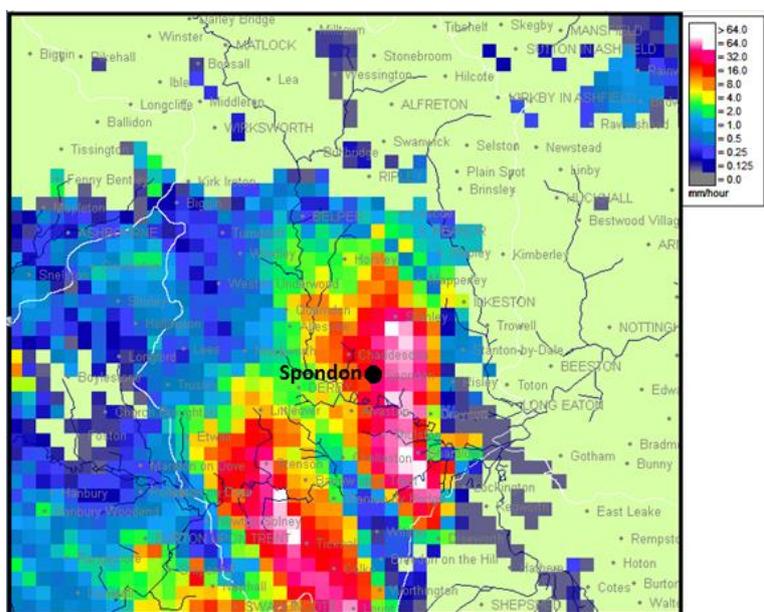


Figure 6: Observed rainfall at 15.30 on Saturday July 19th 2014 (Source: Environment Agency)

investigation.

Figures 5 and 6 demonstrate that, as predicted prior to the event in the Flood Forecasting Centre Flood Guidance Statements, the storm event that affected Spondon was extremely isolated. This had been expected resulting in the highly non-specific nature of the flood warnings that were in place. Draycott rain gauge to the east of Derby recorded 17.2mm of rainfall in 15 minutes (68.8mm/hr) at 15.30, whereas peak rainfall intensity at Meynell Langley to the west of Derby was 2.8mm of rainfall in 15 minutes (11.2mm/hr) at 16.00. From observations and recorded flooding it is expected that rainfall in Spondon, as well as much of the east of Derby, was very much more akin to the rainfall recorded in Draycott.

Analysis of the rainfall data at Draycott has indicated that the 15 minute rainfall event where 17.2mm of rain fell is estimated to be up to a **1 in 50 year return period (1.67% annual probability)** event for this duration. The storm resulted in a significant volume of surface water generated from paved areas rapidly entering the local drainage system.

Figure 2 shows that the affected site is situated on a significant slope from the north of the investigation site towards the south, and eventually towards the River Derwent. Analysis of sewer records has revealed that the drainage system serving the investigation site also serves a large number of roads and properties to the north and north east, as described in Section 2.1.

Owing to the extreme intensity of the rainfall event onto a largely impermeable paved surface, it is expected that this large urban drainage network, including road gullies and the public surface water sewer was inundated with runoff to an extent whereby the capacity of the system was exceeded. This resulted in significant surface water flooding flowing rapidly down slope along localised flow routes towards the affected area.

It is through this mechanism by which properties were flooded internally leading to significant damage to the ground floor living areas of 7 properties.

The local highway drainage and sewer systems, including the gullies and public surface water sewers helped to manage the accumulation and rapid runoff downslope of surface water from paved surfaces. Modern specifications exist that aim to ensure that drainage for new development is designed to accommodate surface water runoff for all but the most extreme storm events. The properties flooded on Willowcroft Road were constructed long before modern drainage specifications and as such it is unknown to what return period, if any was specified, the drainage provision for these developed areas was designed to accommodate.

Therefore due to the intensity of the rainfall event on the 19th July 2014, the capacity of the local surface water system was exceeded, leading to the flooding that was experienced and described above. The flooded areas were defined by local topography which directed excess surface water runoff which could not be managed by the drainage systems towards lower elevation areas.

The City Council received no reports from residents or from Severn Trent Water of foul water flooding in the area during this event. However, if there were any foul flooding incidents Severn Trent Water, as the local water and sewerage company (WaSC), may hold records of these.

4. Summary of Findings

The flooding that occurred on 19th July 2014 was a result of an intense localised summer storm event. Prior to the event, weather warnings were given by the Flood Forecasting Centre warning of the potential for severe thunderstorms. Yellow and then Amber Warnings for severe weather were given, but the specific locations of the worst storms were unclear.

A local rain gauge at Draycott indicated that approximately 52mm of rain fell in the area on the 19th July 2014, including 17.2mm in the 15 minutes following 3.30pm, estimated to be up to a 1 in 50 year return period (1.67% annual probability) event for this duration. The intense rainfall overwhelmed the local drainage networks serving a large urban catchment to the north and north east of Willowcroft Road. This prompted rapid runoff from paved surfaces (highways, roofs and driveways) and as such surface water travelled rapidly down the steep topography in the area, affecting properties on Willowcroft Road before continuing downslope to the south.

Surface water flooding was experienced in large areas of the east of Derby during this event, and in particular Spondon. However, this report focused on a cluster of 7 properties that were internally flooded during the event thus triggering a formal investigation under Section 19 of the Flood and Water Management Act 2010. The locations of the flooding were driven by local topography, and as such properties on natural flow paths created by local topography were worst hit by the storm.

There were no reports of foul water flooding affecting internal property areas during the event.

5. Responsibilities and Future Actions

5.1 Derby City Council as the Lead Local Flood Authority for Derby

As a LLFA, the City Council has the responsibility to coordinate the management of flood risk and the interaction of RMAs across Derby.

As stated within the Introduction section, the LLFA has a duty to investigate flood incidents under Section 19 of the Flood and Water Management Act 2010. Publication of this report is the conclusion of that process.

5.2 Derby City Council as the Highways Authority for Derby

The City Council, as the local Highways Authority, is the relevant RMA with responsibility for the management of surface water falling within the curtilage of the adopted highway and maintaining the drainage infrastructure to an appropriate design standard to drain surface water from the highway. In this instance, the capacity of the highway drainage was exceeded which resulted in surface water flooding in many areas. However, in general it is not considered likely that the maintenance condition of the highway surface water drainage systems had a significant impact on the flooding experienced.

5.3 Severn Trent Water as the relevant Water and Sewerage Undertaker for Derby

Severn Trent Water is the Water and Sewerage Undertaker for the city and hence the relevant RMA with responsibility for the management of flood risk from public sewers and the maintenance of the public sewer network. This includes the surface water sewer network that carries surface water from public and private paved surfaces in the affected areas towards local watercourses. During this event, it is considered likely that the design capacity of the local surface water sewer network was exceeded by the intensity of the rainfall event.

5.4 Property and Land Owners/Tenants

Intense rainfall events are a natural phenomenon and therefore surface water flooding is difficult and costly to predict and control. Intense thunderstorms such as the one that hit Spondon on the afternoon of 19th July 2014 can occur at any time and in any place and therefore it is important for home owners and tenants to ensure that they are as self-resilient as possible. This is advisable not only for those affected by this event, but those on the periphery who may be affected by more severe storms in the future.

Members of the public can check national datasets maintained by the Environment Agency to identify their level of risk from surface water in the future¹. This can help to identify whether any personal resilience measures are necessary.

Advice on self-resilience, including products and services that are commercially available to make home and property less vulnerable to flood waters, can be found by contacting the National Flood Forum. In particular, the National Flood Forum maintains the “Blue Pages” directory of such products and services.

5.5 Actions

Derby City Council:

¹ Environment Agency maps illustrating surface water flood risk, as well as risk of flooding from other sources can be viewed at: maps.environment-agency.gov.uk/

The City Council are currently undertaking feasibility studies with the intention of ascertaining whether there are any highway drainage improvements that could be made to reduce the likelihood of further surface water flooding in the future. It should be noted that prior to the event on 19th July 2014, the area of this investigation had not been recently affected by surface water flooding. The intensity of the storm in question was extraordinary in its intensity and isolated nature. As such, the City Council will prioritise available funding against other feasible flood risk management schemes based on a probabilistic assessment of likelihood of a future event and its impacts.

Severn Trent Water:

No action by the Severn Trent Water is considered likely to be required in follow up to this event.

Local Residents are advised to take the following action:

Residents are advised to review their personal flood resilience to ensure that they are as prepared as possible for any future repeat of the storm on 19th July 2014. It is recommended that residents follow the advice given in Section 5.4 to achieve this.

6. Sources of Information

The following documents, reports, records or sources of information have contributed to this report and are available on request:

- Reports of flooding from residents of Willowcroft Road to Derby City Council.
- Flood Forecasting Centre and Met Office statements and warnings.
- Rain gauge data for Draycott supplied by the Environment Agency.
- STW sewer records.

7. Status of Report and Disclaimer Information

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

The City 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.

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The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the time of preparation and the City 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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