

Derby City Council

Flood Investigation Report

Sandringham Drive, Spondon 19th July 2014

Revision	Date	Details	Author	Checked and Approved By
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Contents

Executive Summary	1
1. Introduction	2
1.1 Section 19 Investigations – Duty to Investigate	2
1.2 Derby City’s Locally Agreed Criteria for Formal Investigation	2
2. Local Information	3
2.1. Location	3
2.1 Local Drainage System	4
2.2 Historical Flood Information	6
3. Flooding on the 19th July 2014	6
3.1 Information Prior to the Event	6
3.2 Description of the Event	8
4. Summary of Findings	11
5. Responsibilities and Future Actions	12
5.1 Derby City Council as the Lead Local Flood Authority for Derby	12
5.2 Derby City Council as the Highways Authority for Derby	12
5.3 Severn Trent Water as the relevant Water and Sewerage Undertaker for Derby ..	13
5.4 Property and Land Owners/Tenants	13
5.5 Actions	13
6. Sources of Information	14
7. Status of Report and Disclaimer Information	14



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 in the Sandringham Drive area of Spondon on 19th July 2014.

The flood events of 19th July 2014 resulted in internal flood damage of up to 18 properties as well as severe highway and external property flooding on Sandringham Drive, Caernarvon Close, Holyrood Close and Harlech Close, 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 the Sandringham Drive area as it has been identified that a large 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);

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 Spondon on 19th July 2014 has been undertaken because the event triggered one of the locally agreed flooding 'characteristics' as follows:

- Up to 17 residential properties were internally flooded within the areas of Sandringham Drive, Caernarvon Close, Holyrood Close and Harlech Close.

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 Borrowash 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.

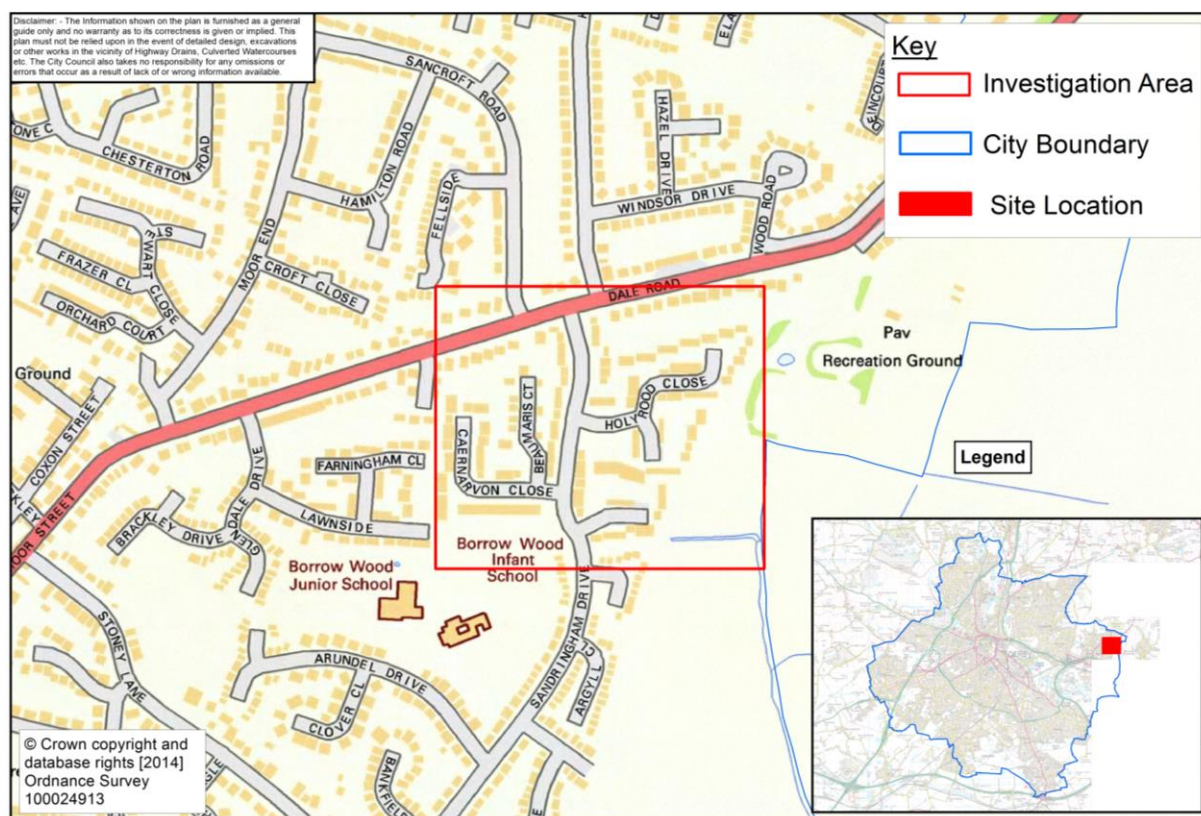


Figure 1: Location Plan for Spondon

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 and external property and highway flooding incidents on Sandringham Drive, Caernarvon Close, Holyrood Close and Harlech Close.

2.1 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 properties in the area have fully paved gardens and driveways. The highways adopted 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 the one on 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 discharges collected surface water to local watercourses/ditches to the east of the study area (Figure 2). Firstly, Wood Road, Deincourt Close, Lancaster Walk and Pheasant Field Drive, all to the north east of Sandringham Drive, drain to a highway drain in Dale Road before discharging to an outfall to the east of Holyrood Road. The system outfalls to a ditch course which directs flow to the south towards a more established ordinary watercourse, an unnamed tributary of the River Derwent.

Secondly, a large area of highway and private surface water drains to a public surface water sewer system which also outfalls to the unnamed tributary of the River Derwent to the east of Hampton Close. This surface water sewer accepts runoff from

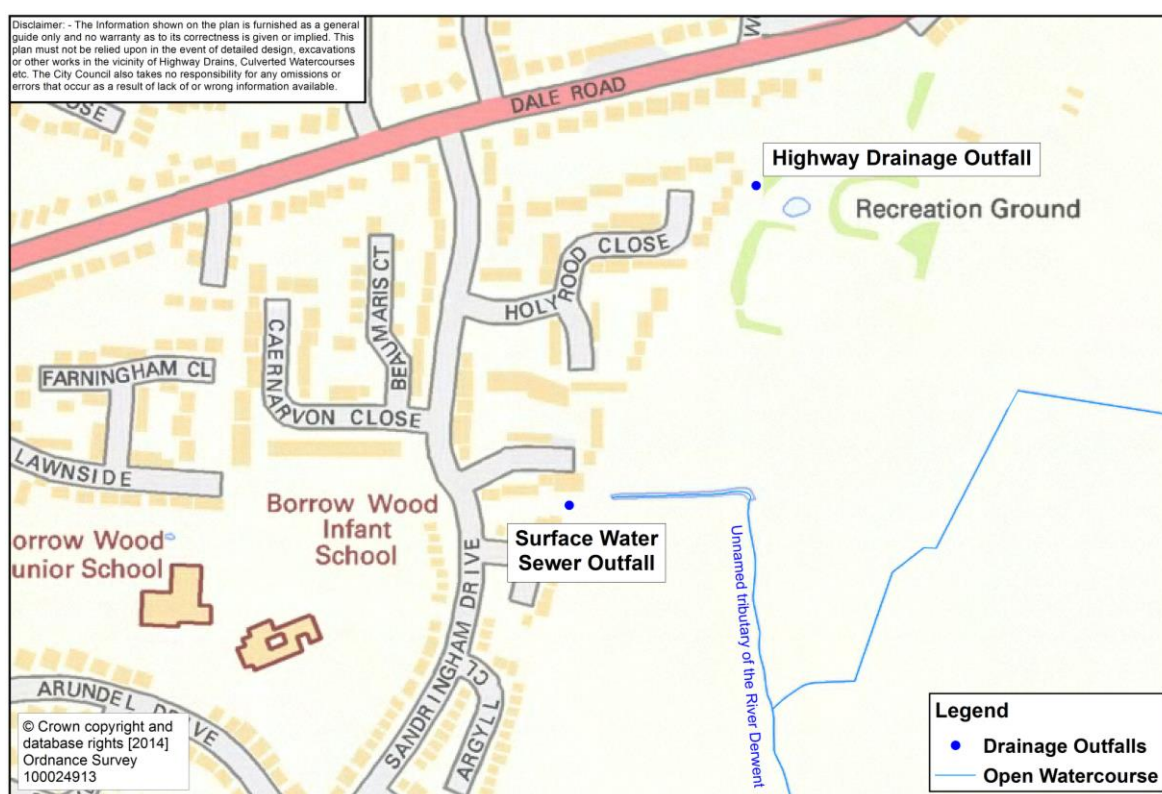


Figure 2: Primary Local Drainage in Report Area

FLOOD INVESTIGATION REPORT – AUGUST 2015

the northernmost 250m section of Sandringham Drive as well as Caernarvon Close, Hampton Close, Holyrood Close, Harlech Close, Beaumaris Court and a section of Dale Road. Some roads to the north of Dale Road, namely Sandcroft Road, Fellside, Hamilton Road, Huntley Avenue and Windsor Drive also drain to the same system. Consequently, a large amount of impermeable surface area relies on the surface water sewer and the outfall of the system to the unnamed tributary of the River Derwent.

The assumed ditch and unnamed tributary of the River Derwent, as illustrated in Figure 2, are designated as 'ordinary watercourses'. The responsibility to coordinate the management of ordinary watercourses, as stipulated by the Flood and Water Management Act 2010, rests with the LLFA for a given area. However, in this instance it appears that the unnamed tributary may form the boundary between Derby City and Derbyshire County Council administrative areas, and hence there is likely to be a joint LLFA responsibility between both authorities in respect of this section of watercourse. Regardless, the responsibility of maintaining ordinary watercourses rests with the adjacent landowners, who are legally termed riparian landowners.

Figure 3 illustrates the local topography of the investigation site. The map illustrates that the roads affected by the flooding event focused on in this report are constructed on a slope running down in a north to south direction. Land to the north is at a higher elevation and land to the south is of a lower elevation. 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 portion of urban drainage drains by gravity towards the

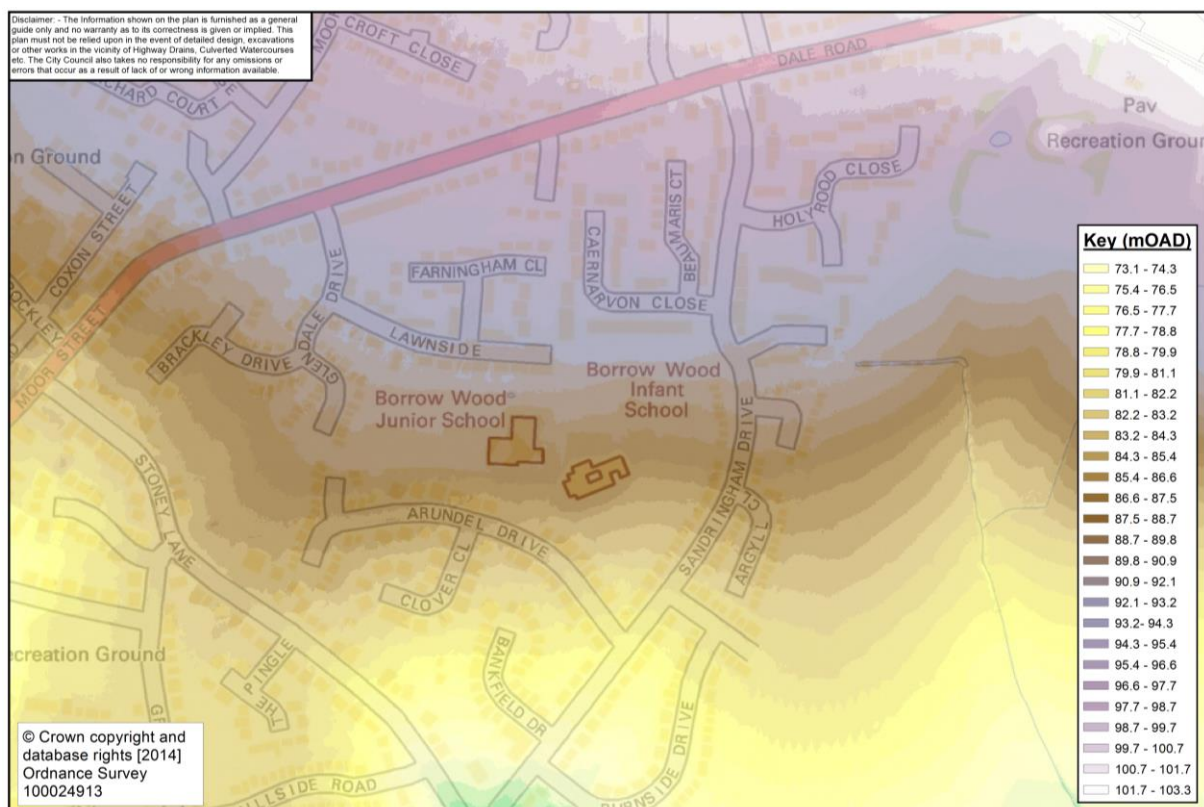


Figure 3: Local Topography of the Investigation Site

Sandringham Drive area.

Furthermore, as described above, urban drainage in the form of the Severn Trent surface water sewer and the highway drain discharge towards the unnamed tributary of the River Derwent to the east. The topographical information in Figure 3 indicates that the area affected is naturally within the catchment of this watercourse.

2.2 Historical Flood Information

Derby City Council hold a suite 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.

The records above were gathered from customer enquiries and reporting following the 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 responses from residents to flood incident questionnaires sent out shortly after the event as well as information gathered by City Council officers during site visits following the event. The information represents the best endeavours 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

FLOOD INVESTIGATION REPORT – AUGUST 2015

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.

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 4 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.

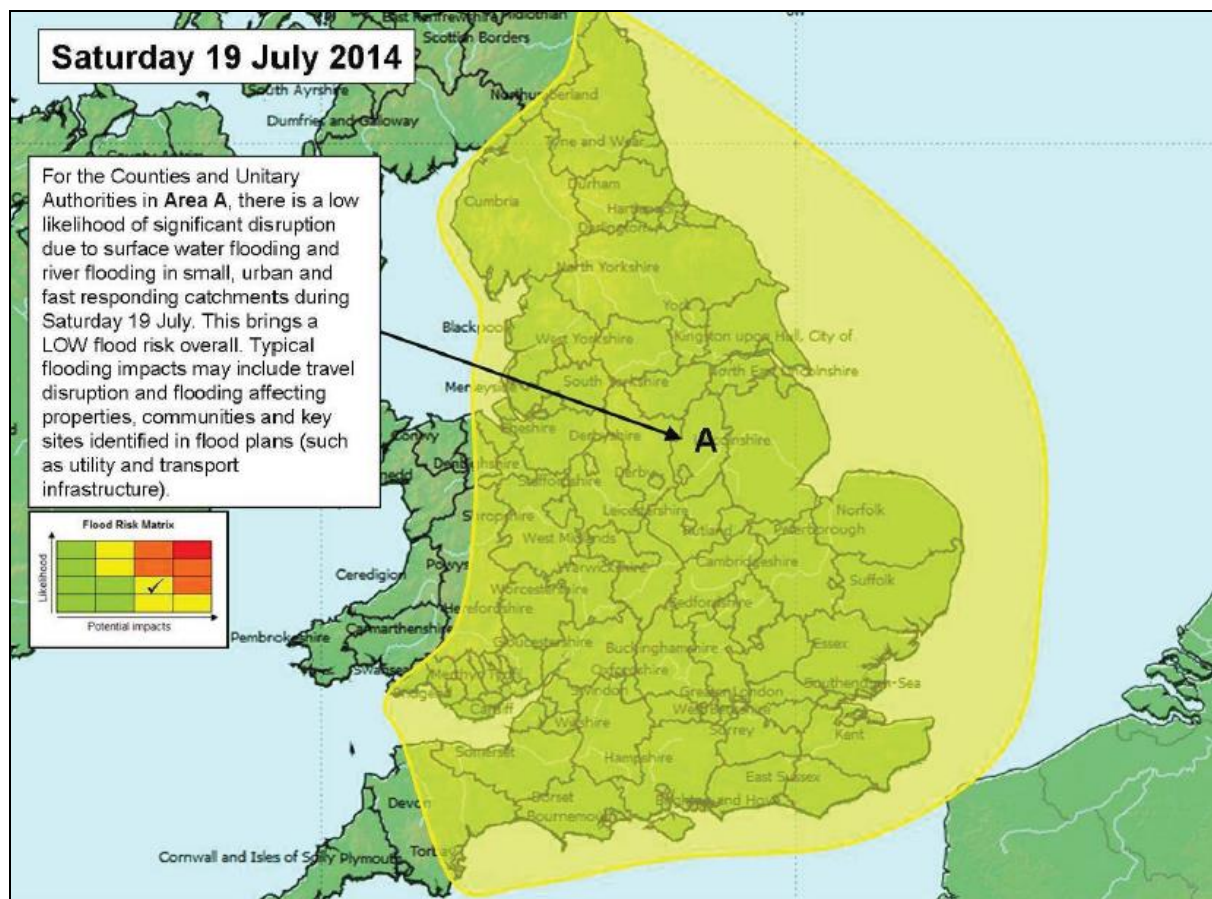


Figure 4: Extracted Figure from the Flood Forecasting Centre Flood Guidance Statement at 10.30am on Wednesday 16th July 2014

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.

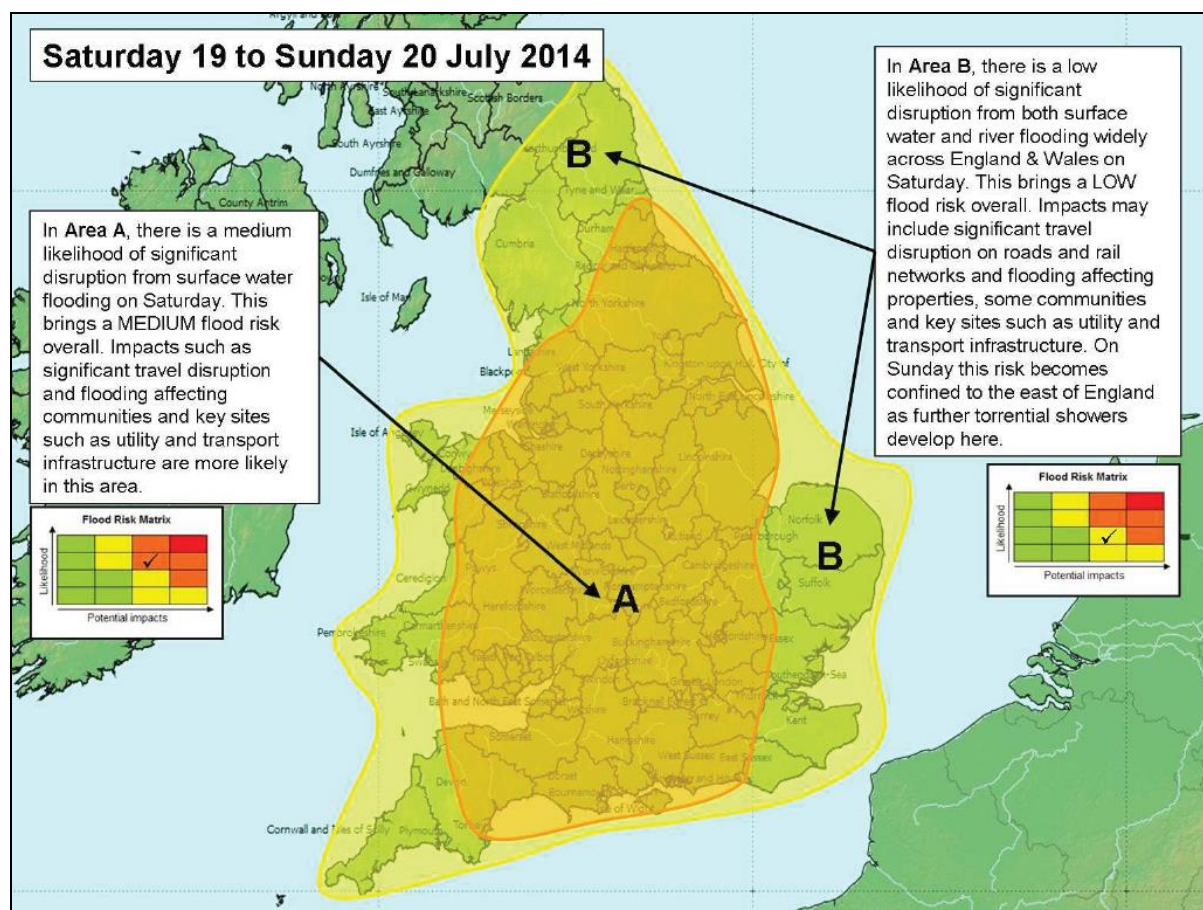


Figure 5: Extracted Figure from the Flood Forecasting Centre Flood Guidance Statement at 7.00am on Saturday 19th July 2014

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 17 homes in total on Sandringham Drive, Caernarvon Close, Holyrood Close and Harlech Close 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

FLOOD INVESTIGATION REPORT – AUGUST 2015

localised, short and thundery downpours. Therefore watercourse levels at drainage outfalls were not expected to be high and are not considered a major contributor to this event.

Figure 6 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 investigation.

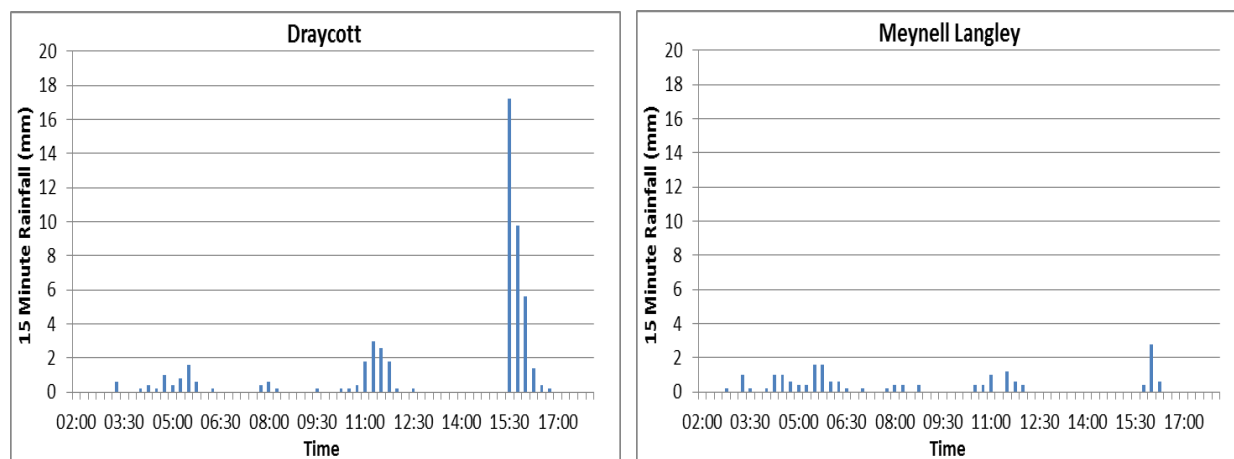


Figure 6: Comparison of 15 minute rainfall intervals on 19th July 2014 recorded at rain gauges at Draycott (4.5km south east of Spondon) and Meynell Langley (12km west of Spondon) (Data Source: Environment Agency)

Figures 6 and 7 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

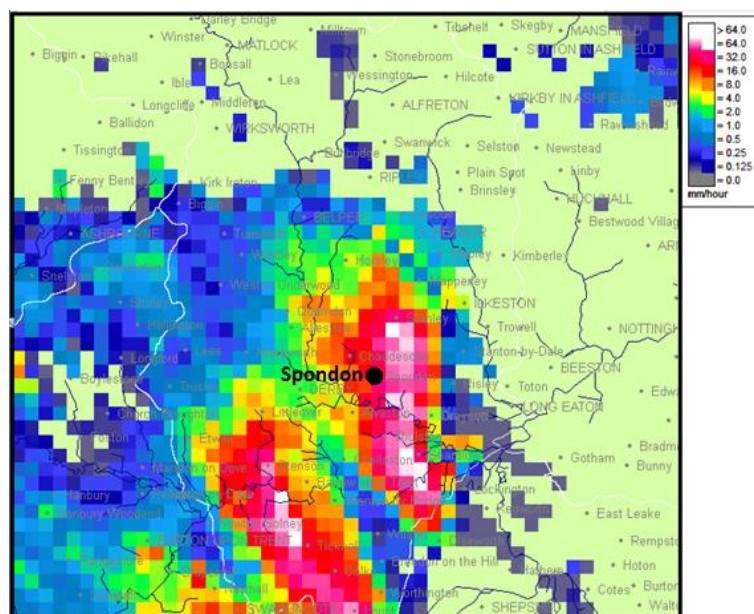


Figure 7: Observed rainfall at 15.30 on Saturday July 19th 2014 (Source: Environment Agency)

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 local drainage systems.

Figure 3 shows that elevation of land generally slopes 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 worst affected areas of the investigation site (Caernarvon Close, Sandringham Drive and Holyrood Close) also serves a large number of roads and properties to the north, 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 the 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 along localised flow routes and accumulating in localised low spots.

It is through this mechanism by which properties were flooded internally leading to significant damage to the ground floor living areas of at least 18 properties.

There is no evidence available to indicate that the outfall, located to the east of Hampton Close, from the public surface water sewer system into the unnamed tributary of the River Derwent was impeded in any way by blockages or otherwise.

According to data received from residents affected via reports to Derby City Council during and shortly after the event, as well as returns from a survey questionnaire issued to residents by City Council officers following the event, surface water flooding affected the following streets in the Sandringham Drive area:

- Nine properties are believed to have flooded internally on Caernarvon Close. In some cases, it was reported that drainage on the flat roofs on this street could not drain the roof water fast enough which in some cases led to water entering properties through walls and high level windows. In one case, foul water flooding was cited as being a contributing factor, with water rising into bathrooms. Garden and highway flooding was widely reported on Caernarvon Close.
- Three properties on Holyrood Close reported internal flooding to ground floor living areas as a result of the heavy rainfall and surface water runoff.
- Two properties on Harlech Close were reportedly flooded from surface water runoff. However it is reported that this was as a result of private drainage serving two car parks on the street being blocked with silt. Silt and other debris from the car parks were washed into gardens and properties.
- A reported four properties on Sandringham Drive experienced flooding to the ground floor living areas. These were all related to surface water runoff from paved carriageway, footways and drives as a result of the intense storm event.

Throughout the investigation area local positive drainage systems, including gullies, public surface water sewers and highway drains helped to manage the accumulation of surface water on 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 intense storm events. The properties flooded in the Sandringham Drive investigation area 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 that could not be managed by the drainage systems towards lower elevation areas.

Reports indicate in some cases that there was a certain degree of foul water flooding during the event on 19th July 2014, with one property identifying internal foul water flooding. Records indicate that the area is drained by separate foul and surface water systems, with the advantage being that this should remove the likelihood of inundation of foul systems with surface water during extreme rainfall events. As the runoff from the rainfall event appears to have entered and flooded some foul water sewers in the area, there is the possibility that misconnections exist whereby surface water is inadvertently piped into a foul water pipe. Severn Trent Water, as the water and sewerage undertaker for the area, has the responsibility for managing flood risk from the waste water system.

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 near vicinity 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, prompting rapid runoff from paved surfaces (highways, roofs and driveways) and as such surface water accumulated in localised low spots.

Surface water flooding was experienced in large areas of the east of Derby, and in particular Spondon. This report however focused on a cluster of 17 properties that were internally flooded during the event, which thus triggered a formal investigation, based on Derby City Council significance thresholds, under Section 19 of the Flood and Water Management Act 2010. In particular, the following areas suffered internal property flooding:

- Caernarvon Close, where nine properties experienced surface water flooding to internal property areas. Garden and highway flooding was widely reported on Caernarvon Close.

- Holyrood Close, where three households reported internal flooding to ground floor living areas as a result of surface water runoff.
- Harlech Close where two properties reportedly flooded from surface water runoff. It is reported that this was as a result of private drainage serving two car parks on the street being blocked through lack of maintenance.
- Sandringham Drive, where four properties experienced flooding to the ground floor living areas. These were all related to surface water runoff from paved carriageway, footways and drives.

In all cases above highway flooding as well as flooding to gardens and external property areas was experienced by residents. The locations of the flooding were driven by local topography, and as such areas of locally low elevation were worst hit by the storm which exceeded the drainage capacity of the local drainage system.

There were a small number of reports that were made of foul water flooding to some properties, one of which was reported internally on Caernarvon Close. This may have been due to one or more misconnections in the area leading to surface water entering the foul system.

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 to local watercourses and sewage treatment works in the Sandringham Drive area. 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.

It is recognised that some incidences of foul water flooding were reported during the event, one of which was internal. Affected residents should direct their enquiries to Severn Trent Water who will be able to investigate the issue.

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:

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 significantly 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

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/

schemes based on a probabilistic assessment of likelihood of a future event and its impacts.

Severn Trent Water:

Severn Trent Water should investigate any incidences of foul water flooding reported to them in the area for this event on behalf of the residents affected.

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 Sandringham Drive, Caernarvon Close, Holyrood Close and Harlech Close to Derby City Council
- Flood Forecasting Centre and Met Office statements and warnings.
- Rain gauge data for Draycott supplied by the Environment Agency.
- Responses to a questionnaire survey issued to residents, including first-hand accounts of the event.
- 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.

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

FLOOD INVESTIGATION REPORT – AUGUST 2015

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.

The City Council does not accept any liability for the use of this report or its contents by any third party.