Derby City Council

Flood Investigation Report

Bishops Drive, Oakwood 19th July 2014

Revision	Date	Details	Author	Checked and Approved By
01	September 2015	Draft report	Ashley Dunn	Kevin Tozer
02	September 2016	Final Report	Ashley Dunn	Kevin Tozer
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Derby City Council

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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 in the Bishops Drive area of Oakwood on 19th July 2014.

The flood events of 19th July 2014 resulted in internal flood damage of at least 10 properties as well as severe highway and external garden flooding on Bishops Drive, Saffron Drive, Columbine Close, Santolina Drive, Morefern Drive and Bryony Close, Oakwood. Further extensive external (highway and garden) and possible further internal flooding was experienced on Bishops Drive. 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 Oakwood, 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 Bishops Drive area as it has been identified that a large cluster of properties were affected by the event within very close proximity from a number of different sources.

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 8km south east of Oakwood) 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 Oakwood on 19th July 2014 has been undertaken because the event triggered one of the locally agreed flooding 'characteristics' as follows:

- At least 9 residential properties were internally flooded within the areas of Saffron Drive, Columbine Close, Santolina Drive, Morefern Drive and Bryony Close.

2. Local Information

2.1. Location

Oakwood is situated to the extreme north east of the Derby City Council administrative area, approximately 3.5km from the city centre (Figure 1). Oakwood is bounded to the south west by the Derby suburb of Chaddesden and to the north and east by agricultural fields most of which sit outside of the Derby City border. Oakwood itself is primarily comprised of residential dwellings, with only minor pockets of commercial and retail property. Several areas of public open space of various sizes are situated throughout Oakwood and offer the only major areas of permeable surfacing. Of particular relevance to this report is the Bishops Drive recreation ground adjacent to Springwood Leisure Centre and the Chandlers Ford recreation ground (Figure 1).

Primary access and egress from Oakwood towards the city centre and beyond is via Lime Lane and the A608 to the north and west respectively, and via Morley Road to the east.

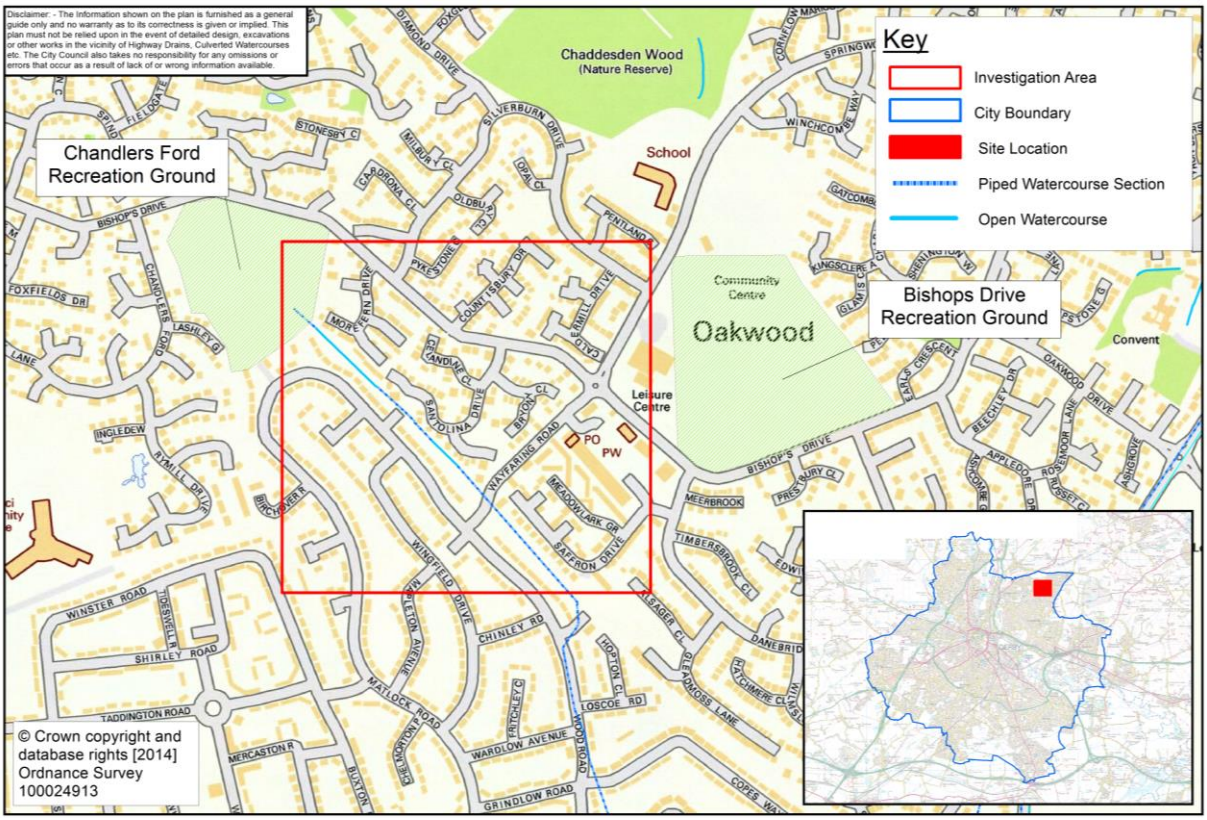

Figure 1: Location Plan for the Investigation Area

Although many areas of Oakwood were affected to some degree by the flooding event on 19th July 2014, including a number of properties internally, the City Council has identified a significant cluster of reported internal and external property flooding from a number of sources as well as highway flooding in the Bishops Drive area. As such, this report focuses on this area as the most significant cluster affecting the area.

2.1 Local Drainage System

The investigation area is a relatively modern residential development of mostly detached and semi-detached houses with the associated areas of impermeable paved surfaces, although there are a relatively high proportion of public and private green spaces for this type of development. The highways adopted by Derby City Council as the Highways Authority are drained by traditional highway gullies.

The gullies as well 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 in the study area (Figure 2). There are two watercourses nearby which are important to note as part of this investigation. Both watercourses are tributaries of the Chaddesden Brook which flows in a southerly direction to the south of the study area.

The first watercourse is referred to as Wood Brook in this report and flows in a south east direction from Chandlers Ford recreation ground. This then flows between rear gardens on Wood Road and Morefern Drive, Santolina Drive, Columbine Close and Saffron Drive. Wood Brook then continues south before being piped beneath Wood Road to the south west of the study area. From here it flows in a southerly direction before joining (or becoming) the Chaddesden Brook.

The second watercourse is referred to as Oakwood Brook in this report and rises in the public open space near to Kirkstead Close to the south west of the site. From here it flows south parallel to Morley Road and continues in an open channel, although culverted for a 150m stretch, towards where it crosses beneath Morley Road near to Lees Brook Community College. From here it is piped to the south before opening into an open channel and joining the Lees Brook, itself a tributary of the Chaddesden Brook.

The Oakwood Brook, although flowing some 600m from the main investigation area, is important in this case as it is to this watercourse that the public surface water sewer serving the investigation area discharges to. It is believed that this surface water sewer system accepts highway surface water from a large urban catchment which is illustrated indicatively Figure 2. This urban catchment includes not only the area that is covered by this investigation report but also a vast area of Oakwood up to the Derby City boundary. Therefore it is observed that during a flood event, a large quantity of surface water will be focussed in a very short period of time towards the bottom of the system and the outfall into the Oakwood Brook. It is thought that much of the paved area of Oakwood, if not all of it, contributes to the Oakwood Brook at an uncontrolled rate meaning that water will have the tendency to drain to the sewer outfall much quicker than pre-development.

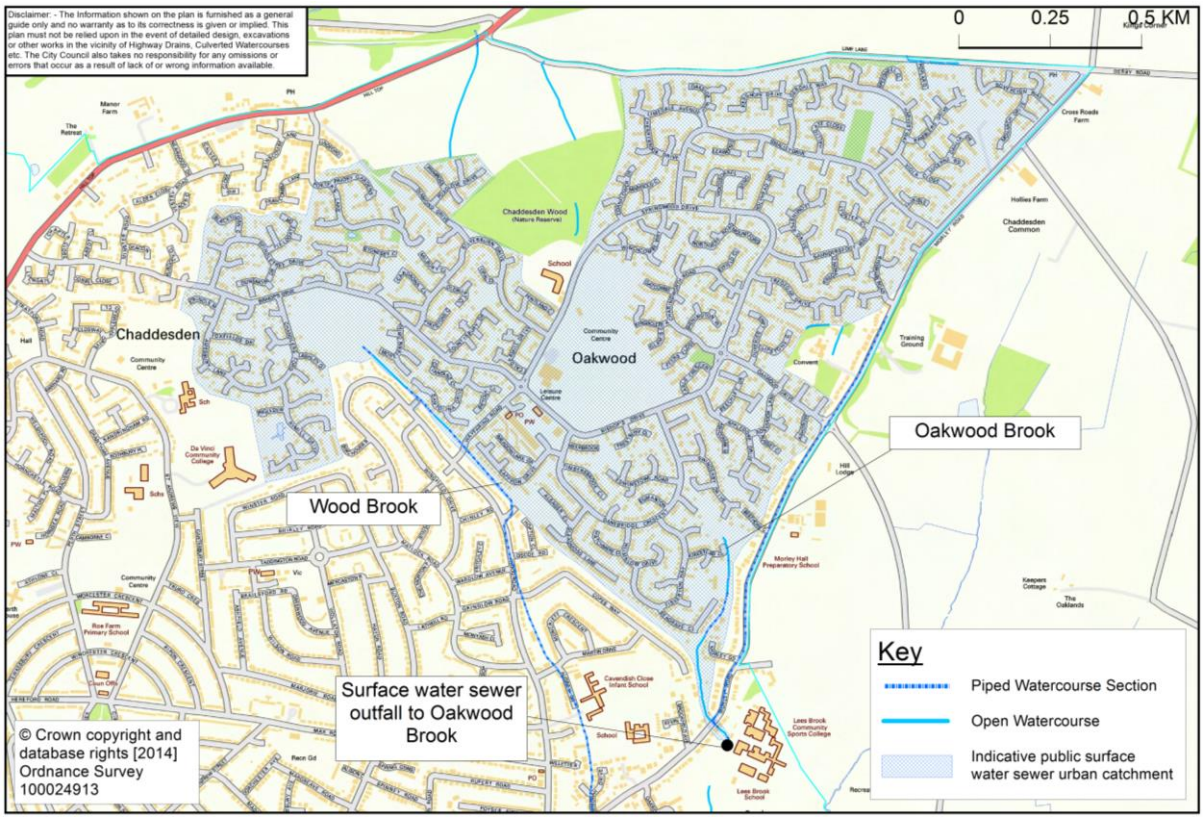

Figure 2: Primary Local Drainage in Report Area

The Oakwood Brook and the Wood Brook are both designated as 'ordinary watercourses'. The responsibility to coordinate the management of flood risk on ordinary watercourses, as stipulated by the Flood and Water Management Act 2010, rests with the LLFA for a given area. Regardless of the sewer outfall discharging to these ordinary watercourses or the responsibilities of the City Council as the LLFA, the responsibility of maintaining all 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 two distinct topographical valleys aligned by the Wood Brook and the Oakwood Brook. Both brooks are illustrated on Figure 3 including their piped lengths. Naturally therefore, it is likely that generally surface water on paved and green surfaces, including any sewer exceedence, will propagate towards the base of these valleys to join one of the two brooks. As such, those streets, highways and properties situated to the base of these valleys adjacent to the watercourse are likely to be more susceptible to either being located within a flow path or in an area of surface water accumulation during a storm event. In particular this is likely to be the case for Morefern Drive, Santolina Drive, Saffron Drive and Columbine Close which are all located in close vicinity to the base of the Wood Brook catchment valley. Inspection of the Environment Agency's Risk of Flooding from Surface Water dataset[1] appears to illustrate this likelihood.

[1] Environment Agency Risk of Flooding from Surface Water are freely available to view on the Environment Agency website at http://apps.environment-agency.gov.uk/wiyby/37837.aspx.

Based on the information obtained from Severn Trent Water records, under normal flow conditions (i.e. not an extreme rainfall event) the public surface water sewer drains to the Oakwood Brook catchment. For residential areas within the Wood Brook catchment identifiable in Figure 3, this would appear to not be the natural destination of surface water and overland flows. However it is assumed that during extreme rainfall events when the capacity of the surface water sewer system is exceeded, local topography dictates the overland flow routes and hence the areas at greatest risk of surface water flooding

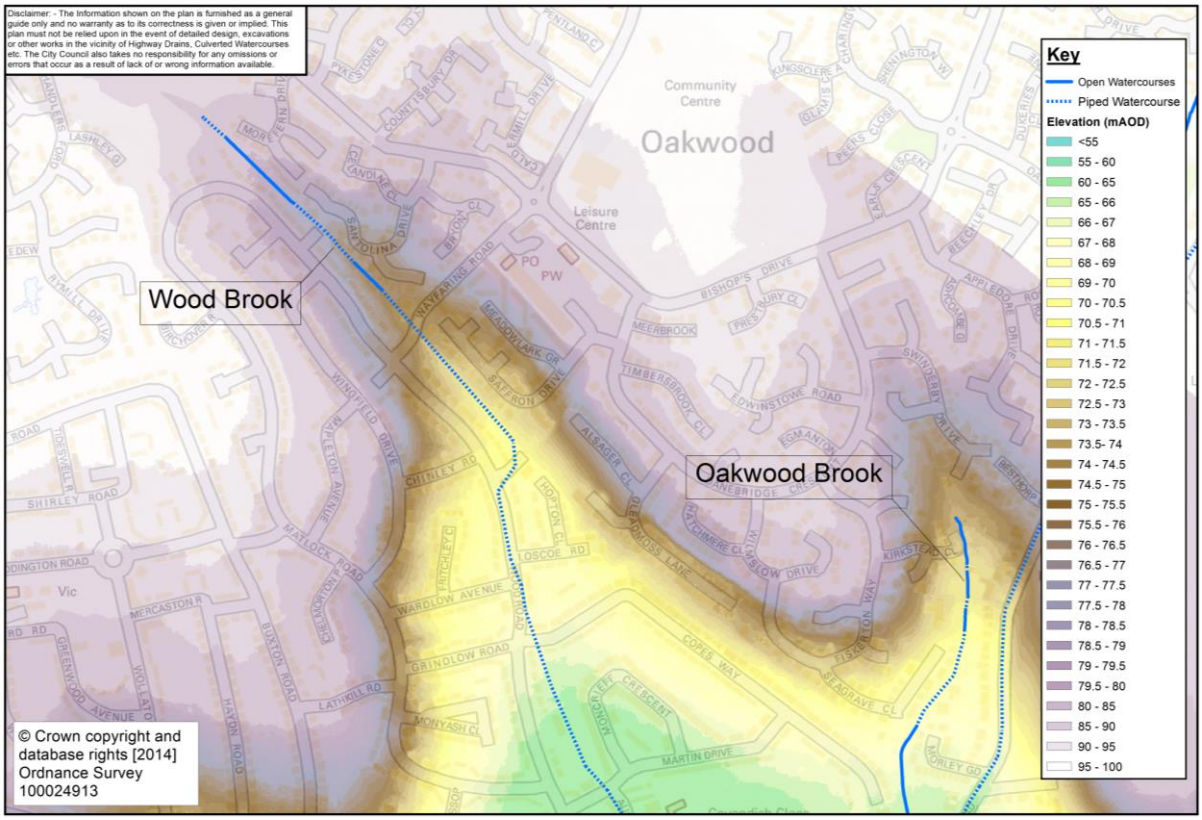

Figure 3: Local Topography of the Investigation Site

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 small number of locations in Oakwood, however none of these were in the immediate vicinity of the area of this study and none related to internal property or highway flooding. Recorded events were as follows:

- A single property on Pearl Close reported flooding to the rear garden caused by surface water running from Chaddesden Wood. This was reported to have occurred in July and December 2012 and is located 400m to the north of the investigation area.
- Surface water flooding to car park areas was reported by Springwood Leisure Centre approximately 400m to the north of the investigation area following the

storm event on 6th July 2012. This was reported to be the result of blocked drains and no internal flooding was reported.

- A single property on Foxglove Drive experienced external property flooding during the storm event on 6th July 2012. This was reported to be caused by surface water from adjacent fields.

The event on 19th July 2014 saw the first reported incidences of internal property flooding in Oakwood. However, 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 the Oakwood area.

3. Flooding on the 19th July 2014

The majority of the information supporting the description of the flooding event is based on the accounts from residents 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 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.

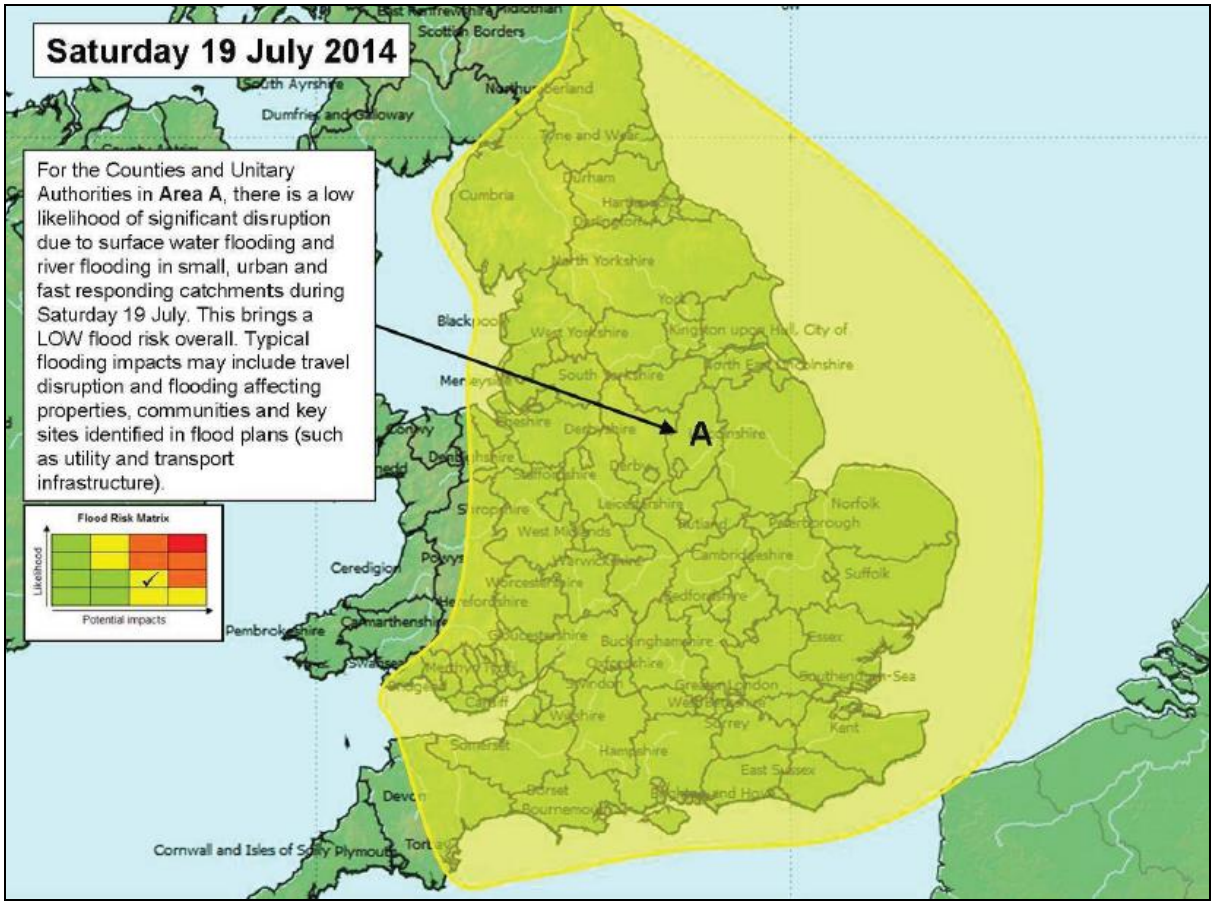

Figure 4: Extracted Figure from the Flood Forecasting Centre Flood Guidance Statement at 10.30am on Wednesday 16th July 2014

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.

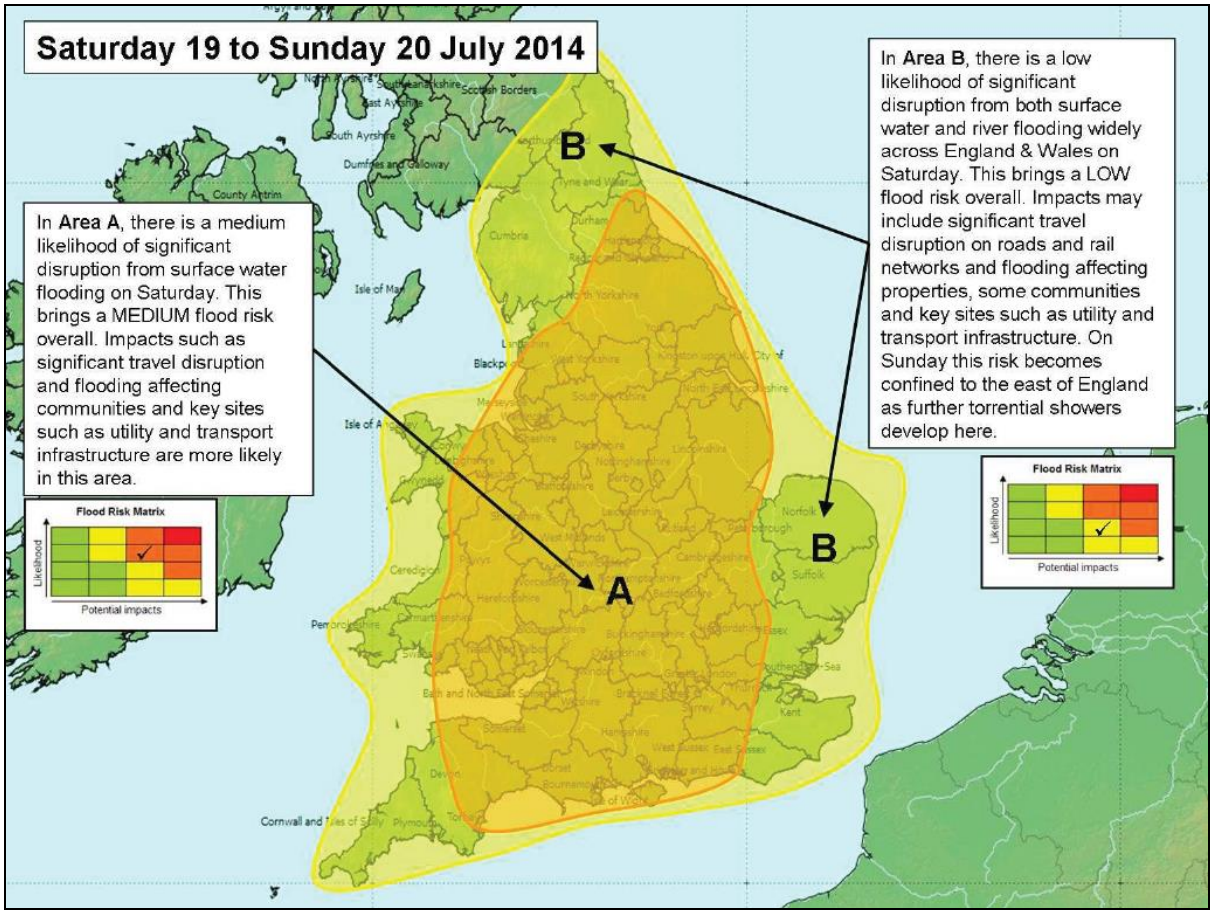

Figure 5: Extracted Figure from the Flood Forecasting Centre Flood Guidance Statement at 7.00am on Saturday 19th July 2014

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 at least 10 homes were affected internally on Bishops Drive, Saffron Drive, Columbine Close, Santolina Drive, Morefern Drive and Bryony Close, Oakwood. An undetermined number of properties in these areas also suffered severe external property flooding to highways and gardens 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 saturated ground conditions 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 8km south east of Oakwood and Meynell Langley approximately 9km west of Oakwood. Data was supplied by the Environment Agency shortly following the event. In the absence of a known rain gauge in Oakwood, the Draycott rain gauge is the closest source of rainfall data available for this investigation.

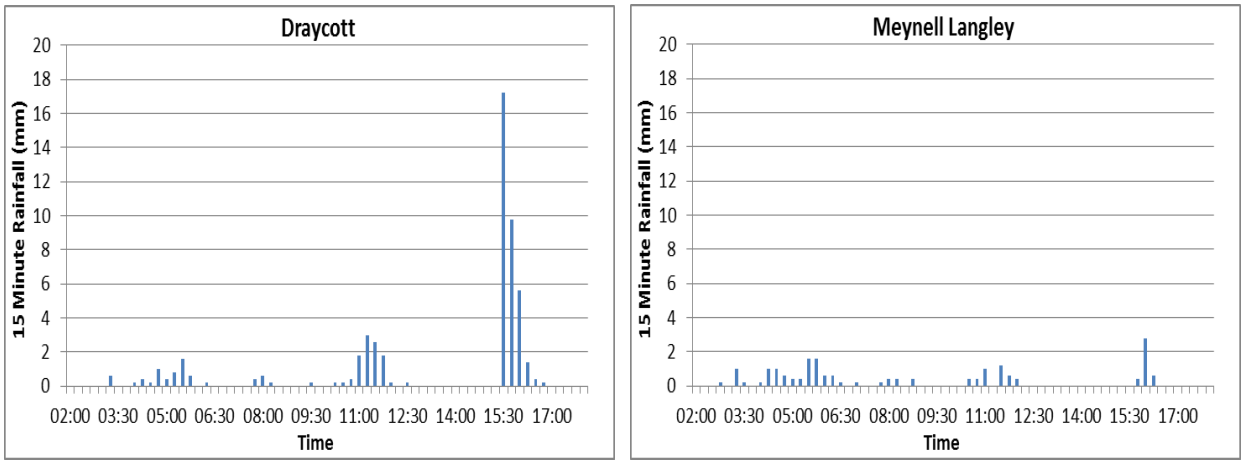

Figure 6: Comparison of 15 minute rainfall intervals on 19th July 2014 recorded at rain gauges at Draycott (8km south east of Oakwood) and Meynell Langley (9km west of Oakwood) (Data Source: Environment Agency)

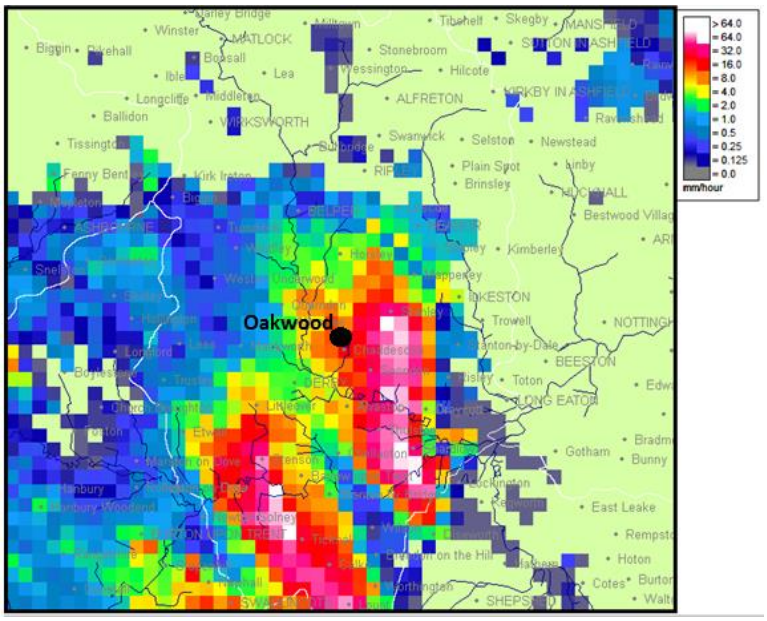

Figure 7: Observed rainfall at 15.30 on Saturday July 19th 2014 (Source: Environment Agency)

Figures 6 and 7 demonstrate that, as predicted prior to the event in the Flood Forecasting Centre Flood Guidance Statements, the storm event that the event that affected Oakwood 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 Oakwood, 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 and later public open green spaces rapidly entering local drainage systems.

Figure 3 shows that elevation of land generally slopes towards the two local brook courses in the area, namely Wood Brook and Oakwood Brook. Generally across the area slope of land is generally towards the Chaddesden brook in the south. Analysis of sewer records has revealed that the public surface water sewer system serving the worst affected areas of the investigation site (Bishops Drive, Morefern Drive, Columbine Close, Santolina Drive and Saffron Drive) also serves a very large urban catchment encompassing the majority of Oakwood, 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 surface water 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 10 properties.

There is no evidence available to indicate that the outfall of the surface water sewer into the Oakwood Brook, located to the east of the study area, from the public surface water sewer system 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 Bishops Drive area:

Figure 8: Slope of Chandlers Ford Recreation Ground from Chandlers Ford towards Morefern Drive. Flattened vegetation illustrates the flow of water over the land.

<u>Morefern Drive</u>

One property is reported to have been flooded internally on Morefern Drive as well as four properties being affected by significant garden flooding. Morefern Drive is at the head of the Wood Brook which flows from the large public open space (Chandlers Ford recreation ground) adjacent to Morefern Drive to the south east. During the event, it is reported that a surface water manhole surcharged on Chandlers Ford causing excess surface water to wash down slope across the Chandlers Ford recreation ground towards Morefern Drive. The overflow from the sewers combined with the runoff

originating directly from the recreation ground and travelled towards the boundary of properties on Morefern Drive and the recreation ground.

It is believed that the excess volume of surface water at this point which could not enter the Wood Brook through limited capacity spilled under the boundary fences of gardens and entered at least one property internally. Anecdotal information indicates that the Wood Brook at this point may have been affected by the presence of detritus resulting from improper disposal of loose materials by individuals into the watercourse.

Columbine Close

Two properties are reported to have been flooded internally on Columbine Close as well as up to four other properties experiencing external garden flooding. Residents have also reported the accumulation of surface water on the highway and a flow of runoff downslope from Bishops Drive, Santolina Drive and other upslope areas. Anecdotal reports suggest that one or more surface water sewer manholes may have surcharged on Bishops Drive leading to increased overland flow towards Columbine Close. Residents have also reported surcharging from the foul and surface water manholes on Columbine Close, both on the highway and in the adjacent public open space. Reports have been received of lifting of the road surface by the water pressure.

Santolina Drive

As above, Santolina Drive was reported to act as a conduit for surface water exceeding the surface water drainage network upslope and a number of manholes and gullies were reported to have surcharged within the highway. The flow of water and local accumulations led to at least 6 properties experiencing external garden flooding as well as significant highway flooding. It is believed that fluvial flooding from Wood Brookmay also have contributed to flooding of gardens on Santolina Drive, and the condition of the watercourse and the presence of fly tipping refuse has been cited as a contributing factor by residents.

Bryony Close

One resident has reported that their conservatory was flooded by a surcharging surface water manhole within their property curtilage. This resulted in internal flood damage to the property.

Saffron Drive

According to reports following the event, surface water was flowing to a similar depth to the kerb level in places down the slope towards the Wood Brook. Runoff was reported to have originated primarily from surcharging surface water manholes and surface water from the highway (Bishops Drive, Danebridge Crescent and Saffron Drive itself). It is also likely that runoff from public open space, in particular the Bishops Drive Recreation Ground contributed to runoff towards Saffron Drive.

Runoff flowed according to the local topography down from Bishops Drive, into Saffron Drive and towards the public open space below which the Wood Brook is piped.

The result of this was four properties on Saffron Drive flooding internally up to a depth of 230mm causing extensive internal property damage. It is reported that the foul sewer system also surcharged on Saffron Drive, but it is unclear as to whether foul water flooding affected properties internally.

Bishops Drive

Aside from the streets described above where Bishops Drive has either acted as a source or conduit to surface water runoff, Bishops Drive was the receptor of significant highway flooding near to the junctions with Earls Crescent. It is also believed that up to ten properties in this area of Bishops Drive were flooded internally by surface water, but this to date unconfirmed.

This junction of Bishops Drive and Earls Crescent is a local topographical low point and is identified in Figure 3 above as being at the head of the Oakwood Brook valley (although Oakwood Brook rises further to the south of this point). For this reason, surface water has the tendency to flow towards this junction and to the south if it is not directed elsewhere by surface water drainage systems. As such, during the storm event on the 19th July 2014, surface water resulting in over-capacity of the local sewer system propagated towards this area causing the identified surface water flooding.

In addition to the surface water sourced from the highway, it can be observed that much of the Bishops Drive Recreation Ground drains via natural topography towards Bishops Drive and to the junction with Earls Crescent. This could be observed by the inflow of soil and sediment from the recreation ground onto Bishops Drive as illustrated in Figure 9. It was also observed shortly after the event by DCC officers as well as from reports from residents that foul water flooding was experienced in this area of Bishops Drive, although there is no evidence available to suggest this affected internal living areas of properties. Figure 10 illustrates foul water flooding from the Severn Trent Water foul system shortly after the event.

Figure 9: Wash of soil from Bishops Drive Recreation Ground onto Bishops Drive indicates the flow of surface water from the recreation ground during the event.

Figure 10: Evidence of foul water flooding near to Earls Crescent during the event, pictured two days after the storm event.

Figure 11: Resident's photo of the flooding of Bishops Drive at the Earls Crescent junction on 19th July 2014 (Source: Derby Telegraph)

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 this investigation area were constructed prior to 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.

Reports have indicated that there was foul water flooding in the investigation area during the event on 19th July 2014. This included a report of internal foul water flooding on Springwood Close where pressure in the system forced water back up into the ground floor toilet of the property. 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 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 rainfall intensity exceeded the infiltration capacity of the green public open spaces in the area prompting overland flow. This resulted in water flowing along natural topographical flow paths towards Wood Brook and Oakwood Brook, causing significant flooding to property and highways.

Surface water flooding was experienced in large areas of the east of Derby, including Oakwood. This report however focused on a cluster of streets between Bishops Drive and Wood Brook where much of the flooding in Oakwood was focussed on. At least 10 properties were internally flooded which thus triggered a formal investigation, based on Derby City Council significance thresholds, under Section 19 of the Flood and Water Management Act 2010.

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. Highway drainage is not designed to manage overland flows from private areas, parks or open space. In this instance, the capacity of the highway drainage was exceeded by a combination of highway and private surface water which resulted in surface water flooding in many areas. However, in general it is not considered likely, given the severity of the storm, 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 in the Bishops 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 Oakwood 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 future[2]. 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 local 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

[2] 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 Morefern Drive, Santolina Drive, Columbine Close, Bryony Close, Saffron Drive and Bishops Drive to City Council officers and councillors.
- Site visits by Derby City Council officers shortly after the flood event.
- Flood Forecasting Centre and Met Office statements and warnings.
- Rain gauge data for Draycott supplied by the Environment Agency. This is the closest known rain gauge to the site known to the City Council.
- Responses to a questionnaire survey issued to residents following the flood event, 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 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.