Flood Investigation Report

Kingsley Close

Project Ref: 22565/016
Doc Ref: R001/Rev 1
January 2013

Peter Brett Associates LLP
Caversham Bridge House
Waterman Place
Reading
Berkshire
RG1 8DN
T: 0118 9500761
F: 0118 9597498
E: reading@peterbrett.com
### Document Control Sheet

**Project Name:** Flood Investigation Report  
**Project Ref:** 22565/016  
**Report Title:** Kingsley Close  
**Doc Ref:** R001/Rev 1  
**Date:** January 2013

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared by:</td>
<td>C Brown</td>
<td>Engineer</td>
<td>09.01.2013</td>
</tr>
<tr>
<td>Reviewed by:</td>
<td>D Hayes</td>
<td>Senior Associate</td>
<td>09.01.2013</td>
</tr>
<tr>
<td>Approved by:</td>
<td>P Jonkin</td>
<td>Partner</td>
<td>09.01.2013</td>
</tr>
</tbody>
</table>

*For and on behalf of Peter Brett Associates LLP*

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
<th>Prepared</th>
<th>Reviewed</th>
<th>Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rev 0</td>
<td>24.10.2012</td>
<td>For Comment</td>
<td>CMB</td>
<td>DTH</td>
<td>PJ</td>
</tr>
<tr>
<td>Rev 1</td>
<td>09.01.2013</td>
<td>Final Issue</td>
<td>CMB</td>
<td>DTH</td>
<td>PJ</td>
</tr>
</tbody>
</table>

Peter Brett Associates LLP disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence within the terms of the Contract with the Client and generally in accordance with the appropriate ACE Agreement and taking account of the manpower, resources, investigations and testing devoted to it by agreement with the Client. This report is confidential to the Client and Peter Brett Associates LLP accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk.

© Peter Brett Associates LLP 2013
Contents

1. Introduction .......................................................................................................................1
2. Background .......................................................................................................................2
   2.1 Site Location ..............................................................................................................2
   2.2 Drainage Regime .......................................................................................................2
   2.3 Historic Flood Events ..............................................................................................4
   2.4 Mitigation Works Undertaken ....................................................................................5
3. Flood Incident .....................................................................................................................6
   3.1 Flood Extent and Impact ...........................................................................................6
   3.2 Investigation .............................................................................................................6
   3.3 Recommendations .....................................................................................................6
   3.4 Flood Alleviation Works Completed .........................................................................7
4. Rights and Responsibilities ...............................................................................................8
   4.1 Lead Local Flood Authority .....................................................................................8
   4.2 Highway Authority ....................................................................................................8
   4.3 Environment Agency .................................................................................................8
   4.4 Water and Sewerage Company ...............................................................................8
   4.5 Riparian Landowners ...............................................................................................8
   4.6 Residents ...................................................................................................................9
5. Summary and Conclusion .................................................................................................10

Figures

Figure 1: Site location plan .................................................................................................2
Figure 2: Surface water drainage network upstream of Kingsley Close ..............................3
Figure 3: Watercourse network downstream of Kingsley Close .........................................4

Photographs

Photograph 1: Western section A33 Ditch south outlet (1st May 2012) ..............................7
Photograph 2: Western section A33 Ditch south inlet (1st May 2012) ...............................7
Photograph 3: Western section A33 Ditch north outlet (1st May 2012) .............................7
1 Introduction

The Flood and Water Management Act (FWMA) 2010 establishes the role of the Lead Local Flood Authority (LLFA), which is responsible for management of flood risk from all sources except main river fluvial flooding and coastal flooding.

The LLFA responsibility is given to unitary and upper tier local authorities (County Councils), and therefore Reading Borough Council (RBC) is the LLFA for the borough of Reading. One of the LLFA responsibilities for flood risk management is the duty to investigate flood events, as defined by section 19 of the FWMA.

Section 19 of the FWMA states:

Section 19

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

(a) which risk management authorities have relevant flood risk management functions, and

(b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

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

(a) publish the results of its investigation, and

(b) notify any relevant risk management authorities.

In accordance with this requirement RBC considered it was necessary to undertake an investigation into the flooding experienced on the 18th August 2011 at Kingsley Close, Reading, which effected six residential properties.
2 Background

2.1 Site Location

Kingsley Close is situated to the south of Reading, to the east of the A33 / B3031 Basingstoke Road and immediately north of the M4 J11. Kingsley Close forms part of the south Reading Ward of Whitley.

![Site location plan](image)

Figure 1: Site location plan

2.2 Drainage Regime

Kingsley Close is situated at the downstream end of a large urban sub-catchment that covers approximately 80ha stretching approximately 3.5km to the northeast of Kingsley Close, as shown in Figure 2. This catchment is drained by Thames Water Utilities Limited (TWUL) sewers ranging in diameter from 150mm to 900mm. Levels across the upstream catchment vary from approximately 80m AOD in the upper northeast down to approximately 41m AOD at Kingsley Close. However, Kingsley Close itself is situated in a low spot in relation to the carriageway of the adjacent B3031 Basingstoke Road and A33. All of the rainfall run-off collected within the catchment and conveyed by the sewer system passes through a single 900mm diameter sewer where the sewer outfalls from Kingsley Close.
Downstream of Kingsley Close the 900mm diameter sewer passes beneath the B3031 Basingstoke Road and discharges into a short section of open ditch known locally as the Compaq Ditch along the southern tip of the Worton Grange site. This ditch is approximately 43m long and flows from east to west before it outfalls to a 900mm diameter culvert which passes beneath the A33, as shown in Figure 3. This culvert in turn discharges into an enmained river known locally as the A33 Ditch which runs south to north adjacent to the A33 and is a tributary of the Foudry Brook. Approximately half way along the western A33 Ditch a 1000mm diameter culvert conveys the river under the highway access to the Tesco Distribution Centre (former Courage Brewery) site.
Figure 3: Watercourse network downstream of Kingsley Close

2.3 Historic Flood Events

2.3.1 Flood Event July 2007

On the 20th July 2007 Reading, along with many parts of the country, experienced an extreme rainfall event which resulted in the flooding of fourteen residential properties on Kingsley Close. An investigation undertaken following this event showed the south-western part of Kingsley Close to be located in a low spot or hollow whereby surface flood water becomes impounded (trapped) by the B3031 Basingstoke Road and the A33. As part of the investigation into the event a topographical survey of the area was undertaken and questionnaires were sent to residents, to confirm the maximum level and volume of the flood water.

The survey showed the point at which surface flood water will drain away from Kingsley Close (the 'spillway level') to be located to the west of No. 43 Kingsley Close at 42.250m AOD and that the properties that flooded had floor levels between 41.64m AOD and 41.70m AOD.

From the information collected it was determined that the maximum flood level was approximately 41.85m AOD with a flood volume of approximately 1330m³. This investigation also included the production and review of a hydraulic model of the Kingsley Close surface water drainage catchment to assess any weakness in the drainage system and allow mitigation measures to be considered.

The assessment concluded that the flooding had occurred as a result of the existing surface water drainage network being overwhelmed at several points, including within Kingsley Close itself, causing
localised surface flooding. However, public surface water sewers are only designed to provide protection from flooding in a 1 in 30 year rainfall event and according to the EA the July 2007 rainfall event was of a magnitude greater than this. The topography of the catchment is also likely to have contributed to the volume of flooding within Kingsley Close with additional flood water from upstream in the catchment potentially flowing overland towards Kingsley Close and being trapped in the hollow.

Several potential mitigation options were considered after the 2007 flood event, which included:

- clearance of the Compaq Ditch,
- diversion of a proportion of surface water runoff from the A33 into a new wetland as part of the M4 Junction 11 works,
- upsizing of sewers within the catchment, upsizing the existing culverts passing under the A33 and B3031,
- construction of new overflow sewers from Kingsley Close to the A33 Ditch, and
- construction of strategic balancing ponds or tanks upstream.

2.4 Mitigation Works Undertaken

Out of the mitigation measures considered, as part of the M4 Junction 11 improvement works in 2010, a proportion of surface water runoff from the A33 was removed from the Kingsley Close surface water drainage catchment and diverted into a new wetland.

Site investigations into the potential to upsize the existing culverts and / or construction of overflow sewers from Kingsley Close to the A33 Ditch concluded that the location of an existing gas main and 18No. BT ducts precluded either option from being viably progressed.

In early 2011 following a successful application for Defra ‘Early Action’ funding, approximately 500m$^3$ of off-line attenuation was implemented in the upstream catchment to the north of Kingsley Close, adjacent to Vernon Crescent in land owned by RBC. The attenuation comprises two 1200mm diameter culverts and 360m$^3$ of cellular storage and operates when water levels in the sewer overtop a weir and flow into the storage. The amount of storage provided in this scheme was restricted by the site constraints posed by existing trees. Construction of what is now known as the Vernon Crescent flood storage scheme was completed in June 2011.
3 Flood Incident

3.1 Flood Extent and Impact

On the 18th August 2011 Reading experienced a rainfall event which resulted in the flooding of six residential properties on Kingsley Close. This flooding occurred after completion and commissioning of the Vernon Crescent flood storage scheme.

During the flood event in an attempt to reduce the water level in Kingsley Close RBC pumped water out of the Compaq Ditch and on to the A33 to reduce the surcharge level on the outfall and assist the flow of water out of the Close and away from the houses.

3.2 Investigation

The magnitude of the storm event on the 18th August 2011 was never categorically determined, however, the EA advised at the time that it was considered to be of a similar magnitude to the 2007 event which was estimated to be a circa 1 in 100 year event (1% annual probability). It was reported that 79mm of rainfall was recorded at Caversham lock on 18th August 2011 and that 81mm fell in the June 2007 event.

An inspection of the Vernon Crescent flood storage, conducted on the 19th August 2011, showed flood water ‘tide marks’ on the brickwork just below the cover levels of the control chambers and silt on top of the weirs, indicating that the storage was fully utilised during the incident.

A hydraulic modelling assessment of the Vernon Crescent flood storage using MicroDrainage modelling software showed that for a 1 in 75 year 120 minute rainfall event the flooding occurring in Kingsley Close would be reduced by approximately 425m³. This effectively equates to the available volume of storage within the scheme and confirms the full operation of the system on the 18th August 2011. The reduction in the flooding extent and the number of houses affected also demonstrates the effectiveness of the Vernon Crescent given the 2007 and 2011 flood events were of a similar magnitude. Nevertheless, a wider modelling assessment undertaken and site observations, made by RBC during the flood event on the 18th August 2011, indicated that the primary cause of flooding was the capacity of the downstream ditch network. RBC also reported large amounts of debris blocking both the inlet and outlet trash screens on the Compaq Ditch, which resulted in water levels backing up in the ditch to above the adjacent A33 carriageway level. The subsequent surcharging of the upstream sewers resulted in manhole flooding and RBC witnessed backflow out of road gullies on Kingsley Close.

The inlet to the A33 Ditch was also reported to be heavily silted resulting in a reduced flow capacity through the culvert beneath the A33 linking the Compaq Ditch and the A33 Ditch. The downstream ditch was also further affected by a long term obstruction caused by a tree across the channel which created a weir backing up the flows.

On the 19th August 2011 RBC removed the trash screens at both the inlet and outlet of the Compaq Ditch and the inlet to the A33 Ditch, and undertook emergency de-silting works on the A33 Ditch which included the partial removal of the tree obstructing the flow. However, after these works had been undertaken standing water was still present at the up and downstream headwalls of the culvert beneath the A33.

3.3 Recommendations

The investigation into the 2011 flood event concluded that the presence of standing water at both the up and downstream headwalls of the culvert beneath the A33 after the emergency mitigation works indicated that there was still regrading work required in the A33 Ditch and potential de-silting of the culvert. Therefore the investigation recommended that a survey of the A33 Ditch be undertaken and that the A33 Ditch be cleared and re-graded where necessary. The investigation also recommended that the culverts beneath the A33 should be surveyed to ascertain their level and condition.
3.4 Flood Alleviation Works Completed

Following completion of the investigation into the 2011 flood event RBC commissioned a survey of the southern and northern sections of the A33 Ditch adjacent to the former Courage Brewery site. The results of this survey showed that the ditch levels were causing the backing up of water and so consequently a regrading scheme was developed. EA consent for the works was received on the 28th February 2012 and clearance / regrading of the A33 Ditch was completed on the 14th March 2012.

Over the weekend of the 28th April 2012 Reading experienced a prolonged and heavy rainfall event. No flooding was experienced on Kingsley Close and the A33 Ditch was seen to be running free of obstructions.

RBC also wrote to all the residents of Kingsley Close historically affected by flooding and offered to install property level flood protection in the form of flood guards to air bricks and doorways. This offer was accepted and measures were installed on ten properties.
4 Rights and Responsibilities

4.1 Lead Local Flood Authority
As a LLFA RBC has a responsibility under Section 19 of the FWMA to investigate flood incidents where it considers it necessary or appropriate, as undertaken within this report. However the FWMA does not provide the mandate or funding to tackle all identified causes of flooding.

Under Section 21 of the FWMA the LLFA also has a responsibility to maintain a register of assets, their ownership and state of repair which in the opinion of the authority are likely to have a significant effect on flood risk.

RBC is the main point of contact for residents concerned about flooding and holds records of complaints regarding Kingsley Close and the Compaq Ditch. It also undertakes liaison with, and provides updates to, the Kingsley Close residents committee.

4.2 Highway Authority
RBC has a duty to maintain the highway under Section 41 of the Highway Act 1980.

The maintenance requirements of the outfalls from the highway drainage network into the A33 Ditch is assessed annually as part RBC’s programme of maintenance works.

4.3 Environment Agency
The EA has permissive powers to carry out maintenance works on Main Rivers under Section 165 of the Water Resources Act 1991.

The A33 Ditch is classified as a Main River, however the frequency of EA maintenance activities is primarily undertaken on a risk based approach.

As previously discussed RBC undertook clearance / regrading works to the A33 Ditch running along the western side of the A33 in March 2012 with EA consent, and following discussions between RBC and the EA in August 2012 the EA undertook clearance works to the downstream section of the A33 Ditch running along the eastern side of the A33.

4.4 Water and Sewerage Company
The surface water drainage catchment in which Kingsley Close sits is drained by sewers owned and maintained by TWUL. Under Section 94 of the Water Industry Act 1991 TWUL has a duty to provide, improve, extend and maintain a public sewer so as to ensure that the area is and continues to be drained effectively.

Sewers for Adoption 7th edition states that a surface water sewer should be designed not to flood in a 1 in 30 year rainfall event. According to the EA and modelling of the flooding incident the rainfall event which resulted in the incident was of a magnitude greater than a 1 in 30 year event.

4.5 Riparian Landowners
Riparian landowners are those who own land adjoining a watercourse. As detailed within the EA document ‘Living on the Edge’, riparian landowners have certain rights and responsibilities including:

- they must maintain the bed and banks of the watercourse, and also the trees and shrubs growing on the banks;
- they must clear any debris, even if it did not originate on their land. This debris may be natural or man-made;
- they must keep any structures that they own clear of debris. These structures include culverts, trash screens, weirs and mill gates;
- not carrying out these responsibilities may result in legal action.

RBC has written several times to the riparian landowners of the Compaq and A33 ditches advising them of their responsibilities. However, due to inaction by the riparian landowners RBC undertook the required works seeking and achieving consent for the clearance and regrading of the ditch network from the EA.

4.6 Residents

Kingsley Close residents who are aware that they are at risk of flooding should, where possible, take action to ensure that they and their properties are protected. In taking up RBCs offer of individual property protection measures and contacting and liaising with RBC, the residents have demonstrated that they are prepared to work with RBC in working towards reducing the impact of flooding in the area.

RBC has requested that anyone affected by flooding in the future should try and document as much information about the incident as possible and contact RBC immediately. The Kingsley Close residents committee have also agreed to review the condition of the Compaq and A33 ditches on a regular basis and provide feedback to RBC to allow future maintenance to be proactive rather than reactive.
5 Summary and Conclusion

This flood investigation has been undertaken into the flooding of six properties on the 18th August 2011 at Kingsley Close, Reading, as was considered appropriate under the requirements placed on RBC as a LLFA under Section 19 of the FWMA.

Kingsley Close is situated in a low spot of the catchment adjacent to the B3031 Basingstoke Road / A33. The upstream catchment covers approximately 80ha and is drained by TWUL sewers. Downstream of Kingsley Close TWULs sewer outfalls into a ditch network which passes under the A33 via a series of 900mm and 1000mm diameter culverts. The section of this ditch network known locally as the A33 Ditch is classed as a Main River.

Following an investigation into the flooding of fourteen properties on Kingsley Close on the 20th July 2007, which concluded that the rainfall event had overwhelmed the capacity of the sewer network, RBC carried out mitigation works. These works included;

- diverting a proportion of the A33 highway surface runoff into a new wetland as part of the M4 Junction 11 improvement works, and
- construction of 500m³ of attenuation upstream of Kingsley Close known as the Vernon Crescent Flood Alleviation Scheme.

An investigation undertaken immediately following the flooding experienced on the 18th August 2011 concluded that the Vernon Crescent Flood Alleviation Scheme had operated as designed and had reduced the volume of flooding experienced in Kingsley Close. Information recorded by RBC operatives during the incident detailed large amounts of debris blocking the trash screens in the downstream ditches causing water to back up the network. Emergency removal of the trash screens and de-silting of the A33 Ditch was undertaken the following day, however water levels remained high within the ditches.

Since the incident on the 18th August 2011 RBC and the EA have carried out clearance and regrading works to the A33 Ditch. RBC has also commissioned a CCTV survey and clearance of the three culverts that convey the ditch network under the B3031 and A33.

The mitigation works completed by RBC in combination with the ‘Early Action’ flood alleviation scheme implemented after the 2007 event have significantly reduced the level of flood risk in Kingsley Close.

As a LLFA RBC is also committed to continued maintenance, investigation and implementation of mitigation measures, where practicable, to manage local flood risk.