

17 October 2014

# Buckinghamshire County Council

## Flood Investigation Report

Old Amersham, Amersham

January – February 2014



Photos courtesy of Glynis Chanell, 30/01/14, and Stephanie & Martin Brooks, 08/02/14.

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## Revision Schedule

### **Buckinghamshire County council** **Flood Investigation Report**

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| Rev | Date     | Details              | Author             | Checked and Approved by |
|-----|----------|----------------------|--------------------|-------------------------|
| 1   | 27/08/14 | Draft for review     | Anne-Claire Loftus | Karen Fisher            |
| 2   | 24/09/14 | Final report         | Anne-Claire Loftus | Karen Fisher            |
| 3   | 17/10/14 | Revised final report | Anne-Claire Loftus | Karen Fisher            |

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## Executive Summary

This report has been produced by Buckinghamshire County Council (BCC) to investigate the flooding that occurred in Old Amersham during January and February 2014. The report provides details of the event and makes recommendations for Risk Management Agencies (RMAs) to undertake to prevent a repeat in the future.

A Section 19 Investigation is a statutory requirement for Lead Local Flood Authorities (LLFA) under the Flood and Water Management Act (FWMA) 2010. On becoming aware of a flood in its area, the LLFA must, to the extent that it considers it necessary or appropriate, investigate:

- Which RMA have relevant flood risk management functions; and
- Whether each of those RMAs has exercised, or is proposing to exercise, those functions in response to the flood.

It was deemed necessary to produce this report as the flood event in Old Amersham exceeded BCC's criteria for carrying out a Section 19 Investigation.

The aim of the Section 19 Investigation is to give an explanation of what happened in the flood event and what were the RMAs' responsibilities during the event. The recommendations are there to help the RMAs learn lessons from the event and to move forward with management of the flood risk in the future.

The flood event in Old Amersham occurred after a prolonged period of above average rainfall which, combined with exceptionally high groundwater levels, raised river levels. In addition, a culvert flow restriction in the town caused the River Misbourne to back up, while the blockage of a drainage asset caused a secondary flow down the High Street. A riverbank collapse also caused property flooding. A list of recommendations is included which, if followed, will reduce the flooding in Old Amersham.

Since the flooding event, RMAs have been working together to come up with solutions for this flooding issue; some of these are listed in this report.



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# 1. Introduction

## 1.1 Background to investigation

BCC as the LLFA has a responsibility to record and report flood incidents as detailed within Section 19 of the Flood and Water Management Act (FWMA) 2010:

### Section 19

- (1) On becoming aware of a flood in its areas, 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.

BCC has established criteria for section 19 flood investigations which can be found in the appendix.

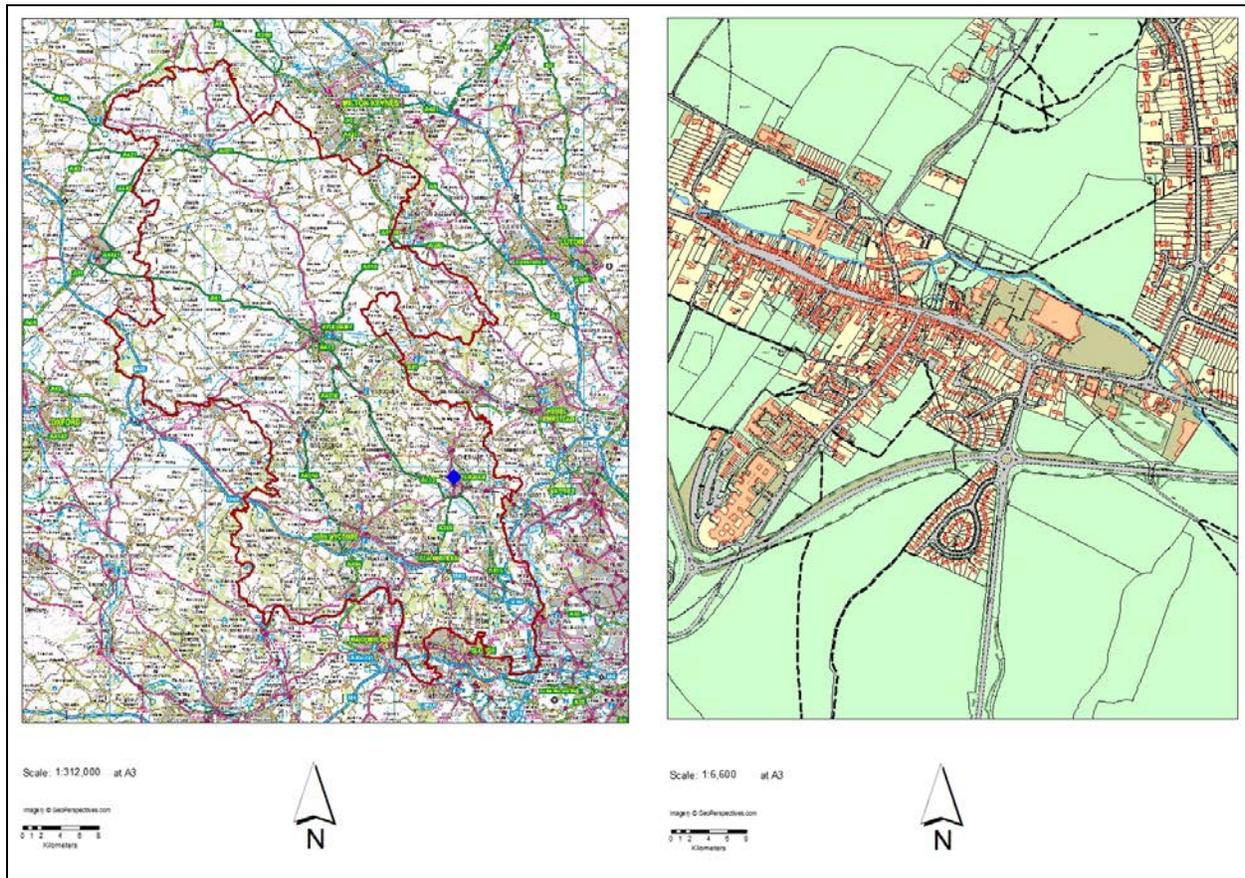
It was deemed necessary to complete an investigation into the flood incident in Old Amersham because it met the following threshold: internal flooding of two or more business premises within an area of 1km<sup>2</sup>. In addition, several residential properties also suffered from flooding.

## 1.2 Site Location

Old Amersham is part of Amersham, a market town of approximately 14,000 inhabitants located at the centre of Chiltern District in the south of Buckinghamshire, as shown in Figure 1.



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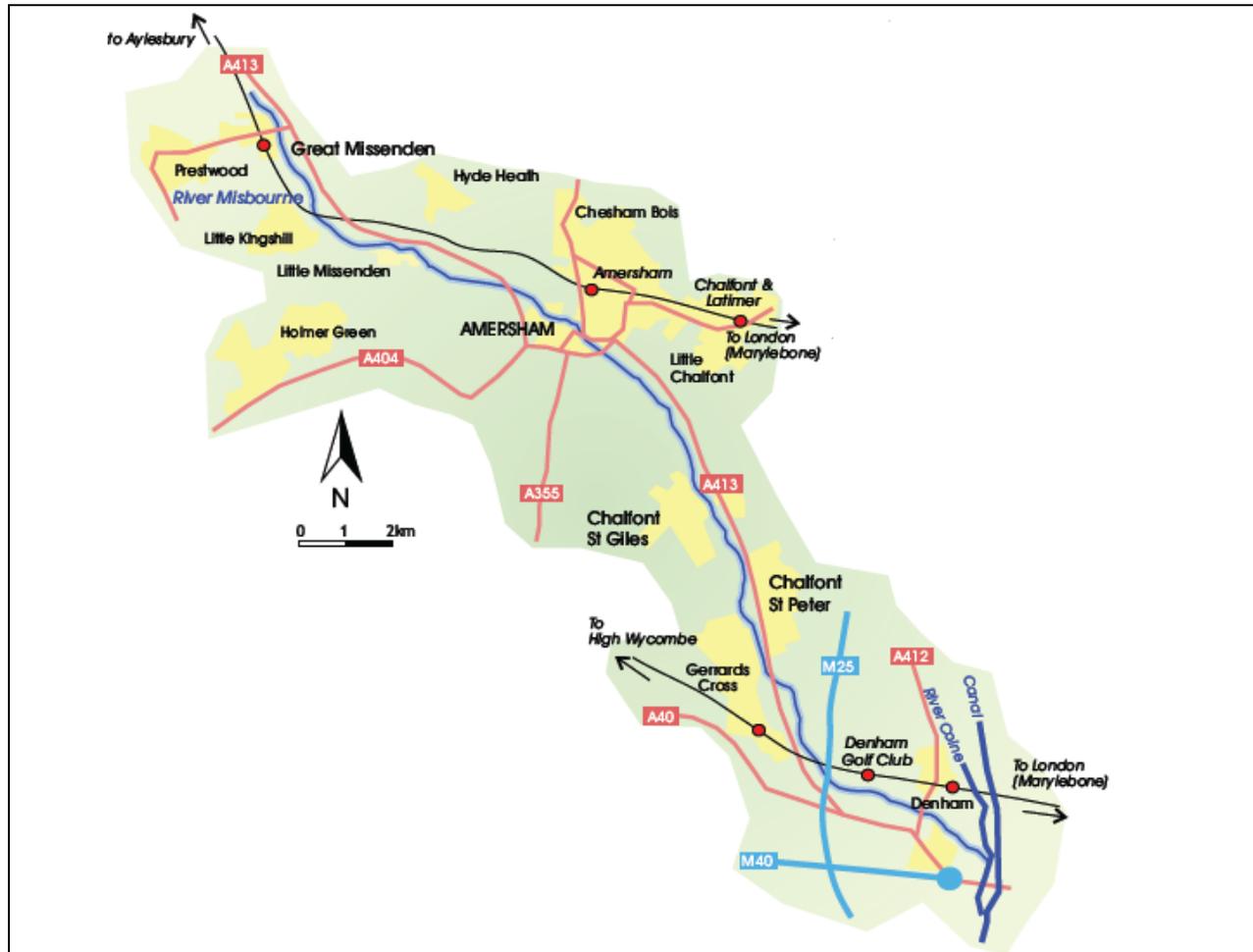


**Figure 1:** Location maps for Old Amersham at County and local level (Ordnance Survey License 100021529 2014)

### 1.3 Drainage system and river network

The River Misbourne is a main river that flows through Old Amersham, as shown in Figure 2. It is a chalk stream that flows for 17 miles (27 km) from Mobwell Pond just north of Great Missenden to its confluence with the River Colne, which itself is a tributary of the River Thames. Apart from a small section in Great Missenden, the River Misbourne is classed as a main river. The Environment Agency (EA) is the RMA for the main river section, as defined in section 4.3. The Environment Agency has powers to work on main rivers and the sea to manage flood risk.

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**Figure 2:** The River Misbourne (Source: Chilterns Chalk Streams Project)

After exiting Shardeloes Lake west of the town (SU 94477 97946), the River Misbourne runs west to east through Old Amersham. It passes behind the houses located on the northern side of the High Street, along the southern edge of the Barn Meadow Recreation ground, going through a number of culverts before branching off into two channels east of the superstore (SU 96202 97296). The channels rejoin east of the Jaguar garage on the A355 (SU 96467 97059). The two main areas of concern are shown in Figure 3 below: A is the culvert underneath The Maltings whose flow was restricted (SU 95599 97438), while B shows the location of the bank collapse near the Jaguar garage (SU 96533 96984). The explanation of these areas of concern is given

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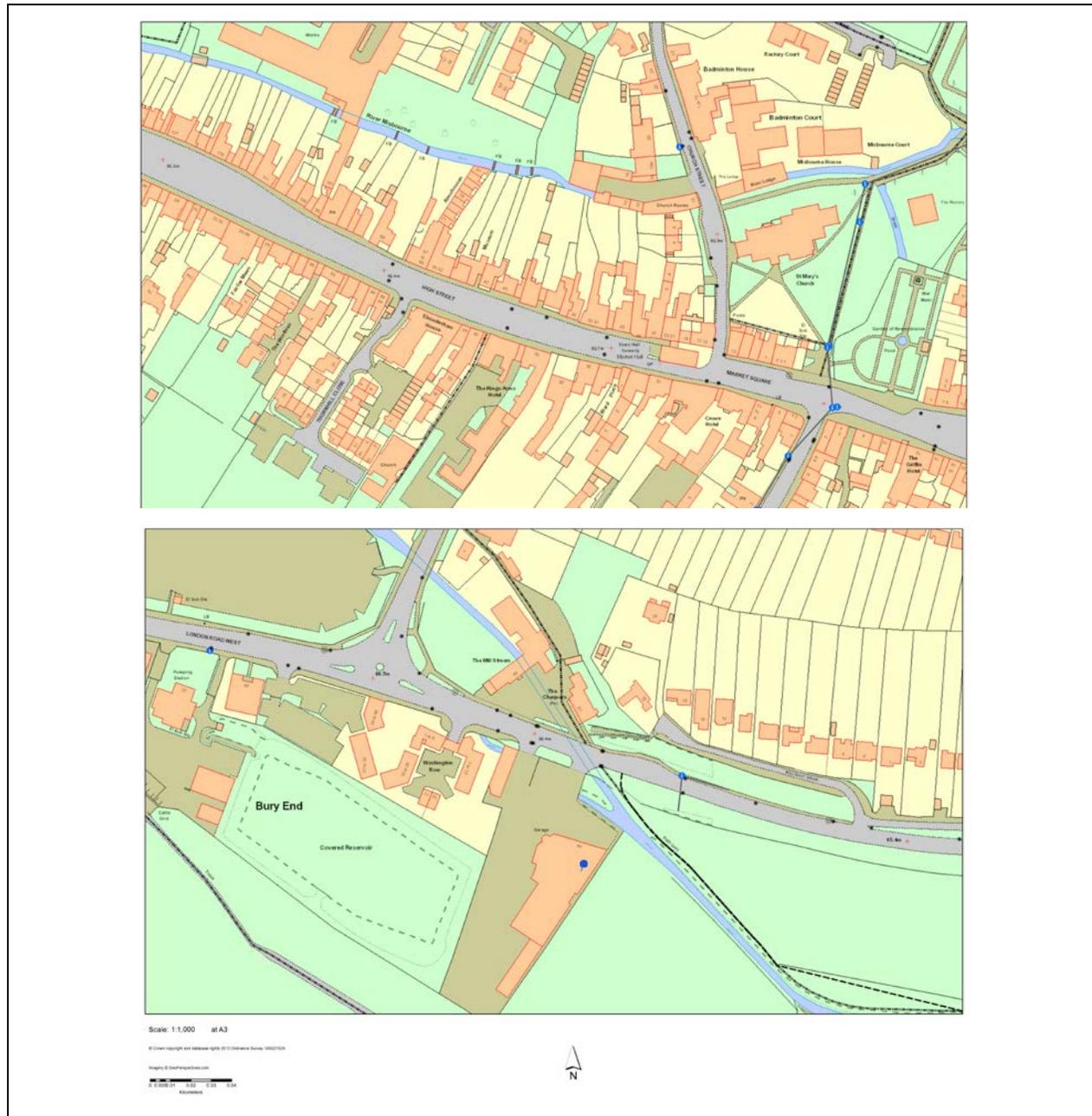
below in section 3.4.



**Figure 3:** Culvert flow restriction (A) and bank collapse (B) locations in Old Amersham.

Figure 4 shows the gullies in Old Amersham; these are all connected to the surface water drainage system which is owned and maintained by Transport for Buckinghamshire (TfB). The road drainage system along the High Street flows south to north into the River Misbourne until the channel splits after the superstore.

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**Figure 4:** Maps showing highway drainage into the River Misbourne in Old Amersham, with black dots indicating gullies.

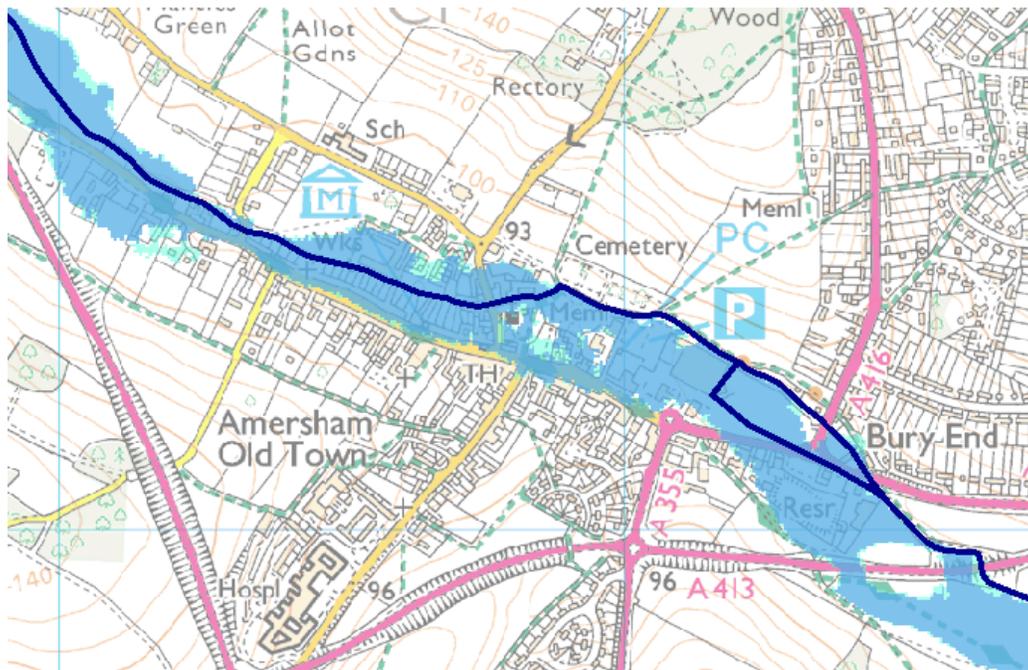
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## 2. Background

### 2.1 Catchment characteristics

The River Misbourne is a main river, as designated on the main river map produced by the EA. The Misbourne is culverted in some sections through the town, allowing for access to properties and the passage of flow under the highway. In several cases, properties have been built above the culverted river. Figures 4, 5 and 6 below show the fluvial and surface water flood maps for the town.

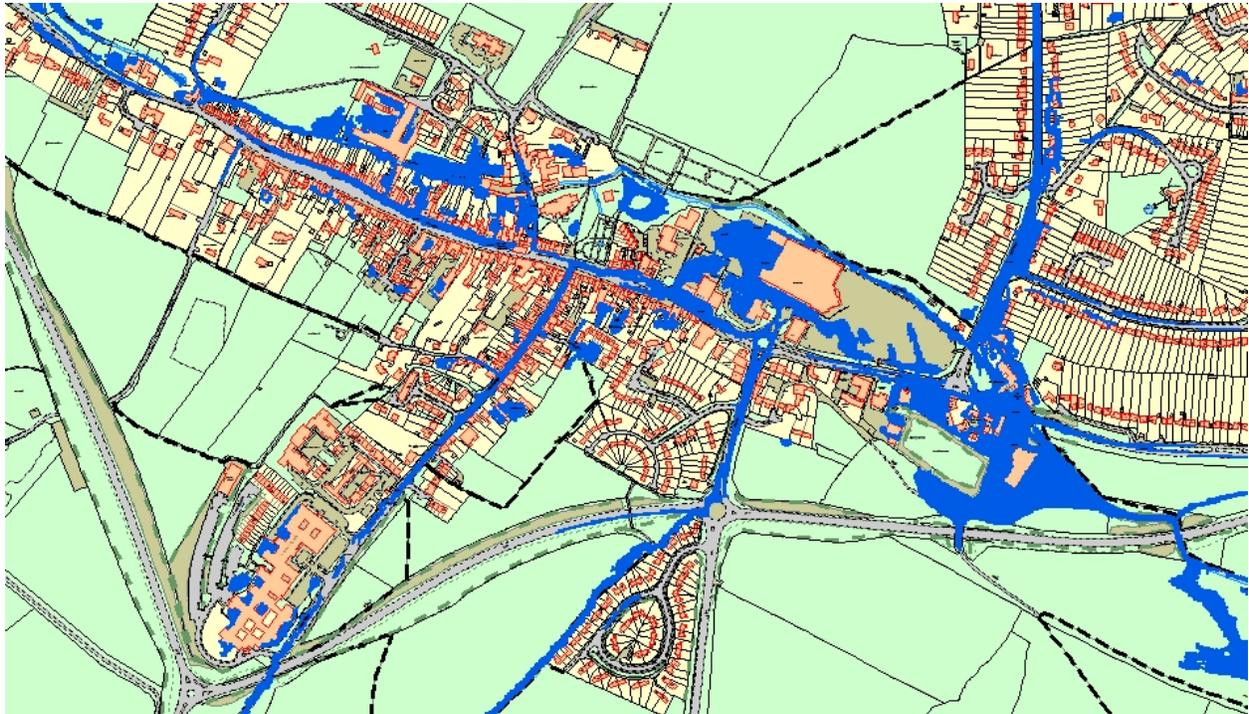
The fluvial flood map (see figure 5) shows the flooding which would occur from the main river in a 1 in 100 year (medium blue) and 1 in 1000 year (light blue) event, with the dark blue line representing the Misbourne. The flood water in these situations would come from the river and flow out onto the impacted areas shown on the map.



**Figure 5:** EA flood map showing the River Misbourne 1:100 year event (flood zone 3) in dark blue and 1:1000 year (flood zone 2) in light blue (EA, 2014)

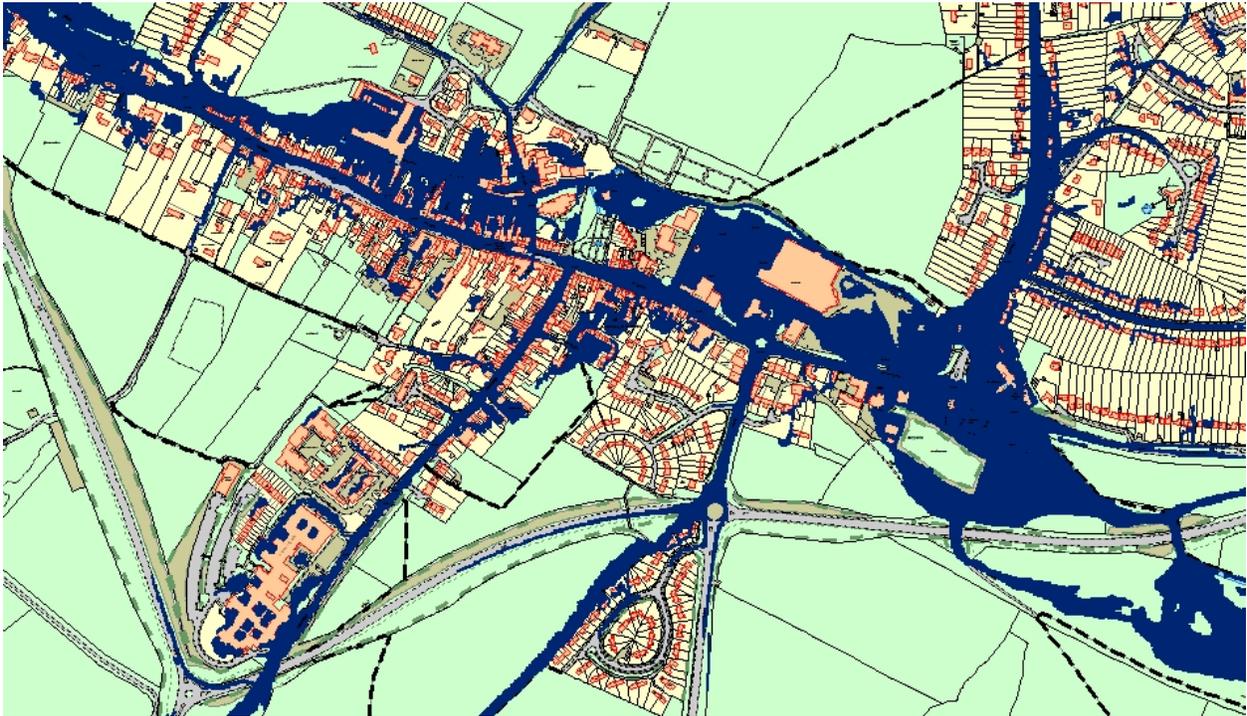
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The surface water flood maps show the extent of flooding in the 1 in 100 year (see figure 6) and the 1 in 1000 year (see figure 7) events for the area surrounding Old Amersham. Surface water flooding occurs when extreme or prolonged rainfall cannot infiltrate into saturated ground, or flow into the rivers and/or highways drainage due to high volumes of water.



**Figure 6:** 1:100 year surface water flood map showing predicted depth across Old Amersham (EA, 2013)

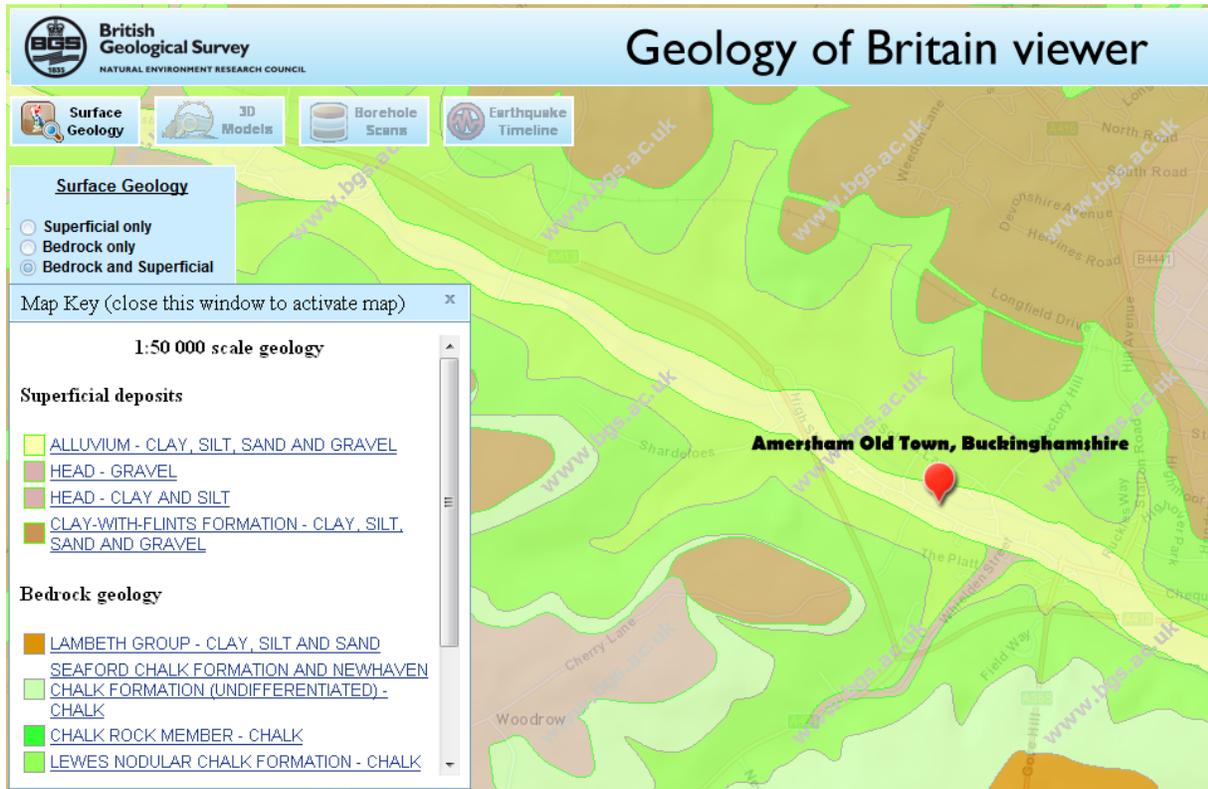
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**Figure 7:** 1:1000 year surface water flood map showing predicted depth across Old Amersham (EA, 2013)

Old Amersham is situated on alluvium (clay, silt, sand and gravel) along the line of the Misbourne, with no superficial deposits in Old Amersham outside of the alluvium areas. The solid geology is chalk, as shown in figure 8. The valley of the River Misbourne at Old Amersham slopes from 150-160mAOD either side of the town down to 95mAOD where the river flows through Old Amersham towards the southeast.

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**Figure 8:** Geology of Old Amersham (BGS online map, 2014)

## 2.2 Previous flood events

Several properties along the High Street were flooded in the winter of 2000/1. At least one of these was flooded internally again during the event described in this report, while two other businesses reported that the flood barriers they installed following the 2000/1 event effectively protected their premises this time. A report produced by the Chiltern Society into the flooding of 2000/1 indicated flooding to the rear of St Mary's Church as well as basement flooding to multiple properties on the High Street (Chiltern Society, 2001). Further flooding occurred in 2003.

A household on the High Street whose garden backs onto the River Misbourne reported that the garden had been flooded on three occasions prior to the event described in this report, including once in March 2013 and once in August 2013 (records from M. Brooks

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and S. Brooks). Both of the 2013 flooding events are reported to have led to the same flows of river water down the High Street from west to east as were witnessed in the flood event described in this report.

Following the flooding of August 2013, the Environment Agency responded to the incident. Despite concerns and initial indications to the contrary (Amersham Town Council, 05 August 2013), investigations found that the fluctuating water levels were not related to the management of Shardeloes Lake. Although residents expressed concern over possible debris in the Maltings culvert, the EA noted a good passage of water through it. The EA Operations team attended on a number of occasions with rakes and other physical means to remove any debris restricting flow from the culvert. The EA received information that a local resident entered the culvert to remove debris, possibly including a fence panel, placing him/herself in considerable danger. The EA found the high water levels to be caused by factors including, but not limited to: heavy & prolonged periods of rain; a possible restriction of the culvert; under-capacity of the culvert during high flows; the design of the culvert, a siphon, that results in the build-up of debris in the channel immediately downstream of the culvert; two weirs downstream of the culvert that further slow the river and allows silt to collect; waste materials, including fence panels and failing parts of the numerous footbridges spanning the watercourse. Following the August 2013 flooding, the EA made several attempts to inspect the culvert under the Maltings. However, inspection was put on hold until minimum flow levels would allow for a standard CCTV inspection, which would not have been possible even during normal flow conditions.

The Environment Agency sent Amersham Town Council a number of emails between 13 and 23 August 2013 (Environment Agency, 13, 15 and 23 August 2013) regarding damage to the riverbank on both sides of the River Misbourne alongside Barn Meadow caused by a vehicle accessing a property on the south bank via Barn Meadow and the river. The Environment Agency advised that any work to repair the riverbank would be subject to a Method Statement being agreed with the EA, and advised that the riverbank should be left to recover naturally. A written warning to the resident in question was issued, and though the Environment Agency did not pursue prosecution, the resident and Amersham Town Council were advised that further breaches of the Thames Region Land Drainage Byelaws 1981 would result in an investigation and potential formal



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enforcement action. The resident and Amersham Town Council were advised that the potential future construction of a temporary bridge to allow for machinery access to the property would require an application for Flood Defence Consent.



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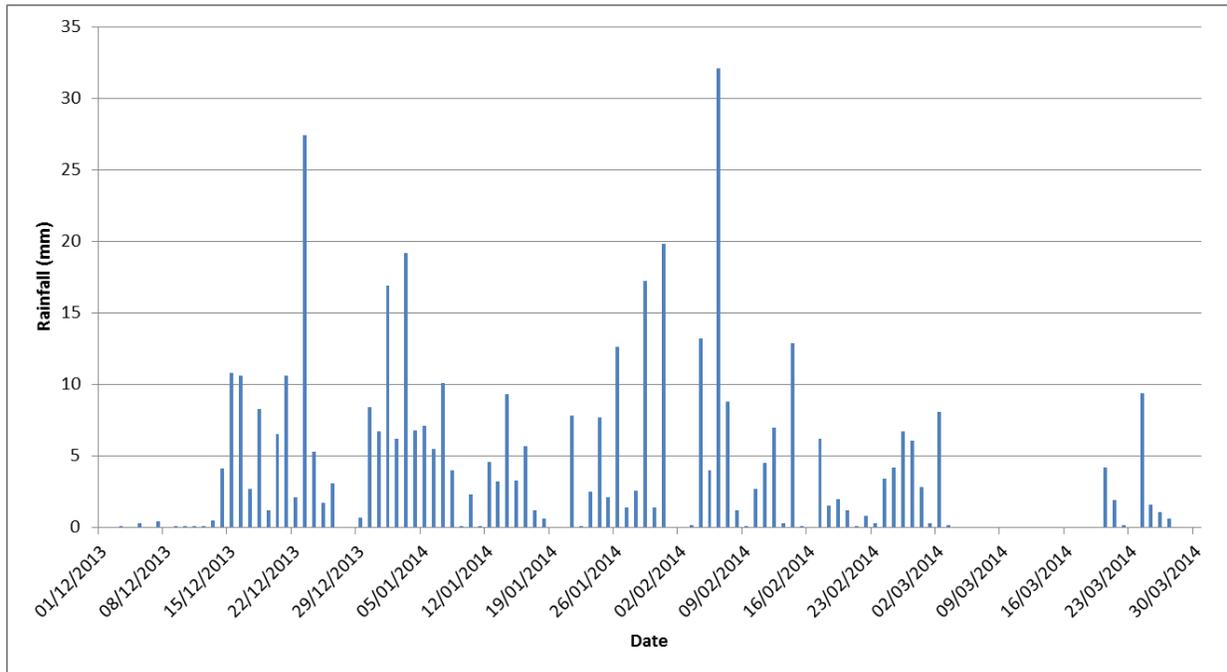
## 3. Analysis of January-February 2014 flood event

### 3.1 Conditions at the time

The EA provided rainfall data for the period of 01 December 2013 to 30 March 2014. The nearest EA rain gauge is at Little Chalfont. Figure 9 gives the daily rainfall totals from the Little Chalfont gauge for December 2013 and January, February and March 2014. From this data it can be seen that there were constant high levels of rainfall from mid-December 2013 to early March 2014, with peaks on 23 December 2013, 01, 03, 29 and 31 January and 06 February 2014. There was almost daily rainfall from mid-December 2013 until early March 2014, and the gauge registered a maximum (for the period) of 32 mm of rainfall on 06 February 2014.

To put this rainfall in context, from 01 October 2013 to 28 February 2014, the Colne catchment received 166% of the long-term average, while for the month of February itself the Colne catchment received 240% of the monthly rainfall average (EA, February 2014). This was the third wettest February in the EA's North East Thames Area since records started in 1910 (EA, February 2014).

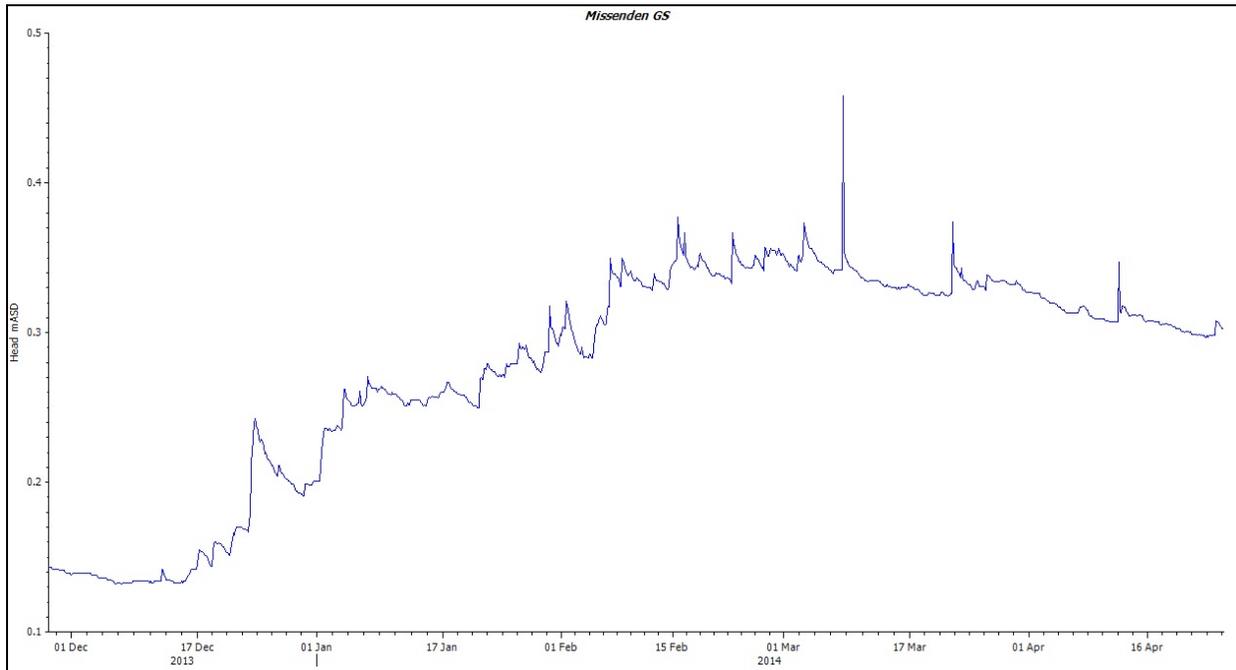
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**Figure 9:** Daily total rainfall for rain gauge at Little Chalfont from 01 December 2013 to 30 March 2014 (EA, 2014)

The EA's nearest telemetered river level gauge is at Little Missenden (SU 93280 98521, approximately 2.6 km upstream of the centre of Old Amersham). Figure 10 shows the river levels for December 2013 to April 2014.

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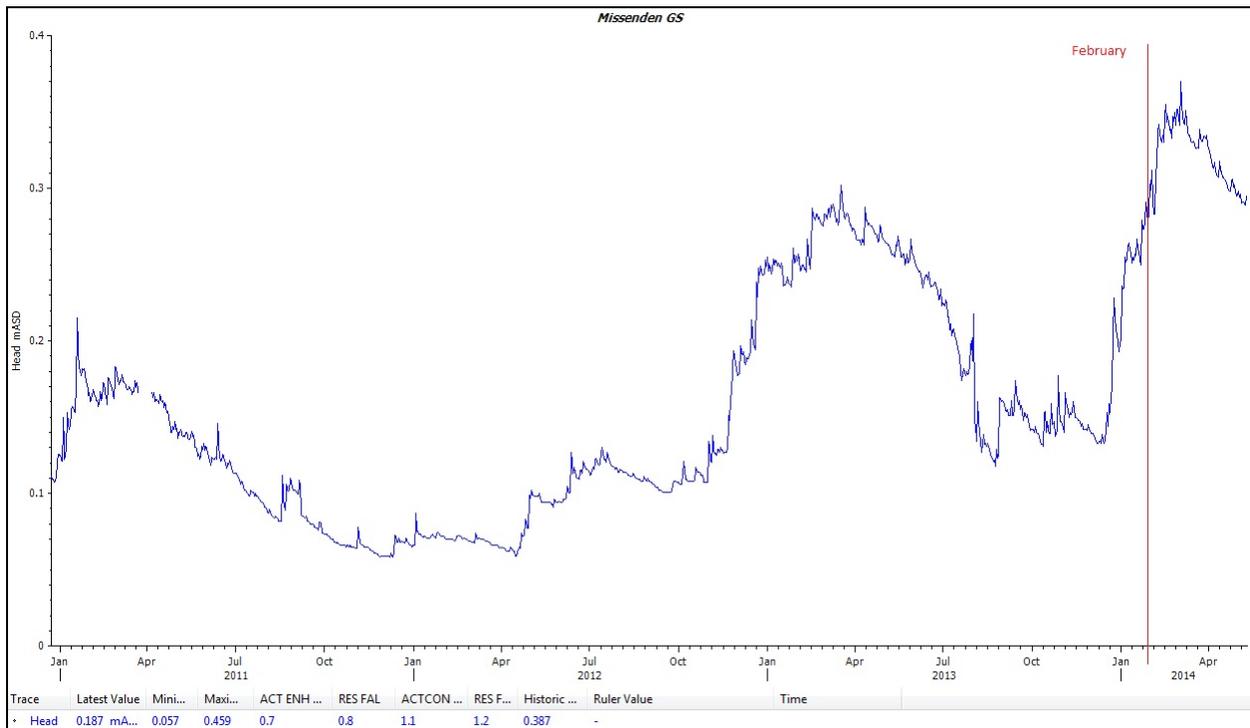


**Figure 10:** River Misbourne hydrograph, as per Little Missenden gauge measurements, December 2013 to April 2014 (EA, 2014)

The Little Missenden gauge has been in operation since October 1993. The EA's records for the gauge show that the entire event (the three months leading up to March 2014) is listed as number 1 of the top 10 levels ever recorded at this site. The peak level of the event was on 08 March 2014, at 459mm, although there were other peaks in river levels during the event in question, for example on 07 and 08 February 2014, which is when much of the property flooding occurred.

The measurements from the Little Missenden gauge can only give an indication of levels in Amersham. Indeed, it is too far upstream from the town to accurately reflect the local river levels in Amersham, which are primarily affected by the presence of culverts, natural restrictions to flow, blockages and other things. However, Figure 11 – the hydrograph for the past three years – can give an indication of levels in the area. It shows the high levels of February/March 2014, with similar levels recorded in March/April 2013. As a note, river levels in the area vary in the period analysed by 443mm (the difference between the lowest and the highest recorded levels).

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**Figure 11:** River Misbourne hydrograph, as per Little Missenden gauge measurements, January 2011 to April 2014 (EA, 2014)

Groundwater was ‘exceptionally high’ throughout the Colne catchment during the period of flooding under investigation; ‘exceptionally high’ is the maximum category for groundwater levels, meaning levels are likely to fall within this band 5% of the time (EA, February 2014). The EA, using the river gauge data at Little Missenden, treated the three-month period leading up to 08 March 2014 as one event, because of the heavy influence of groundwater. The situation was much the same across the whole River Colne catchment, with the soil moisture deficit (SMD) being zero in February 2014, indicating that the soil was completely saturated (EA, February 2014). This would have had important implications for the flooding, as the soil would have been unable to absorb the continuing rainfall.

### 3.2 Condition of features

The flow in the culvert located under The Maltings (see A, figure 3) was partly restricted.

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The gullies on the High Street, which are designed to discharge to the Misbourne, were partly blocked with sediment but mostly unable to discharge at full capacity due to the high water levels in the Misbourne.

### **3.3 Condition of watercourse**

The section of watercourse downstream of The Maltings' culvert (see A, figure 3) contains several weirs, which impede the flow of water and cause a build-up of sediment by preventing the flushing of sediments by the flow of the river itself. Although this sedimentation did not cause the flooding as it was downstream of the flow restriction, it would have contributed to the problem by preventing the fast flow of water out of the culvert and causing a backing up of the water, and is worth noting for future flood risk management.

It is not known whether the section of riverbank which collapsed on 07 February 2014 downstream of the Jaguar garage was at risk of failure prior to the flooding or whether the exceptional rainfall on 06 February 2014 caused the collapse.

The EA do not undertake maintenance on the River Misbourne under their routine maintenance schedule. Therefore the maintenance should be undertaken by the respective Riparian Owner. The EA's 'Living on the Edge' booklet provides guidance on riparian owner responsibilities.

### **3.4 What happened?**

Old Amersham experienced a prolonged period of flooding from November 2013 to mid-February 2014, with two particularly severe flooding events on and around 17 January and 06/07 February 2014. Due to the saturated catchment, when large amounts of rainfall fell on the area it ran off the fields in large volumes. The large amounts of surface water in addition to the high river levels meant that the capacity of the River Misbourne and highway drainage was exceeded. Several flow restrictions within drainage assets meant the drainage infrastructure was not able to adequately convey the additional flows from surface and highway runoff, and the riverbank collapse caused additional difficulties, with water flowing from the river into the surrounding areas. A

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detailed account of the events is given below, while the main stages of the emergency response are covered in section 3.6. As a note, section 2.2 covers the response following the August 2013 flooding, which is pertinent to the event described in this report.

High river levels, causing flooding to a section of Barn Meadow and some gardens backing onto the River Misbourne, were identified as being problematic as early as November 2013. The EA arranged for an independent contractor to carry out an inspection of the culvert using specialist sonar equipment in early December 2013. This was not possible as there were only two such pieces of equipment working in the country at the time. At the start of January 2014, the EA used another method to assess the flow through the culvert, determining that while there remained a flow through the culvert, there was a reduction in capacity due to the possible presence of material.

The internal property flooding in Old Amersham started around 17 January 2014: a flap valve installed to drain surface water from the High Street to the River Misbourne (but prevent river water from flowing back up onto the street) had been lodged open by debris, including brick rubble. It is still not known whether this blockage was intentional or not. This caused water to back up out of the river through a gully near the Methodist Church and flow down the High Street eastward. Because river levels were high, water which had backed up was not able to re-join the River Misbourne until it reached the gullies near Church Street on the north side of the High Street. In the process, the High Street was flooded both along the road and above the kerb line, with water entering the basement of the Elephant & Castle pub on and after 17 January 2014. Parking of vehicles with the front wheels touching the kerb contributed in places to the diversion of water over the pavement. Sandbags and FloodSax® installed by Chiltern District Council and the Environment Agency on 17 January 2014 were moved, hampering the RMAs' efforts to redirect flows. It is not known who moved the temporary defences or why they were moved. Following an investigation by the EA which revealed the cause of the flooding, the rubble obstructing the flap valve was removed on 18 January 2014. The flap valve was closed, resulting in a seal of approximately 80%, which was sufficient to reduce flows along the High Street.

The most severe flooding event started overnight between 06 and 07 February 2014,



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with several properties along the High Street continuing to be flooded internally for several days subsequently. Having identified a partial flow restriction within the culvert underneath The Maltings as the primary cause of the problem, the EA started jetting to clear the obstruction on 12 February 2014. Prior to the jetting having started, the EA installed a bypass pumping system around the culvert to reduce the level of water retained upstream affecting the properties along the High Street. Although this flow restriction had been identified earlier, high river levels prevented the safe removal (in terms of the safety of the jetting crew, the risk of pollution incidents and downstream flooding risk) of the restriction until mid-February 2014. The nationwide flooding situation also partly contributed to the delay, as equipment was in use at other locations. Following the jetting of the culvert on and after the 12<sup>th</sup> of February 2014, no further flooding occurred in Old Amersham, demonstrating the effectiveness of the culvert clearing operation and the ability of the culvert to pass high flows when operating correctly.

A section of the riverbank downstream of the Jaguar garage (near the A355) collapsed on 07 February 2014, causing water to back up and flood the Jaguar garage workshop. The collapse was repaired on 07 February 2014, and a boom was also installed to prevent any water pollution, since oil tanks (containing around 100,000 litres of oil) present on the garage premises came close to being overtopped. A fallen tree at the same location caused river levels to rise more by preventing the free flow of water.

In total, the flooding caused at least 4 residential properties and 5 business premises to flood internally. These numbers are based on instances of internal flooding as reported to the RMAs; more properties may have been affected. In addition, business activities were indirectly affected by the flooding on the High Street which affected parking and pavement usage by customers.

### 3.5 Possible causes

#### *The weather conditions*

- Continued high levels of rainfall throughout December 2013, January and February 2014 (see figure 8).
- Peaks in the rainfall on 23 December 2013; 01, 03, 29 and 31 January and 06



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February 2014 (see figure 8).

- Saturated soils due to exceptionally high groundwater levels.

#### *The condition of the main river*

- The water levels in the River Misbourne were high due to above-average rainfall and exceptionally high groundwater levels.
- The culvert under The Maltings was partially restricted and caused water to back up.
- A section of the riverbank downstream of the Jaguar garage collapsed.
- A fallen tree downstream of the Jaguar garage further impeded the flow of water.

#### *The condition of highway ditches and drainage*

- Tampering or damage to a flap valve caused water from the River Misbourne to back up and flow eastward down the High Street. Reports that this flow also occurred in March and August 2013 indicate that the valve may have been in this condition for some time.
- High river levels prevented the return flow of water from the High Street to the Misbourne through several valves downstream of the tampered one.
- The highway drainage was full to capacity and unable to take the full volume of flow.

### **3.6 Incident response**

Table 1 below summarises the main incident response activities that took place in relation to this event.

Following the event, those residents and businesses that reported experiencing internal flooding of their property to CDC were advised to apply for support under the Repair and Renew Grant funded by Central Government. They were also advised to take advantage of council tax exemptions and business rate rebates and of the support scheme available to businesses.

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**Table 1:** Incident response

| Date and time            | Activity/event  | Agency           |
|--------------------------|---|------------------|
| 22 November 2013         | Contracts Manager at Amersham Town Council informs the Amersham Town Clerk of high river levels in Barn Meadow and in gardens of properties on the north side of the High Street. | ATC              |
| 13 December 2013         | EA newsletter to residents published and distributed, informing of high river levels and investigation.   | EA               |
| 09 January 2014          | EA team visit Old Amersham to investigate culvert.  | EA               |
| 15 January 2014          | CDC Emergency Planning Officer undertakes site visit in Old Amersham.   | CDC              |
| 17 January 2014          | EA and CDC distribute sandbags to protect properties at risk from High Street flooding.   | EA & CDC         |
| 18 January 2014          | Removal of obstruction to flap valve, ending the bulk of the flooding of the High Street.   | EA               |
| 18 January 2014          | Investigation reveals partial flow restriction within the culvert underneath The Maltings.  | EA               |
| 21 January 2014          | Multi-agency meeting organised in response to high river levels.  | RMAs (CDC chair) |
| 24 January 2014          | EA newsletter to residents published and distributed, informing of culvert flow restriction and planned repairs.  | EA               |
| Week of 03 February 2014 | Distribution of FloodSax ® to properties with gardens flooding.   | CDC              |
| 04 February 2014         | EA newsletter to residents published and distributed, informing of delays in culvert restriction clearance.   | EA               |
| 05 February 2014         | ATC supplies 200 sandbags and clears debris in the garden of one High Street property.  | ATC              |
| 06 February 2014         | Hatfield Area Incident Room opened to respond to widespread flooding in the EA Hertfordshire & North London area.   | EA               |
| 06 February 2014         | Blockage in storm drain overflow removed near the superstore.   | CDC              |

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|                     |   |                               |
|---------------------|---|-------------------------------|
| 06 February 2014    | Door-knocking to update High Street residents of situation.   | CDC                           |
| 06 February 2014    | Pump installed to alleviate flooding caused by culvert flow restriction.  | EA                            |
| 07 February 2014    | Truck full of FloodSax ® brought to Old Amersham, distributed to residents.   | CDC                           |
| 07 February 2014    | Bank collapse downstream of the Jaguar garage – CDC, Bucks Fire & Rescue, tenant farmer and EA collaboration to restore the river bank using 28 Hippo bags.   | CDC, BFRS, tenant farmer & EA |
| 07 February 2014    | Bank collapse downstream of the Jaguar garage – EA deploy a boom to prevent water pollution.  | EA                            |
| 07 February 2014    | Tree removed from Misbourne downstream of the Jaguar garage, lowering water levels by 100-150mm.  | EA                            |
| 08 February 2014    | CDC Council offices open on the weekend to allow for resident pickup of FloodSax ®.   | CDC                           |
| 08 February 2014    | ATC staff offer assistance to Old Amersham residents via door-knocking, FloodSax distribution and assistance with furniture transport.  | ATC                           |
| 10 February 2014    | Jetting of restricted culvert begins.   | EA                            |
| 11-12 February 2014 | Jetting of restricted culvert continues. Water level dropped by 300mm when jetted on 11/02 and dropped another 300mm on 12/02. 12/02: EA estimates that 98% of flow is going through the culvert following jetting. | EA                            |
| 23 April 2014       | Flood Surgery (covering flooding in Old Amersham and other areas) organised with presence of EA, BCC (flood management and Transport for Buckinghamshire), CDC and Thames Water.                                    | EA                            |
| 02 July 2014        | Multi-agency meeting held to discuss culvert flow restriction prevention and general flood risk.  | RMAs (CDC chair)              |

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|               |  |                      |
|---------------|--|----------------------|
| Mid-July 2014 | Agreement in principle to remove weirs in Misbourne (action from 02 July meeting) between EA and riparian owners | EA & Riparian owners |
|---------------|--|----------------------|

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## 4. Responsible Authorities and landowners

There are different responsibilities for flood management depending on the type of flooding. Organisations responsible for flooding are known as Risk Management Authorities (RMAs) and their responsibilities are detailed below. Riparian landowners also have responsibilities for watercourses across their land and these are also detailed below. These are summaries of the details included in the Buckinghamshire County Councils Local Flood Risk Management Strategy (2013-2018).

### 4.1 Lead Local Flood Authority

The Lead Local Flood Authority in this area is Buckinghamshire County Council. Buckinghamshire County Council has a role as a RMA in coordinating management of local flood risk from surface water, ground water and ordinary watercourses in the county.

### 4.2 Chiltern District Council

Chiltern District Council have responsibilities to inspect and maintain watercourses on District Council land, respond to requests for assistance during flood events and have the power, if instructed by Buckinghamshire County Council, to carry out flood risk management work which will benefit management of surface runoff, groundwater and ordinary water courses.

### 4.3 Environment Agency

The Environment Agency is one of the RMAs as defined by the Flood and Water Management Act 2010. Protecting the river environment and managing flood risk is part of their job. The EA is the RMA for flooding from main rivers.

### 4.4 Highways Authority – Transport for Buckinghamshire

Any flooding from highways is managed by the Highways Authority which is BCC and the highways function is managed by TfB.

### 4.5 Water Utility Company – Thames Water

Thames Water is responsible for flooding from foul sewers and surface water sewers



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which they own. Whilst undertaking this they must manage flood risk from sewers.

#### **4.6 Landowners and riparian owners**

Landowners and riparian owners must maintain any culvert, or the bed and banks of any adjacent watercourse. They should clear away any debris from the watercourse or culvert even if it did not originate from their land.

Riparian owners can find further guidance on their responsibilities as landowners in the Environment Agency document 'Living on the Edge' which can be found online at [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/297423/LIT\\_7114\\_c70612.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297423/LIT_7114_c70612.pdf).

#### **4.7 Residents**

Residents have a responsibility to take measures to protect themselves and their property when flooding is imminent.

#### **4.8 Emergency Responsibilities**

The emergency responsibilities are outlined in table 2 below. Please note that Parish and Town Councils do not have a legal obligation to respond to emergencies. Whatever service they provide is voluntary and unique to each Parish or Town Council.



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**Table 2:** Roles and responsibilities in an emergency, during and after a flood event

|  |   |
|--|---|
| <p><b>Local (County and District) Authorities</b></p> <ul style="list-style-type: none"> <li>• Coordinate emergency support within their own functions</li> <li>• Deal with emergencies on 'non main rivers'</li> <li>• Coordinate emergency support from the voluntary sector</li> <li>• Liaise with central and regional government departments</li> <li>• Liaise with essential service providers</li> <li>• Open rest centres</li> <li>• Manage the local transport and traffic networks</li> <li>• Mobilise trained emergency social workers</li> <li>• Provide emergency assistance</li> <li>• Deal with environmental health issues, such as contamination and pollution</li> <li>• Coordinate the recovery process</li> <li>• Manage public health issues</li> <li>• Provide advice and management of public health</li> <li>• Provide support and advice to individuals</li> <li>• Assist with business continuity</li> </ul> |   |
| <p><b>Police Force</b></p> <ul style="list-style-type: none"> <li>• Save life</li> <li>• Coordination and communication between emergency services and organisations providing support</li> <li>• Coordinate the preparation and dissemination</li> </ul> <p><b>Fire and Rescue Service</b></p> <ul style="list-style-type: none"> <li>• Save life rescuing people and animals</li> <li>• Carry out other specialist work, including flood rescue services</li> <li>• Where appropriate, assist people where the use of fire service personnel and equipment is relevant</li> </ul> <p><b>Ambulance Service</b></p> <ul style="list-style-type: none"> <li>• Save life</li> <li>• Provide treatment, stabilisation and care at the scene</li> </ul>  | <p><b>Utility Providers</b></p> <ul style="list-style-type: none"> <li>• Attend emergencies relating to their services putting life at risk</li> <li>• Assess and manage risk of service failure</li> <li>• Assist with recovery process, that is, water utilities manage public health considerations</li> </ul> <p><b>Internal Drainage Board</b></p> <ul style="list-style-type: none"> <li>• Operate strategic assets to reduce flood risk in partnership with RMAs and public</li> </ul> <p><b>Town and Parish Councils</b></p> <ul style="list-style-type: none"> <li>• Support emergency responders</li> <li>• Increase community resilience through support of community emergency plan development</li> </ul> <p><b>Voluntary services</b></p> <ul style="list-style-type: none"> <li>• Support rest centres</li> <li>• Provide practical and emotional support to those affected</li> <li>• Support transport and communications</li> <li>• Provide administration</li> <li>• Provide telephone helpline support</li> </ul> |
| <p><b>Environment Agency</b></p> <ul style="list-style-type: none"> <li>• Issue Flood Warnings and ensure systems display current flooding information</li> <li>• Provide information to the public on what they can do before, during and after a flood event</li> <li>• Monitor river levels and flows</li> <li>• Work with professional Partners and stakeholders and respond to requests for flooding information and updates</li> <li>• Receive and record details of flooding and related information</li> <li>• Operate water level control structures within its jurisdiction and in line with permissive powers</li> <li>• Flood event data collection</li> <li>• Arrange and take part in flood event exercises</li> <li>• Respond to pollution incidents and advise on disposal</li> <li>• Assist with the recovery process, for example, by advising on the disposal of silt, attending flood surgeries</li> </ul>         |   |

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## 5. Conclusions and recommendations

### 5.1 Conclusions

A number of issues contributed to the prolonged flooding and two severe flood events that occurred in Old Amersham, and can be summarised as follows:

- The water levels in the River Misbourne were high due to above-average prolonged rainfall and exceptionally high groundwater levels.
- The culvert under The Maltings was partially restricted and caused water to back up.
- A section of the riverbank downstream of the Jaguar garage collapsed.
- Tampering or damage to a flap valve caused water from the River Misbourne to back up and flow eastward down the High Street.
- High river levels prevented the return flow of water from the High Street to the Misbourne through several valves downstream of the tampered one.

### 5.2 Recommendations

The recommendations are summarised in table 3 below. Many of the actions cover the maintenance of watercourses and highway drainage. The table also includes some more strategic actions, for example encouraging RMAs to work closely on the potential EA-led Misbourne scheme. The recommendations are not only for the RMAs but also for riparian owners and Old Amersham residents.

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**Table 3:** Recommendations

| <b>Authority / Stakeholder</b> | <b>Recommended Actions</b>  |
|--------------------------------|---|
| All RMAs                       | <ul style="list-style-type: none"> <li>• Organise a vegetation management demonstration day for local residents and landowners, led by the EA.</li> <li>• Make improvements to the emergency response and coordination from all RMAs.</li> <li>• In the event of a future culvert flow restriction, all RMAs to consider what remediation options are available.</li> <li>• Work in partnership to deliver the EA-led Misbourne scheme, if this is successfully funded. If it is not, work in partnership to come up with alternative funding and/or solutions.</li> </ul>  |
| EA                             | <ul style="list-style-type: none"> <li>• Distribute 'Living on the Edge' booklets to residents and landowners adjacent to the River Misbourne in Old Amersham and in impacting/impacted areas.</li> <li>• If required, use enforcement action under Section 25 of the Land Drainage Act where land owners have failed to maintain/remove obstructions from the Misbourne.</li> <li>• Provide training on culvert flow restriction detection and reporting to relevant stakeholders.</li> <li>• Look at flood management options on the Misbourne and/or land management practices upstream of Amersham with appropriate RMAs and landowners.</li> <li>• Consider installing a telemetered river level gauge closer to Old Amersham to improve the accuracy of the flood warning service.</li> </ul> |

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|     |   |
|-----|---|
| TfB | <ul style="list-style-type: none"> <li>• For TfB culverts from and including Mill Lane to and including the culvert under the A413 southwest of the A413/London Road West/Stanley Hill roundabout: <ul style="list-style-type: none"> <li>○ Continue inspecting culverts above 900mm in diameter in line with current codes of practice, which entail general inspection every two years and principal inspection every 6 years.</li> <li>○ For culverts below 900mm in diameter, TfB to continue using the expertise of local area-based teams who look at all road infrastructure aspects in their area. Upon noticing issues, these will be raised as concerns or as work orders.</li> </ul> </li> <li>• As planned, conduct the jetting of drains and gullies along the High Street during the scheduled September 2014 road closure for the Amersham fair. If flow restrictions or other problems are detected as part of the jetting exercise, repair of these should be prioritised in the schedule.</li> <li>• Continue to carry out cleansing of all gullies and highway drainage as part of the ongoing maintenance schedule.</li> <li>• To ensure the open sections of the River Misbourne located on Highways-owned land are maintained in agreement with the EA.</li> <li>• CDC street cleaning teams and TfB to consider coordinating their work on autumn leaves removal and gully emptying, in partnership with the community regarding potential road closures.</li> </ul> |
| BCC | <ul style="list-style-type: none"> <li>• Ensure the owners of culverts and watercourses/ditches within the area are aware of their responsibilities.</li> <li>• Facilitate sharing of information between RMAs and the community.</li> </ul>  |

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|                     |  |
|---------------------|--|
| CDC                 | <ul style="list-style-type: none"> <li>• Continue to aid residents of Old Amersham if they wish to apply for the Repair and Renew grant offer from Central Government.</li> <li>• Continue to encourage Old Amersham businesses to take up the flood recovery support available to them via CDC. This includes the Repair and Renew grant, the business support scheme and business rates relief.</li> <li>• Consider a targeted promotional campaign to encourage use of garden waste bins and/or waste recycling centres (with an emphasis on flood alleviation), in coordination with the planned vegetation management activities mentioned above.</li> <li>• CDC street cleaning teams and TfB to consider coordinating their work on autumn leaves removal and gully emptying, in partnership with the community regarding potential road closures.</li> <li>• To discuss setting up an Amersham Flood Action Group with residents, landowners and relevant RMAs.</li> </ul>   |
| Thames Water        | <ul style="list-style-type: none"> <li>• Share the outcomes of their information gathering exercise for catchments affected by infiltration problems with other RMAs.</li> <li>• Work with other RMAs to address potential infiltration problem.</li> </ul>  |
| Affinity Water      | <ul style="list-style-type: none"> <li>• Work with other RMAs to understand the potential flood risk implications of any abstraction reduction plans.</li> </ul>   |
| Riparian Landowners | <ul style="list-style-type: none"> <li>• Ensure that the River Misbourne banks are maintained in a suitable manner. The guidance given in the EA's 'Living on the Edge' booklet regarding riparian owner responsibilities should be followed. The Chilterns Chalk Streams Project's 'Managing the River Misbourne' booklet also provides useful guidance and is available here: <a href="http://www.chilternsaonb.org/uploads/files/CCSP/misbourne_awareness_web.pdf">http://www.chilternsaonb.org/uploads/files/CCSP/misbourne_awareness_web.pdf</a></li> <li>• Undertake clearance of vegetation and debris on the Misbourne with guidance from relevant RMAs.</li> <li>• Riparian landowners not to dump waste (including garden waste, tree cuttings and woody debris) into the river or on the riverbanks.</li> <li>• Riparian owners of relevant culverts (as determined by the RMAs) to install appropriately-sized and -designed trash screens.</li> <li>• Owners of footbridges to ensure structures are firmly fastened to the bank and do not include elements at risk of being washed downstream in the event of a flood (e.g. semi-rotten sleepers).</li> <li>• Seek permission from the EA prior to installation any new footbridges.</li> </ul> |

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|           |  |
|-----------|--|
| Residents | <ul style="list-style-type: none"><li>• Sign up for the Environment Agency’s Floodline Warnings Direct, where available.</li><li>• Residents are not to move emergency flood measures deployed by agencies (e.g. sandbags).</li><li>• Residents are not to move/block infrastructure in and around the river (e.g. flap valves).</li><li>• Take advantage of the Repair and Renew grant if their property was flooded during the winter of 2013/4.</li><li>• Take measures to protect themselves and their property against flooding.</li><li>• Continue to document and photograph flood incidents where possible and report flooding to CDC and/or BCC and EA.</li><li>• Consider forming a Flood Action Group.</li><li>• Residents not to dump waste (including garden waste, tree cuttings and woody debris) into the river or on the riverbanks. The Chilterns Chalk Streams Project’s ‘Managing the River Misbourne’ booklet provides useful guidance and is available here:<br/><a href="http://www.chilternsaonb.org/uploads/files/CCSP/misbourne_awareness_web.pdf">http://www.chilternsaonb.org/uploads/files/CCSP/misbourne_awareness_web.pdf</a></li></ul> |
|-----------|--|

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## Explanation of Acronyms

| Acronym | Definition                            |
|---------|---------------------------------------|
| CDC     | Chiltern District Council             |
| BCC     | Buckinghamshire County Council        |
| BGS     | British Geological Survey             |
| EA      | Environment Agency                    |
| FWMA    | Flood and Water Management Act        |
| LLFA    | Lead Local Flood Authority            |
| RMA     | Risk Management Authority             |
| TfB     | Transport for Buckinghamshire         |
| ATC     | Amersham Town Council                 |
| BFRS    | Buckinghamshire Fire & Rescue Service |

## References

| Reference in document                         | Refers to:   |
|---|--|
| Amersham Town Council, 05 August 2013         | Amersham Town Council (2013). Email from Steve Catanach, Amersham Town Council, to Martin Brooks, resident, on 05 August 2013.               |
| Environment Agency, 13, 15 and 23 August 2013 | Environment Agency (2013). Email from Paul Etienne, Environment Agency, to Janet Wheeler, Amersham Town Council, on 13 August 2013 at 12:34. |
|   | Environment Agency (2013). Email from Paul Etienne, Environment Agency, to Janet Wheeler, Amersham Town Council, on 13 August 2013 at 14:48. |
|   | Environment Agency (2013). Email from Paul Etienne, Environment Agency, to Janet Wheeler, Amersham Town Council, on 15 August 2013.          |
|   | Environment Agency (2013). Email from Paul Etienne, Environment Agency, to Janet Wheeler, Amersham Town Council, on 23 August 2013.          |
| BGS online map, 2014                          | <a href="http://mapapps.bgs.ac.uk/geologyofbritain/home.html">http://mapapps.bgs.ac.uk/geologyofbritain/home.html</a>                        |

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|                        |  |
|------------------------|--|
| EA, 2013               | Updated flood maps for surface water <a href="http://www.ufmfsw.com">http://www.ufmfsw.com</a>   |
| EA, 2014               | Environment Agency flood map <a href="http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&amp;y=355134.0&amp;scale=1&amp;layerGroups=default&amp;ep=map&amp;textonly=off&amp;lang=_e&amp;topic=floodmap&amp;utm_source=Poster&amp;utm_medium=FloodRisk&amp;utm_campaign=FloodMonth13">http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&amp;y=355134.0&amp;scale=1&amp;layerGroups=default&amp;ep=map&amp;textonly=off&amp;lang=_e&amp;topic=floodmap&amp;utm_source=Poster&amp;utm_medium=FloodRisk&amp;utm_campaign=FloodMonth13</a> |
|                        | Contains Environment Agency information © Environment Agency and database right  |
| Chiltern Society, 2001 | Chiltern Society (2001). <i>The Great Deluge</i> (unpublished report). The Chiltern Society, Chesham.  |
| EA, February 2014      | Environment Agency (February 2014). <i>Monthly Water Situation Report, South East Region, North East Thames Area.</i>  |

## Contacts

### Lead Local Flood Authority



Flood Management Team  
Buckinghamshire County Council  
County Hall, Walton Street  
Aylesbury  
Bucks HP20 1UY

Telephone: 084537 08090

Email: [FloodManagement@buckscc.gov.uk](mailto:FloodManagement@buckscc.gov.uk)

Website: [www.buckscc.gov.uk/flooding](http://www.buckscc.gov.uk/flooding)

### Environment Agency



**Environment  
Agency**

National Customer Contact Centre  
PO Box 544  
Rotherham S60 1BY

Telephone: 03708 506506

Email: [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)



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Website: <http://www.gov.uk/government/organisations/environment-agency>

### **District Council**



**Chiltern**  
District Council

Chiltern District Council  
King George V House, King George V Road  
Amersham HP6 5AW

Telephone: 01494 729000

Email: [info@chiltern.gov.uk](mailto:info@chiltern.gov.uk)

Website: <http://www.chiltern.gov.uk/flooding>

### **Highways Authority**

Transport for Buckinghamshire

Telephone: Transport and roads – 0845 2302882

Out of hours emergencies (Highways) – 01296 486630

Email: [fb@buckscc.gov.uk](mailto:fb@buckscc.gov.uk)

Website: <http://www.transportforbucks.net/Transport-and-roads.aspx>

### **Water Utility**



Thames Water  
PO Box 286  
Swindon  
SN38 2RA

Telephone: 0845 9200 800

Website: <http://www.thameswater.co.uk/help-and-advice/16739.htm>

### **Emergency Response**

#### **Buckinghamshire Fire and Rescue Service**

Address: Buckinghamshire Fire & Rescue Service, Brigade HQ, Stocklake, Aylesbury,  
Bucks, HP20 1BD

Telephone: 01296 744400



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Website: <http://www.bucksfire.gov.uk/BucksFire/Contact+Us/>

**Thames Valley Police**

Telephone: 101 in non-emergency, 999 in emergency

Website: <http://www.thamesvalley.police.uk/contactus-phone.htm>

**Buckinghamshire Ambulance Service**

Telephone: 111 in non-emergency, 999 in emergency

Website: <http://www.southcentralambulance.nhs.uk/content/press-release/buckinghamshire/flooding-advice.ashx>



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## Appendices

### Appendix A: BCC criteria for a Section 19 Investigation

- Internal flooding (including to basements) to five or more residential properties within an area of 1km<sup>2</sup>
- Internal flooding of two or more business premises within an area of 1km<sup>2</sup>
- Internal flooding (including to basement) of at least one property for one week or longer
- Flooding of one or more items of critical infrastructure, which could include hospitals, health centres, clinics, surgeries, colleges, schools, day nurseries, nursing homes, emergency services (police, fire, ambulance) stations, utilities and substations.
  
- Caused a transport link to be impassable for the following periods:
  - Motorways, trunk roads and major rail links – 2 hours or more
  - Class A and B highways and other railway links – 4 hours or more
  - Class C highways – 10 hours or more unless the route is the only means of access, or is primary route for critical infrastructure then reduce to 4 hours
  - Class U highways – 24 hours or more unless the route is the only means of access, or is primary route for critical infrastructure then reduce to 4 hours
  
- Any flooding event that a risk management authority deems significant does not meet the agreed thresholds should be brought to the next strategic flood management committee for consideration.

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**Appendix B: Photos taken by residents of Old Amersham and RMAs.**



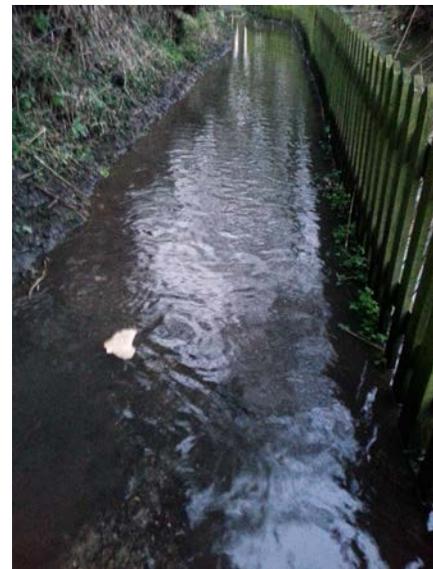
High Street Public House garden flooding. Photo courtesy of Glynis Chanell, 30/01/14



High Street flooding. Photo courtesy of Sam Richards, 09/01/14



Jaguar garage repair shop. Photo courtesy of Glynis Chanell, 30/01/14



Path into Barn Meadow. Photo courtesy of Glynis Chanell, 07/02/14

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High Street – internal property flooding. Photo courtesy of Stephanie & Martin Brooks, 08/02/14



High Street – internal property flooding. Photo courtesy of Stephanie & Martin Brooks, 07/02/14



High Street – internal property flooding. Photo courtesy of Stephanie & Martin Brooks, 08/02/14



High Street – garden flooding. Photo courtesy of Stephanie & Martin Brooks, 08/02/14

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The Misbourne at Church Mead. Photo courtesy of Peter Borrows, 08/02/14



The Misbourne near the New Rectory. Photo courtesy of Peter Borrows, 08/02/14



High Street, Old Amersham. Photo courtesy of Peter Borrows, 10/02/14



Flooded footpath to Barn Meadow from Mill Lane. Photo courtesy of Peter Borrows, 10/02/14.



Jetting contractor vehicle parked in School Lane. Photo courtesy of Peter Borrows, 10/02/14.



EA pumps. Photo courtesy of Bucks Examiner.

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The Misbourne alongside Barn Meadow. Photo courtesy of Sam Richards, 09/01/14



High Street flooding. Photo courtesy of Sam Richards, 09/01/14



The Misbourne alongside Barn Meadow. Photo courtesy of Sam Richards, 09/01/14



High Street flooding. Photo courtesy of Sam Richards, 09/01/14

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Flooding at The Maltings. Photo courtesy of Laura Mowat.



Internal property flooding on the High Street. Photo courtesy of Laura Mowat.

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