26th January 2015

Buckinghamshire County Council

Flood Investigation Report

The Orchards Residential Park, Wexham

December 2013 – February 2014

Photos courtesy of Tingdene Park Homes, 10th February 2014.

Revision Schedule

Buckinghamshire County council
Flood Investigation Report

26th January 2015
Final Revision number 2

Rev	Date	Details	Author	Checked and Approved by
1	16/12/2014	Draft for Review	Jessica Dippie	Karen Fisher
2	26/01/2015	Final Report	Jessica Dippie	Karen Fisher

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Executive Summary

This report has been produced by Buckinghamshire County Council (BCC) to investigate the flooding that occurred at The Orchards Residential Park in Wexham between December 2013 and February 2014. The report provides details of the event and makes recommendations for Risk Management Authorities (RMAs) to undertake to reduce future flood risk.

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 RMAs 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.

Although this flood event did not meet BCCs criteria for carrying out a Section 19 Investigation it was deemed necessary to produce this report as decided by the Buckinghamshire Strategic Flood Management Committee.

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 the management of flood risk in the future.

The flood event at The Orchards Residential Park occurred after a prolonged period of above average rainfall which caused the groundwater levels to rise and an increased volume of surface water. The private combined drainage was overwhelmed with surface water and groundwater causing localised flooding at low points. The event posed serious environmental and public health risks due to standing contaminated flood water. A list of recommendations is included which, if followed, should prevent this event from reoccurring.

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 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 at The Orchards even though it did not meet BCCs criteria. This was decided by the Buckinghamshire Strategic Flood Management Committee, due to the environmental and public health risk posed to those residents affected.

1.2 Site location

The Orchards Residential Park has approximately 200 properties and is located East of Middle Green in Wexham, as shown in Figure 1.

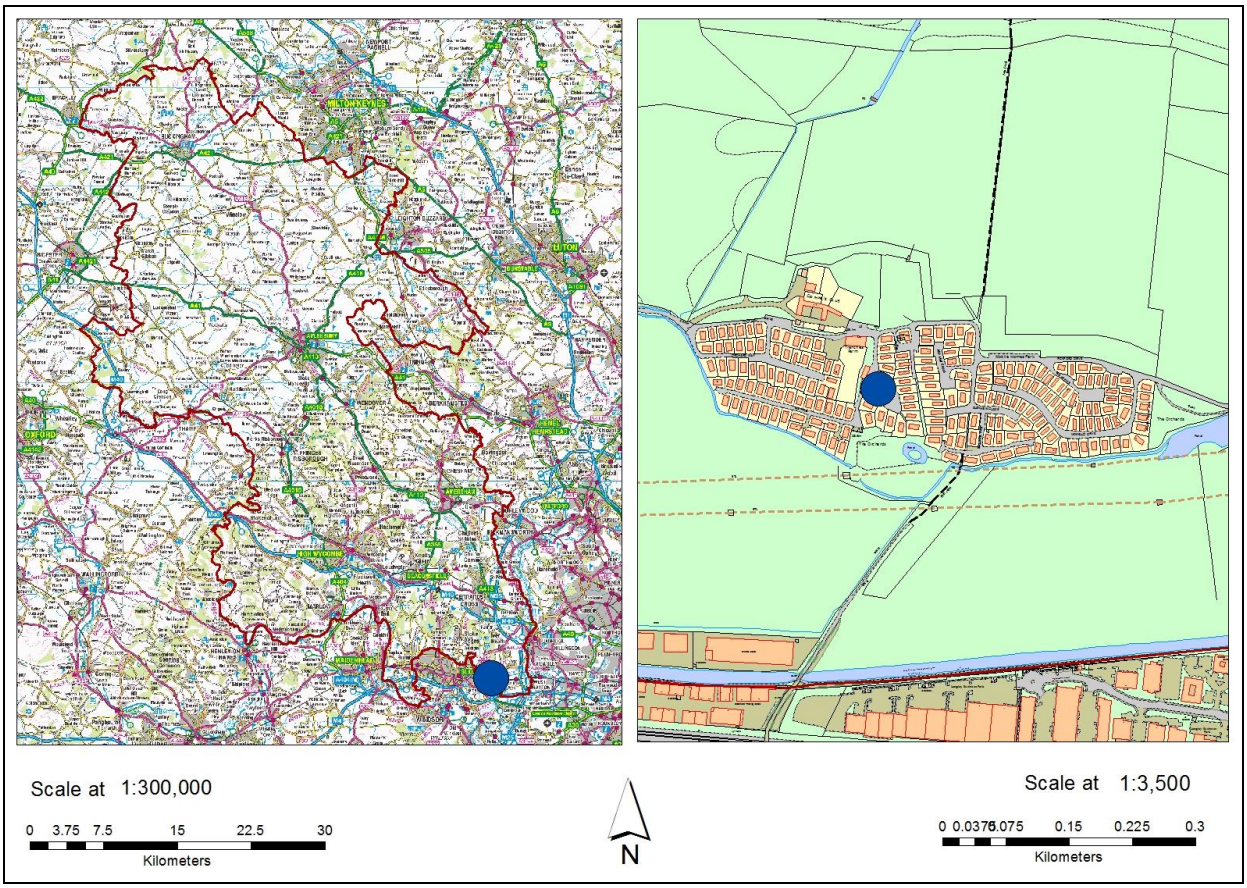

Figure 1 Location maps for The Orchards Residential Park at County and local level (Ordnance Survey License 100021529 2014)

1.3 Drainage system and river network

The drainage system within The Orchards Residential Park is all privately owned by Tingdene Park Homes, who are the maintenance company and land owner. It is thought that the drainage is a combined system which flows from east to west, ending at the Thames Water Pumping Station situated on Middle Green Road to the west of the site.

The river network is separate to the site's combined drainage system. Immediately to the west of the site, two tributaries of the Colne Brook merge to form one tributary (Figure 2). This flows from west to east, following the south boarder of The Orchards. The watercourse feeds two ponds situated to the south of the site (Figure 2). To the east of the site, the watercourse flows under a bridge (Trenches Lane) and eventually joins the Colne Brook. These watercourses are not classified as Main River, therefore BCC are the RMA but the maintenance responsibility falls under riparian owners.

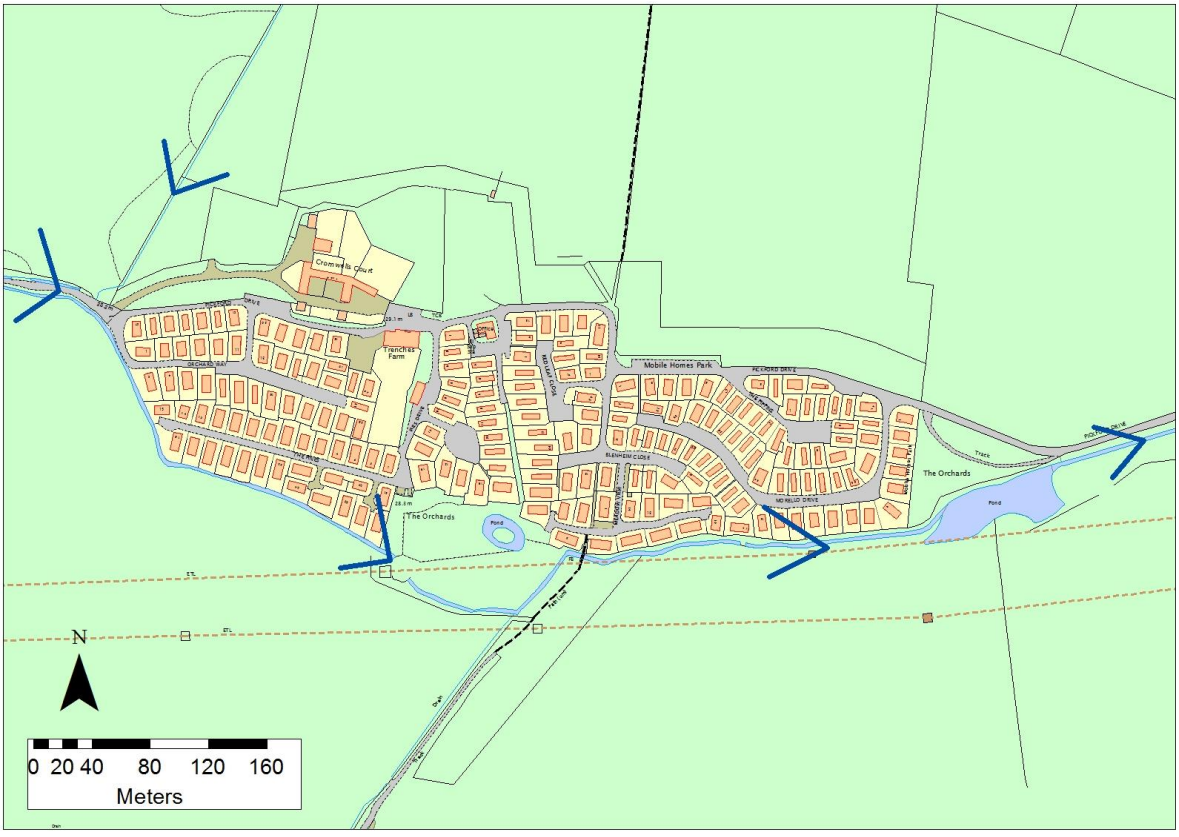

Figure 2 Map showing Colne Brook Tributaries and their direction of flow at The Orchards Residential Park, Wexham (Ordnance Survey License 100021529 2014)

2. Background

2.1 Site characteristics

Figures 3 and 4 below show the fluvial and surface water flood maps for the residential park. The fluvial flood map (see figure 3) shows the flooding which would occur from the rivers in a 1 in 100 year (dark blue) and 1 in 1000 year (light blue) event. The flood water in these situations would come from the river and flow out onto the impacted areas shown on the map. From the Environment Agency's (EA) records The Orchards is affected by fluvial flooding during a 1 in 100 and 1 in 1000 year event.

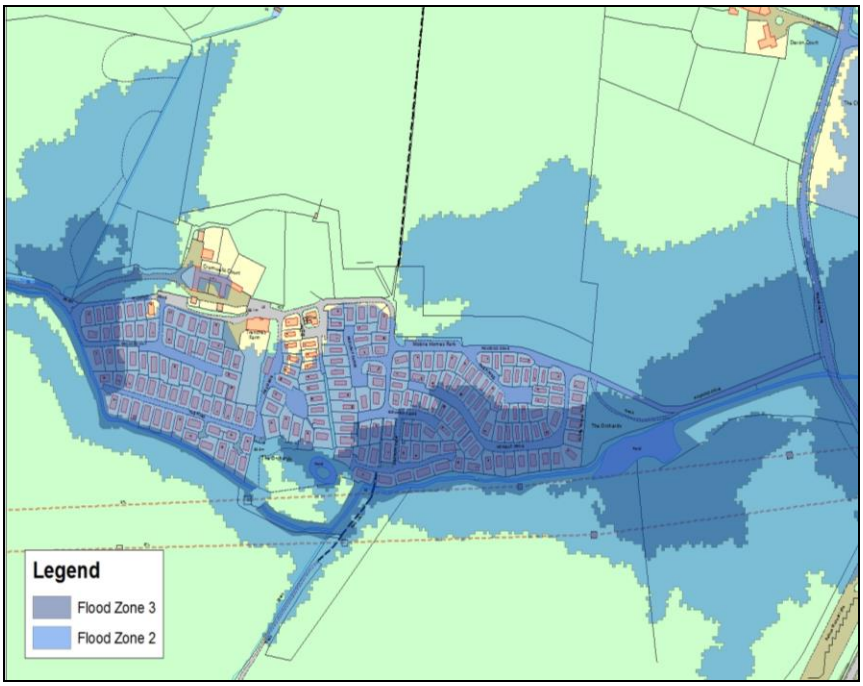

Figure 3 EA flood map showing fluvial flooding for 1:100 year event (flood zone 3) in dark blue and 1:1000 year (flood zone 2) in light blue (EA, 2014) (Ordnance Survey License 100021529 2014)

The surface water flood map (Figure 4) shows the difference in the extent of flooding in the 1 in 30 year, 1 in 100 year and the 1 in 1000 year events for the area surrounding The Orchards. 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.

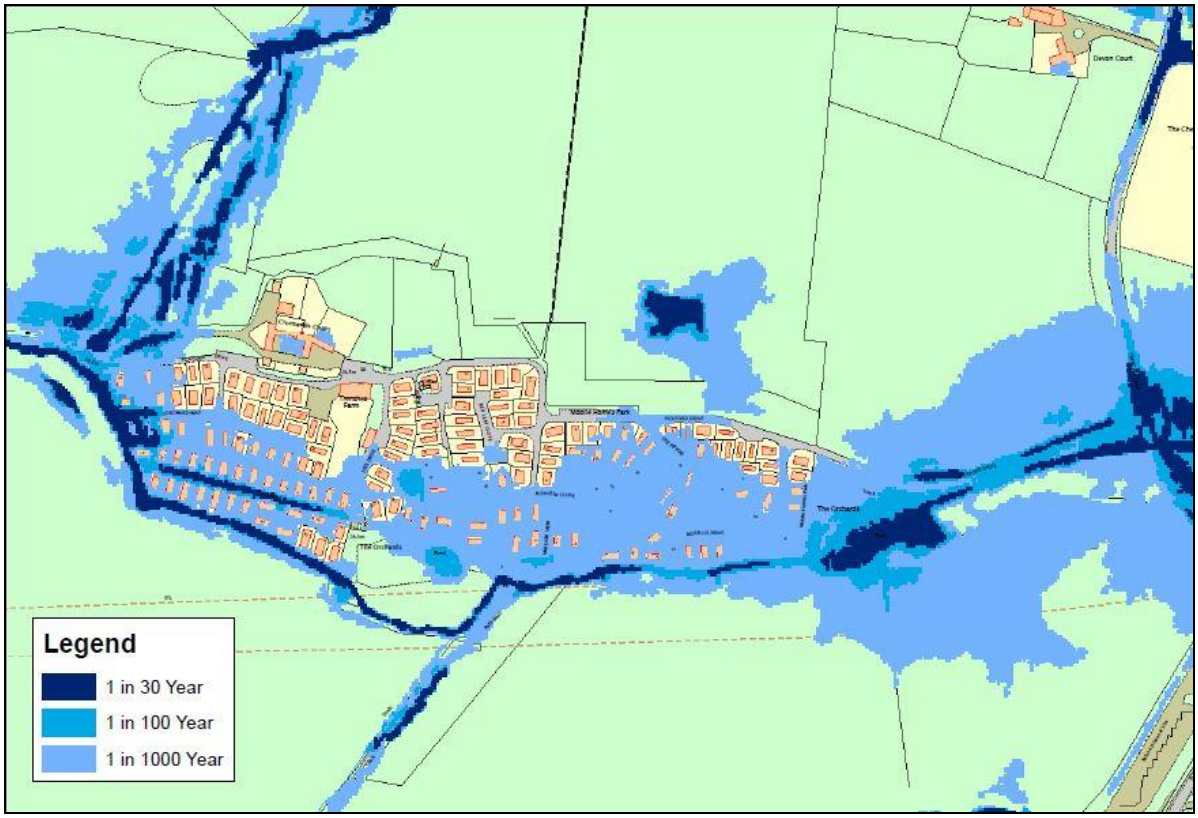

Figure 4 Surface water flood map showing predicted extent across The Orchards (EA, 2014) (Ordnance Survey License 100021529 2014)

From both figure 3 and figure 4 is can be seen that The Orchards is predicted to suffer from both fluvial flooding and surface water flooding mainly in the south of the residential park. The surface water flooding shown in these maps is true to the flooding which was experienced during this flood event. However, it is unlikely that between December 2013 and February 2014 a 1 in 100 year rainfall event occurred. This indicates that it was a combination of high watercourse levels, high groundwater levels and surface water flooding.

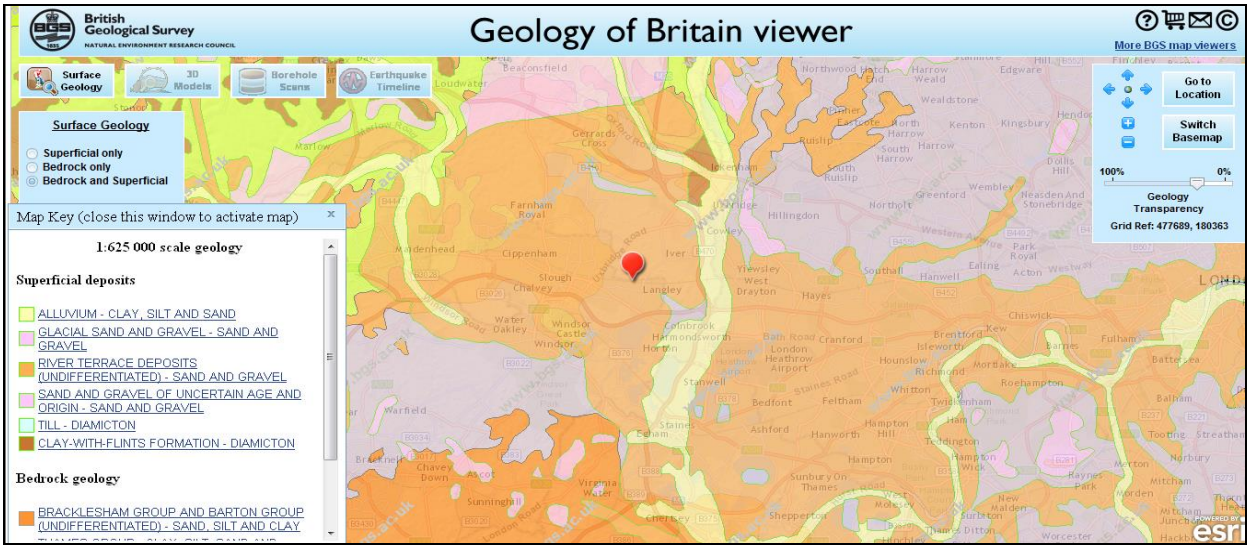

Figure 5 Geology of Wexham (BGS online map, 2014)

The Orchards Residential Park is situated on superficial head (clay, silt, sand and gravel) and the solid geology is also sand, silt and clay (Bracklesham Group and Barton Group) as shown in figure 5 above. The valley of the Colne Brook tributaries slopes from 60mAOD to the north of the site down to 30mAOD where the watercourse flows just south of the residential park. The mixture of a sloping valley and the superficial head shows the likelihood of surface water flooding in this area.

2.2 Previous flood events

There have been no previous flooding events known to Buckinghamshire County Council at this location.

3. Analysis of Flood Event

3.1 Conditions at the time

The EA provided the rainfall data for the period of the event. The nearest EA rain gauge is Iver Heath. Figure 6 below gives the daily rainfall totals from the Iver Heath rain gauge for December, January, February and March. From this data it can be seen that there were constant high levels of rainfall with high peaks of over 20mm in a day during December and February.

Continuous rainfall meant that the ground would have been saturated and the Colne Brook tributaries would have been flowing at full capacity.

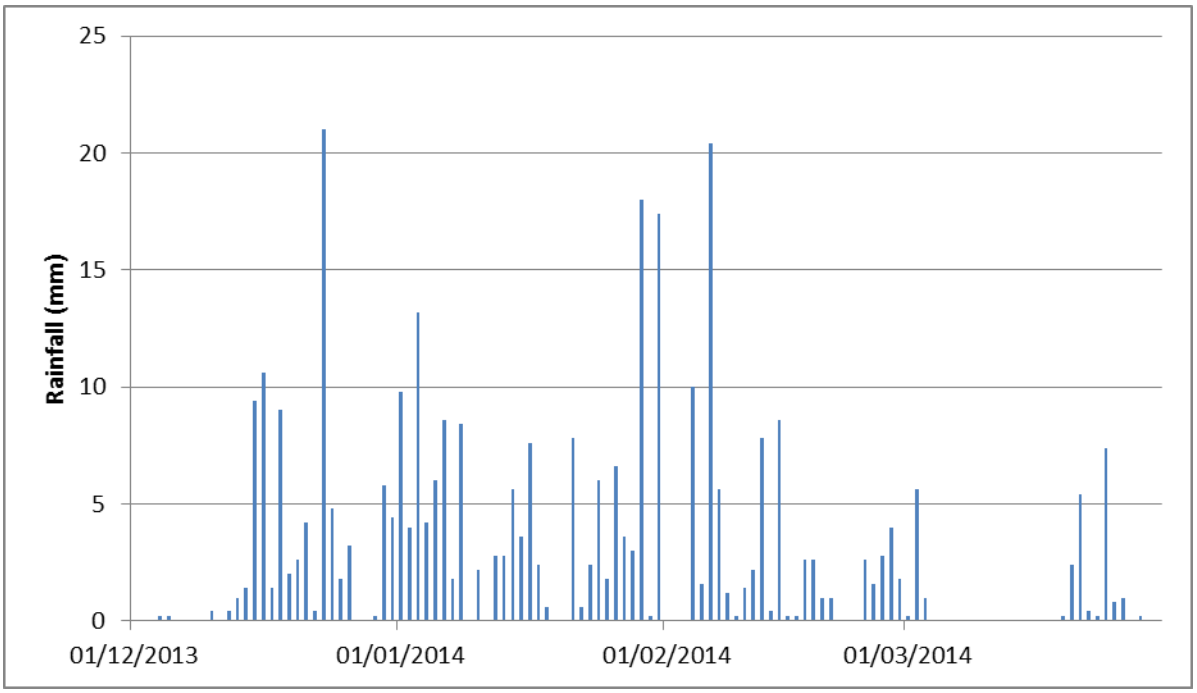

Figure 6 Daily total rainfall for rain gauge at Iver Heath Rain Gauge from December 2013 To March 2014 (EA, 2014)

3.2 Condition of features

The condition of the drainage system within the Orchards Residential Park is unknown as it is a private system and not maintained by Transport for Buckinghamshire (TfB). The drainage is owned and therefore maintained by Tingdene Park Homes.

3.3 Condition of watercourse

The Colne Brook tributaries were in a good condition; they are of a substantial size and are capable of passing large volumes of flow. Following the flood event it was noted that there was log debris within the watercourse, but nothing large enough to cause a significant blockage.

3.4 What happened?

The Orchards Residential Park experienced a prolonged period of flooding from December 2013 to February 2014 with severe flooding at the beginning of February. Due to the saturated catchment, when large amounts of rainfall fell on the area it ran off the fields and hard standing surfaces and entered the combined drainage system, it is likely the system would have already been inundated with groundwater. Due to the large volumes entering the combined system, it backed up and came out of the gully's causing contaminated flood water to pond in areas around the residential park. It was likely the groundwater levels were also high and therefore would have been infiltrating in to the combined sewer, causing a reduced capacity.

Due to the height of the homes in The Orchards, there were no records of internal flooding. However, the flooding posed an environmental and public health risk due to the flood water being contaminated with sewerage. It was observed that there was no fluvial flooding; all flood water came from the combined drainage system.

3.5 Possible causes

The weather conditions

- Continued high levels of rainfall throughout December 2013, January and February 2014 (see figure 6).
- Peaks in the rainfall in December 2013 and February 2014 (see figure 6).
- Saturated soils due to high groundwater levels and continued high levels of rainfall.

The condition of the drainage

- Combined system full to capacity due to groundwater infiltration and excess runoff.

3.6 Incident response

Both South Bucks District Council (SBDC) and TfB responded to the flood event swiftly, providing sand bags and when required and coordinating the removal of surface water via tankers. TfB also provided portable toilets, as resident's toilets could not be flushed. SBDC encouraged some of the most affected properties to evacuate their properties, it is unknown if any residents did.

Necessary items were also donated and distributed by the community such as disinfectant, sanitiser and tinned food.

It was thought by local residents and individuals from different organisations on site at the time, that there was a fault with the Thames Water Middle Green pumping station. Thames Water reported that they received two customer calls in February 2014 regarding flooding close to their Middle Green pumping station. On both occasions they attended the site and reported the pumping station running normally. They carried out extra mitigation by pumping out at the station to provide additional support to the sewer network.

It was noted by everyone on site that there was a sudden receding of flood water towards the end of the flood event, whereby water which had been standing and accumulated for some time disappeared quickly. This was thought to have been down to the pumping station fault being corrected, however based on Thames Water's report it is now thought that this must have been due to the extra pumping they carried out at the pumping station to relieve the system.

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 South Bucks District Council

South Bucks 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 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.

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 1 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.

Table 1 Roles and responsibilities in an emergency, during and after a flood event

Local (County and District) Authorities

- Coordinate emergency support within their own functions
- Deal with emergencies on 'non main rivers'
- Coordinate emergency support from the voluntary sector
- Liaise with central and regional government departments
- Liaise with essential service providers
- Open rest centres
- Manage the local transport and traffic networks
- Mobilise trained emergency social workers
- Provide emergency assistance
- Deal with environmental health issues, such as contamination and pollution
- Coordinate the recovery process
- Manage public health issues
- Provide advice and management of public health
- Provide support and advice to individuals
- Assist with business continuity

Police Force

- Save life
- Coordination and communication between emergency services and organisations providing support
- Coordinate the preparation and dissemination

Fire and Rescue Service

- Save life rescuing people and animals
- Carry out other specialist work, including flood rescue services
- Where appropriate, assist people where the use of fire service personnel and equipment is relevant

Ambulance Service

- Save life
- Provide treatment, stabilisation and care at the scene

Utility Providers

- Attend emergencies relating to their services putting life at risk
- Assess and manage risk of service failure
- Assist with recovery process, that is, water utilities manage public health considerations

Internal Drainage Board

- Operate strategic assets to reduce flood risk in partnership with RMAs and public

Town and Parish Councils

- Support emergency responders
- Increase community resilience through support of community emergency plan development

Voluntary services

- Support rest centres
- Provide practical and emotional support to those affected
- Support transport and communications
- Provide administration
- Provide telephone helpline support

Environment Agency

- Issue Flood Warnings and ensure systems display current flooding information
- Provide information to the public on what they can do before, during and after a flood event
- Monitor river levels and flows
- Work with professional Partners and stakeholders and respond to requests for flooding information and updates
- Receive and record details of flooding and related information
- Operate water level control structures within its jurisdiction and in line with permissive powers
- Flood event data collection
- Arrange and take part in flood event exercises
- Respond to pollution incidents and advise on disposal
- Assist with the recovery process, for example, by advising on the disposal of silt, attending flood surgeries

5. Conclusions and Recommendations

5.1 Conclusions

The main issue that caused flooding at The Orchards Residential Park was the extreme and prolonged rainfall experienced. The combined drainage system could not cope with the volumes of groundwater and surface water trying to enter the system causing it to back up and out of the drainage gullies. Although the flooding did not affect any properties internally, it was contaminated with sewerage and covered roads, gardens and footpaths, making access very difficult for the community, and posing an environmental and public health risk.

5.2 Recommendations

Some recommendations have been put forward and are summarised in table 2 below. When discussing the possible causes it was clear that several actions could be undertaken by a variety of the RMAs to ensure this event does not re-occur. Although the flooding experienced was not fluvial, there are some recommendations that relate to the watercourse, this is to ensure that the watercourse continues to efficiently carry flows in the future.

Table 2 Recommendations

Authority/Stakeholder	Recommended Action
Tingdene Park Homes	• Conduct a full investigation in to the combined drainage system, recording location of pipes, gullies and manholes. • Conduct a survey of combined drainage system to establish the condition of the assets. • Carry-out any repairs or improvements recommended or identified by the drainage survey.
Thames Water	• Ensure that this location is highlighted as a high risk area and that extra mitigation may be required at Middle Green pumping station in similar future events.
BCC	• To ensure the riparian owners of the watercourses in the area are aware of their responsibilities. • To facilitate sharing of information between RMAs and the community. • If required to use enforcement action under Section 25 of the Land Drainage Act where land owners have failed to maintain/remove obstructions from ordinary

	watercourses.
SBDC	• To facilitate sharing of information between RMAs and the community.
Riparian Landowners	• Undertake clearance of vegetation and debris on any adjacent ordinary watercourses (including ditches) with guidance from Buckinghamshire County Council. • To follow the guidance given in the EAs booklet 'Living on the Edge' about their responsibilities as riparian owners.
Residents	• Take measures to protect themselves and their property when flooding is imminent. • Continue to document and photograph flood incidents where possible and report flooding to AVDC and/or BCC and EA.

Explanation of Acronyms

Acronym	Definition
BCC	Buckinghamshire County Council
RMAs	Risk Management Authorities
LLFA	Lead Local Flood Authority
FWMA	Flood and Water Management Act (2010)
EA	Environment Agency
TfB	Transport for Buckinghamshire
SBDC	South Bucks District Council
BGS	British Geological Survey

References

Reference in document	Refers to:
BGS online map, 2014	http://mapapps.bgs.ac.uk/geologyofbritain/home.html
EA, 2014	Environment Agency risk of flooding from surface water map - http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfsw&scale=7&ep=map&layerGroups=default&lang=_e&y=181500&x=531500#x=531500&y=181500&scale=7
EA, 2014	Environment Agency flood map http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=floodmap&utm_source=Poster&utm_medium=FloodRisk&utm_campaign=FloodMonth13

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
Website: www.buckscc.gov.uk/flooding

Environment Agency

National Customer Contact Centre
PO Box 544
Rotherham
S60 1BY

Telephone: 03708 506506
Email: enquiries@environment-agency.gov.uk
Website: http://www.gov.uk/government/organisations/environment-agency

District Council

South Bucks District Council
Capswood
Oxford Road
Denham
Bucks UB94LH

Opening times
Monday - Wednesday
9am – 5.30pm
Thursday - Friday
9am – 5pm

Telephone: 01895 837200

Highways Authority
Transport for Buckinghamshire
Telephone: Transport and roads – 0845 2302882
Out of hours emergencies (Highways) – 01296 486630
Email: tfb@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
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

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 1km2
- Internal flooding of two of more business premises within an areas of 1km2
- 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.

Appendix B: Photos from the flood event

Surcharging combined sewer (Tingdene Park Homes, 10th February 2014)

Flood water after it had receded (Tingdene Park Homes, 10th February 2014)