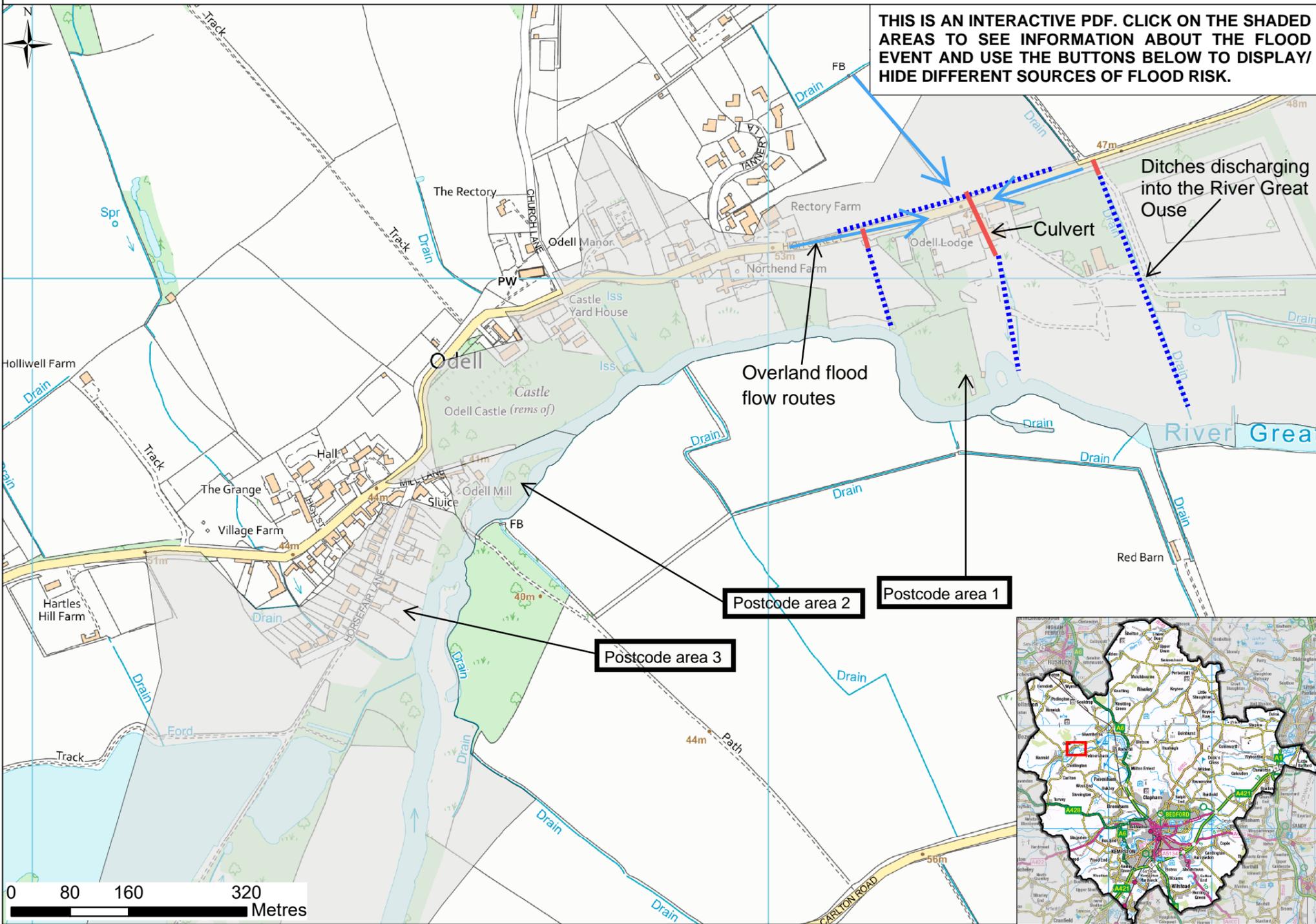


The village of Odell suffered flooding in December 2020. Under the Flood and Water Management Act 2010, Bedford Borough Council as the Lead Local Flood Authority (LLFA) has the duty to investigate the flood event. The scope of this flood investigation is to identify the source, cause and impact of flooding from available information; identify actions completed by relevant Risk Management Authorities (RMAs) in response to the flood event; and consider actions to better understand and manage the risk of flooding in the affected area.



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### Legend

- Postcode Boundary
- EA Flood Warning Areas
- Flood Warning Areas
- Areas benefitting from flood defences

### Flood Map for Planning

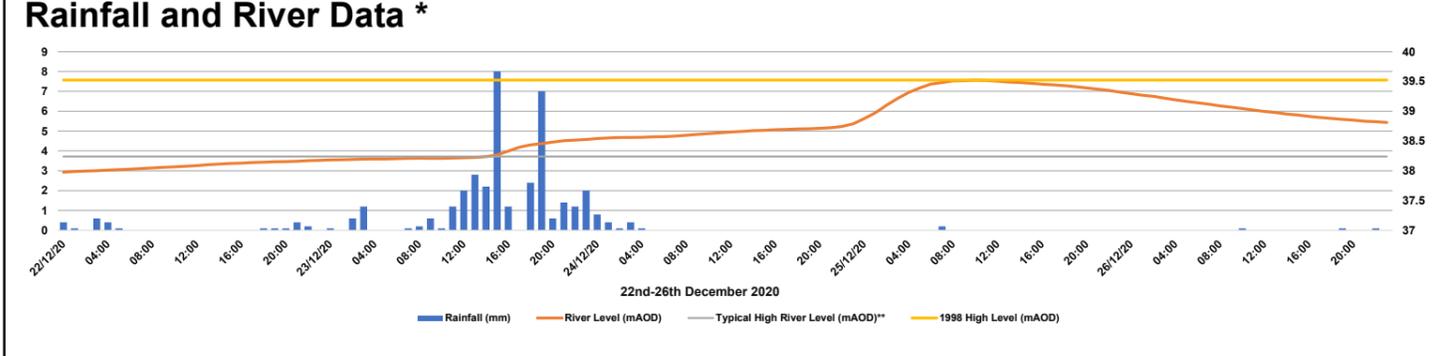
- Flood Zone 3
- Flood Zone 2

### Risk of Flooding from Surface Water

- High risk of flooding (3.3% AEP)
- Medium risk of flooding (1% AEP)
- Low risk of flooding (0.1% AEP)

### CLICK ON THESE BUTTONS

- FLOOD MAP FOR PLANNING
- RISK OF FLOODING FROM SURFACE WATER
- FLOOD WARNING AREAS
- BACKGROUND MAP



### Rainfall and River Gauges

Nearest Rain Gauge	Thurleigh
Distance to Gauge	8.57 km
Nearest River Gauge	Sharnbrook
Distance to Gauge	4.69 km

\*Rainfall and River data was obtained from the Environment Agency (May 2021)  
 \*\*River levels below this level 90% of the time.

### Rainfall and River Data Interpretation

The graph identifies that the main rainfall event at the nearest rainfall gauge to Odell occurred between 08:00 on December 23rd and 04:00 on December 24th. The total rainfall volume is recorded as 34.7mm with a peak rainfall intensity of 8mm/hour. This single event saw more than half of the 55mm of rainfall which is expected for the whole month of December on average.

The graph shows that the river levels in the Great Ouse were elevated above the 'typical high river level' from 15:00 on December 23rd and stayed above this level until beyond December 26th. The 'typical high river level' at the nearest gauge station is identified as 38.2m Above Ordnance Datum (AOD). River levels above this are only expected to be recorded 5% of the time. For context, the 1998 peak flood level is included, which was recorded as 39.5m AOD, and the graph shows that the December 2020 river levels reached the 1998 level at 07:00 on December 25th.

**SOURCE OF FLOODING:** Surface Water

## FLOOD EVENT & CAUSE

One property located off High Street reported internal flooding on December 23<sup>rd</sup> from the fields and ditch to the north of the property and from flood flow routes along the road. The resident attempted to dig ditches around the property to reduce water ingress, however, water did encroach within the property up to a depth of approximately 150mm.

The reported flood mechanism is partially consistent the Environment Agency Flood Risk from Surface Water mapping<sup>1</sup>, which identifies a flood flow route through the fields to the north of High Street. The flow route from the fields flows into a ditch on the northern side of High Street (see map annotation). The heavy rainfall also caused overland flood flow routes on High Street, which were conveyed along the road towards a topographic low point (see map annotation). The ditch is culverted beneath the road near the low point before becoming an open-channel ditch further south and discharging into the River Great Ouse. There are two additional drainage ditches (see map annotation) which convey runoff from High Street and areas to the north into the River Great Ouse. It was reported to Bedford Highways in mid-January 2021 that two culverts beneath High Street were in need of maintenance, however, the condition of the highway drainage or culverts prior to the flood event is unknown. Any build-up of debris or blockages would have exacerbated the flooding experienced.

In conclusion, December 2020 was a very wet month with an average rainfall of 108mm across East Anglia, which is 95% higher than the December average<sup>2</sup>. The three months leading up to December also saw higher than average rainfall such that by December 23<sup>rd</sup> the ground was already saturated. This, combined with the rainfall recorded during the dates in question, meant that surface water was less able to infiltrate into the ground and more likely to run off into ditches and form overland flood flow routes. It is thought that the heavy rainfall overwhelmed the capacity of the local drainage/ditch network, causing water to overtop and contribute to the flooding experienced at the property.

## FLOOD WARNINGS & INITIAL RESPONSE

- **23/12/2020:** Lead Local Flood Authority (LLFA) officers monitored/assessed locations based on the conditions and forecast predicted.
- **23/12/2020 15:05 – 17:05:** Fire service provided flooding advice to residents, and pumped water away from the affected property.
- **24/12/2020 daytime:** LLFA visited those who flooded on December 23<sup>rd</sup> to gain information on the damage caused and offer assistance.
- **25/12/202 14:30:** Flooding experienced in the wider area declared a major incident by Bedford Borough Council.
- **28/12/2020:** LLFA, Bedford Flood Response Team, and volunteers from the Council visited properties to carry out impact assessment to help with recovery and clean up.

## ACTIONS

Timescale	Action	Responsible Party
Complete	Clear debris build-up and blockages in High Street culverts. Two culverts were cleared in March 2021.	Bedford Highways
Complete	Increase capacity and/or maintain highway drainage along High Street. Following the flood event, grips were dug either side of High Street to facilitate water draining away from the road into the adjacent ditches.	Bedford Highways
Complete	Increase capacity and/or maintain the ditches along High Street. This was completed by the resident following the flood event.	Landowner / Lead Local Flood Authority
Complete	Set up a community flood group. The flood group should enable access to the flood kits, flood action plans, and information about flood warnings/alerts and Property Flood Resilience (PFR).	Lead Local Flood Authority
Ongoing	Continued engagement with and support of the community flood group to enable preparedness in the event of a future flood.	Lead Local Flood Authority
Short-term (1-6 months)	Set an appropriate inspection and maintenance regime for the highway grips along High Street, such that they are maintained appropriately ahead of severe rainfall events.	Bedford Highways
Medium-term (6-12 months)	Liaise with landowners to identify suitable land management techniques for the fields to the north of High Street, to reduce the amount of water which flows into the drainage ditches and highway grips.	Lead Local Food Authority

**ORIGINATED:** Nora Balboni CEng C.WEM MCIWEM, Senior Engineer, 14/07/2021

**CHECKED/VERIFIED:** Matt Tandy C.WEM MCIWEM MInstLM, Principal Engineer, 16/07/2021



<sup>1</sup> Environment Agency Flood Risk from Surface Water map, <https://flood-warning-information.service.gov.uk/>, [accessed June 2021].

<sup>2</sup> Environment Agency, December 2020 Flooding Great Ouse Catchment Summary.

**SOURCE OF FLOODING:** Main River (Fluvial)

## FLOOD EVENT & CAUSE

Three properties located along the northern bank of the River Great Ouse reported internal flooding between December 24<sup>th</sup> and 25<sup>th</sup>. The residents reported a flood depth up to 1m across the ground floor, which damaged carpets and cupboards. Residents of one property evacuated for two days and residents of another property reported staying with family. Horsefair Lane was reported to be impassable due to the floodwater.

One of the affected properties is located in Environment Agency Flood Zone 3<sup>1</sup>, which means that the chance of river flooding is greater than 1% in any given year. Two of the affected properties are located in Environment Agency Flood Zone 2 (albeit close to Flood Zone 3), which means that the chance of river flooding is between 0.1% and 1% in any given year. The Environment Agency Flood Warning was issued after flooding was first reported to the Fire Service.

December 2020 was a very wet month with an average rainfall of 108mm across East Anglia, which is 95% higher than the December average<sup>2</sup>. The three months leading up to December also saw higher than average rainfall such that by December 24<sup>th</sup> the ground was already saturated. This, combined with the rainfall recorded during the dates in question, meant that surface water was less able to infiltrate into the ground and more likely to run off into the River Great Ouse, raising its levels. In conclusion, it is thought that this prolonged period of heavy rainfall and saturated ground conditions contributed to the River Great Ouse overtopping its banks and flooding the affected properties.

## FLOOD WARNINGS & IMMEDIATE RESPONSE

- **22/12/2020 08:57:** Environment Agency Flood Alert Middle River Great Ouse in Milton Keynes, Bedford Borough and Central Bedfordshire issued.
- **23/12/2020 19:16, 21:00:** Fire service provided flooding advice to residents.
- **24/12/2020 13:48:** Environment Agency Flood Warning River Great Ouse at Odell issued.
- **24/12/2020 evening:** Police volunteers mass leaflet drop to warn residents of likely flooding.
- **25/12/2020 00:30 – 8:30:** Fire service provided flooding advice to residents.
- **25/12/2020:** Lead Local Flood Authority (LLFA) visited to provide assistance on the ground.
- **25/12/2020 14:30:** Flooding experienced in the wider area declared a major incident by Bedford Borough Council.
- **28/12/2020:** LLFA, Bedford Flood Response Team, and volunteers from the Council visited properties to carry out impact assessment to help with recovery and clean up.

## ACTIONS

Timescale	Action	Responsible Party
Complete	Set up a community flood group.	Lead Local Flood Authority
Ongoing	Continued engagement with and support of the community flood group. The flood group should enable access to the flood kits, flood action plans, and information about flood warnings/alerts and Property Flood Resilience (PFR).	Lead Local Flood Authority
Inspections short term (1-6 months) Remedial works as required	Inspect Main River assets (sluices, weirs, gates, locks and river banks) and identify the requirement for remedial works. Over 5,000 checks are already complete across East Anglia (95% of relevant assets), with 22 assets identified as being in need of remedial works in the wider area <sup>3</sup> .	Environment Agency
Medium term (6-12 months)	Investigate the suitability of flood protection measures for the affected properties (e.g. flood barriers, waterproof wall sealant, non-return valves, etc.). Specialist advice should be sought from a Property Flood Resilience (PFR) surveyor.	Homeowner
Medium term (6-12 months)	Investigate improvements to the Flood Warning system. This warning is already included as medium priority in the Flood Warning Improvement Plan.	Environment Agency

**ORIGINATED:** Nora Balboni CEng C.WEM MCIWEM, Senior Engineer, 21/07/2021

**CHECKED/VERIFIED:** Matt Tandy C.WEM MCIWEM MInstLM, Principal Engineer, 23/07/2021



<sup>1</sup> Environment Agency Flood Map for Planning, <https://flood-map-for-planning.service.gov.uk/>, [accessed June 2021].

<sup>2</sup> Environment Agency, December 2020 Flooding Great Ouse Catchment Summary.

<sup>3</sup> Environment Agency, May 2021. Harrold Winter Flooding Briefing.