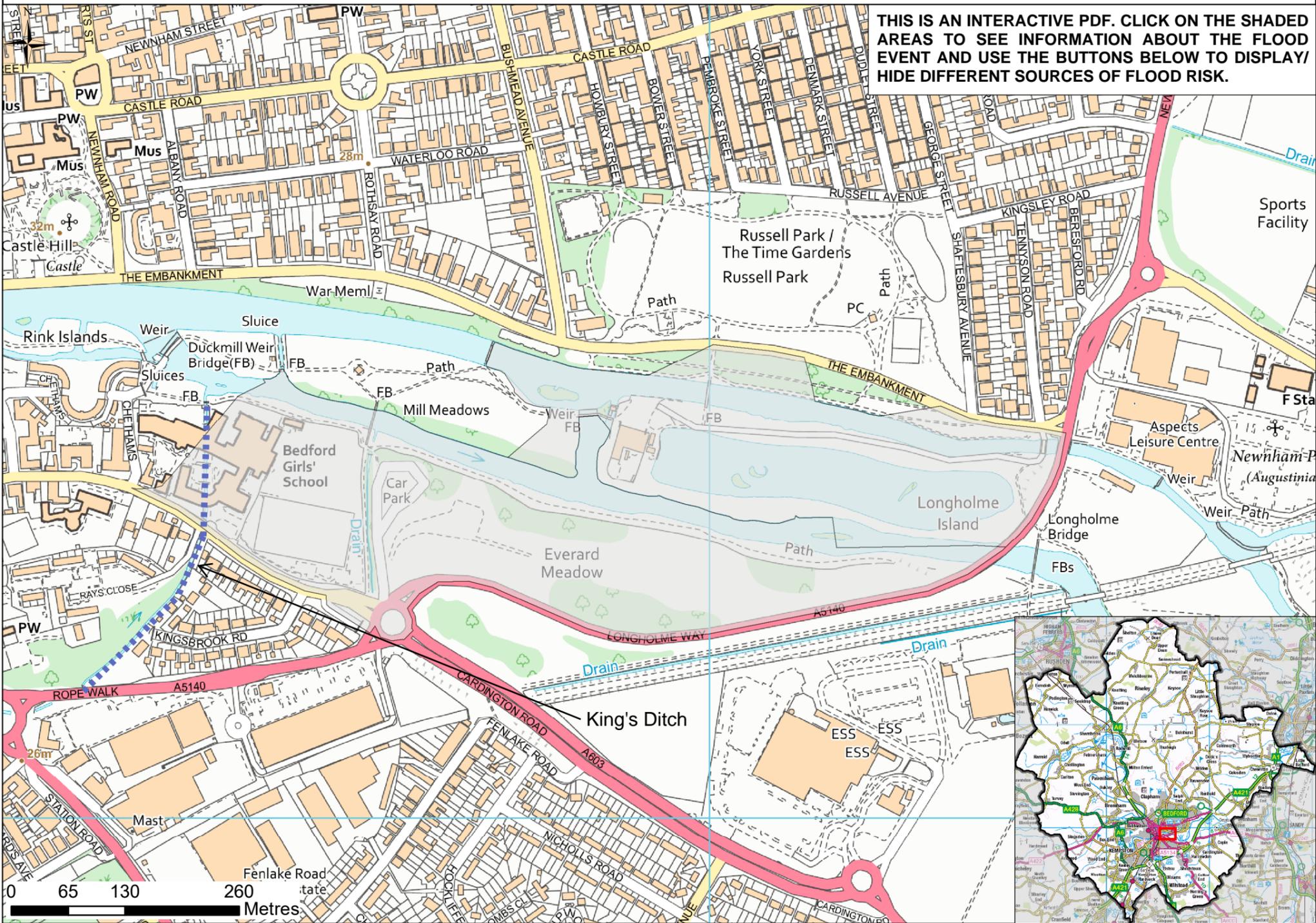


The area in Bedford between the Boating Lake, Longholme Way, and Cardington Road suffered flooding in December 2020. Under the Flood and Water Management Act 2010, Bedford Borough Council as the Lead Local Flood Authority (LLFA) has the duty to investigate the flood event. The scope of this flood investigation 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.



Legend

- Postcode Boundary
- EA Flood Warning Areas
- Flood Warning Areas
- 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)

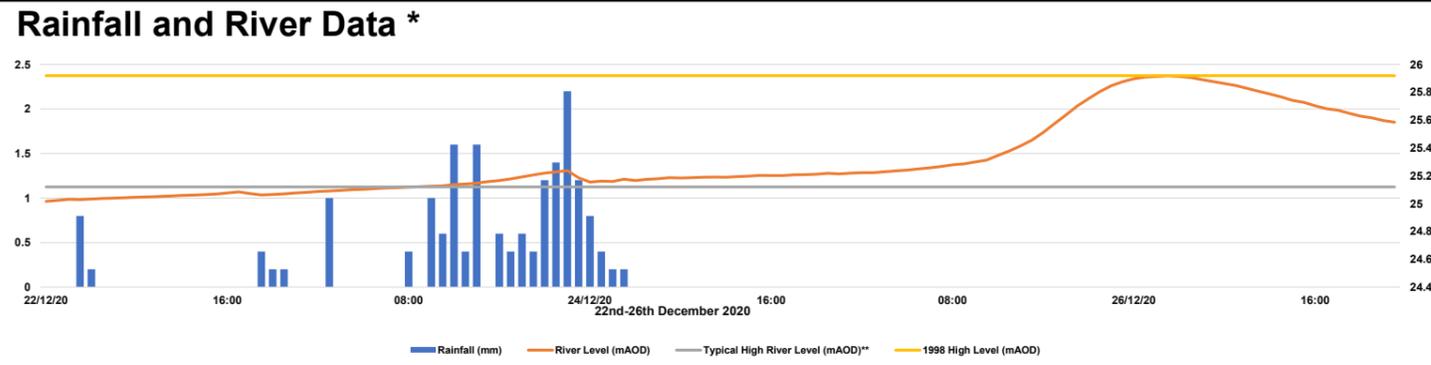
CLICK ON THESE BUTTONS

FLOOD MAP FOR PLANNING

RISK OF FLOODING FROM SURFACE WATER

FLOOD WARNING AREAS

BACKGROUND MAP



Rainfall and River Gauges

Nearest Rain Gauge	Bedford
Distance to Gauge	2.36 km
Nearest River Gauge	Bedford
Distance to Gauge	0.44 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 the Boating Lake area in Bedford occurred between 19:00 on December 23rd and 03:00 on December 24th. The total rainfall volume is recorded as 17mm with a peak rainfall intensity of 2.2mm/hour. This single event saw a third of the 55mm of rainfall which is expected for the whole month of December on average.

The graph also shows that the river levels in the Great Ouse at the gauge closest to the Boating Lake area in Bedford were elevated above the 'typical high river level' from 12:00 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 25.1m 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 25.9m AOD, and the graph shows that the December 2020 river levels reached the 1998 level at 02:00 on December 26th.

SOURCE OF FLOODING: Main River (Fluvial)

FLOOD EVENT & CAUSE

One commercial and one educational building located between the Boating Lake, Longholme Way, and Cardington Road reported internal flooding from the River Great Ouse overtopping its bank on December 25th. The commercial property reported standing water at the ground floor causing damage to furniture. The educational building reported water in the basement. The Environment Agency Flood Warning was issued after the first residents reported flooding in the area. The commercial property is surrounded by the River Great Ouse and is located in Environment Agency Flood Zone 3, which means that the chance of river flooding is greater than 1% in any given year¹. It is understood that this property flooded due to raised river levels overtopping the banks. The educational building is located in Flood Zone 2, which means that the chance of river flooding is between 0.1% and 1% in any given year. Only the eastern part of the property is shown to be protected by the River Ouse flood defences, which suggests that the other side of the property remains vulnerable to flooding. The cause of flooding to this property is not clear, however, the most likely causes are groundwater emergence or overtopping of the River Great Ouse.

The 'Kings Ditch' runs between Rope Walk and Cardington Road to the south of the educational building and discharges via a twin outfall into the River Great Ouse. It was reported that water levels in the ditch rose significantly as surface water was unable to drain away due to the high river levels. The water in the ditch was pumped away to prevent water overtopping from the ditch, which otherwise would have likely 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 average². The three months leading up to December also saw higher than average rainfall such that by December 25th 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 watercourses and form overland flood flow routes. It is thought that this prolonged period of heavy rainfall and saturated ground conditions contributed to the River Great Ouse overtopping its banks.

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.
- **24/12/2020 13:36:** Fire service provided flooding advice to resident.
- **24/12/2020 evening:** Police volunteers mass leaflet drop to warn residents of likely flooding.
- **25/12/2020 09:00 – 23:20:** Fire service provided flooding advice to residents in the area.
- **25/12/2020:** Lead Local Flood Authority (LLFA) visit to provide assistance on the ground.
- **25/12/2020 15:09:** Environment Agency Flood Warning Low Lying Areas Close to the River Great Ouse at Bedford issued.
- **25/12/2020 14:30:** Flooding experienced in the wider area declared a major incident by Bedford Borough Council.
- **26/12/2020 02:00 – 19:40:** Fire service provided flooding advice to residents in the area.
- **26/12/2020 morning:** The Bedford Internal Drainage Board (IDB) pumped out the 'Kings Ditch'.
- **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	Investigate the need for improvements to the Flood Warning system.	Environment Agency
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. ³	Environment Agency
Medium term (6-12 months)	Investigate the trigger level at the Kings Ditch and the communication procedure to ensure that the IDB duty officer is alerted from the Environment Agency when the ditch is nearing capacity.	IDB / Environment Agency
Medium term (6-12 months)	Investigate the suitability of flood protection measures for the affected properties (e.g. tanking of basements, flood barriers, waterproof wall sealant, non-return valves, etc.). Specialist advice should be sought from a Property Flood Resilience (PFR) surveyor.	Homeowner / Landowner
Medium term (6-12 months)	Investigate the potential benefits and local appetite for a community flood group. The flood group should enable access to flood kits, flood action plans, and information about flood warnings/alerts and Property Flood Resilience (PFR).	Lead Local Flood Authority

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



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

² Environment Agency, December 2020 Flooding Great Ouse Catchment Summary.

³ Environment Agency, May 2021. Harrold Winter Flooding Briefing.