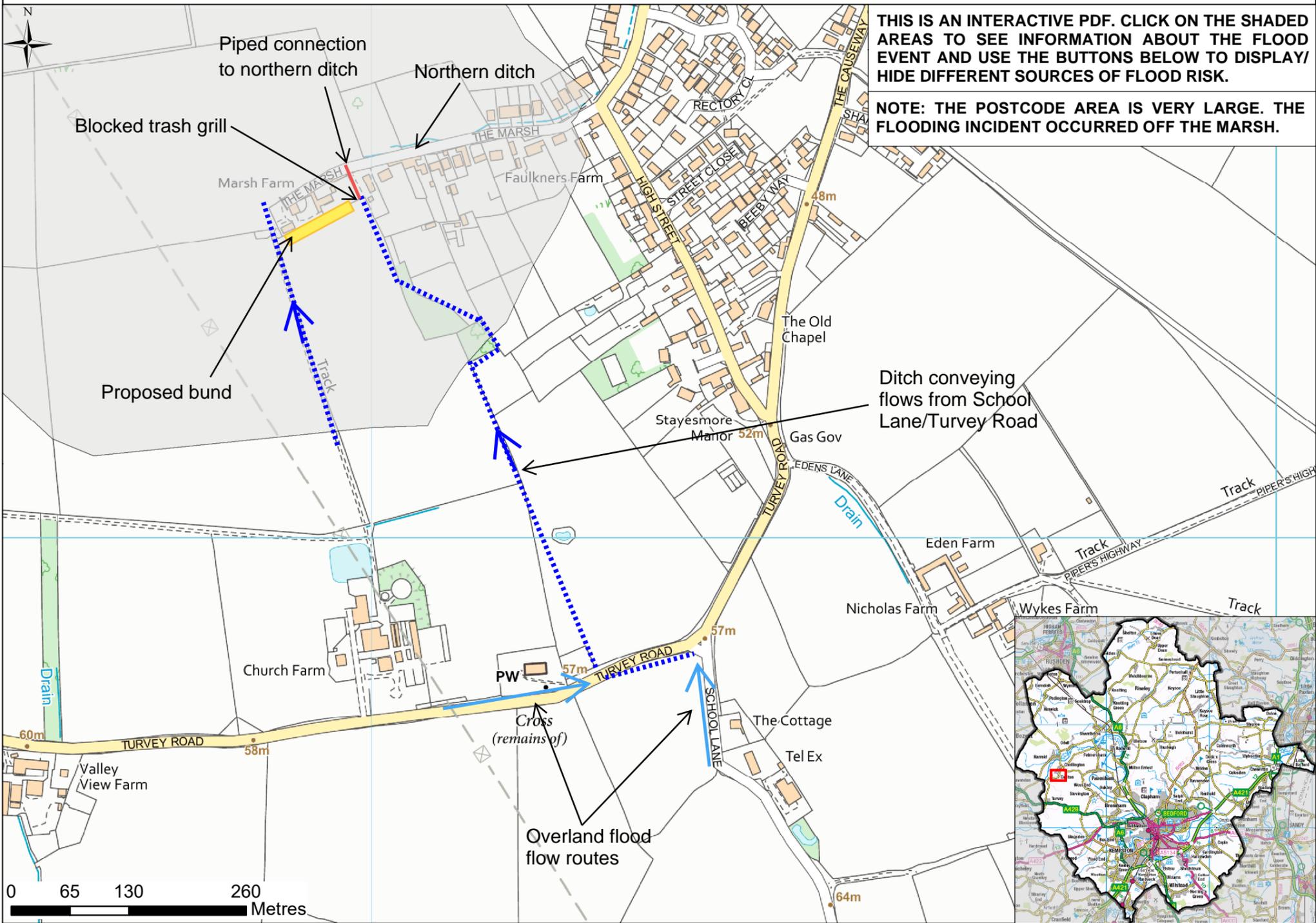


The village of Carlton suffered flooding in December 2020. Under the Flood and Water Management Act 2010, Bedford Borough Council as the Lead Local Flood Authority (LLFA) has the duty to investigate the flood event. The scope of this flood investigation is to identify the source, cause and impact of 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.



THIS IS AN INTERACTIVE PDF. CLICK ON THE SHADED AREAS TO SEE INFORMATION ABOUT THE FLOOD EVENT AND USE THE BUTTONS BELOW TO DISPLAY/HIDE DIFFERENT SOURCES OF FLOOD RISK.

NOTE: THE POSTCODE AREA IS VERY LARGE. THE FLOODING INCIDENT OCCURRED OFF THE MARSH.

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Legend

- Postcode Boundary
- Flood Map for Planning
- 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)

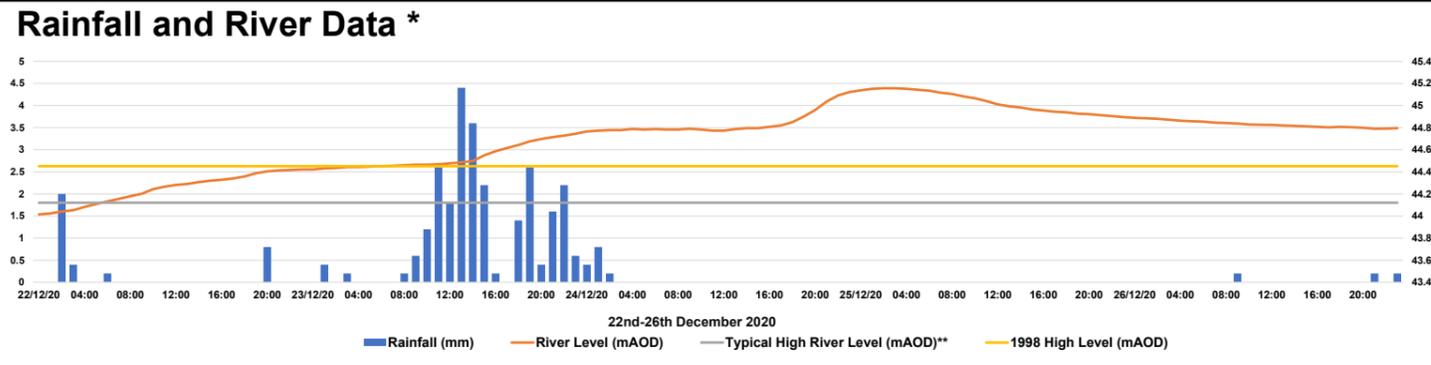
CLICK ON THESE BUTTONS

FLOOD MAP FOR PLANNING

RISK OF FLOODING FROM SURFACE WATER

FLOOD WARNING AREAS

BACKGROUND MAP



Rainfall and River Gauges

Nearest Rain Gauge	Olney
Distance to Gauge	7.33 km
Nearest River Gauge	Turvey
Distance to Gauge	3.58 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 Carlton occurred between 08:00 on December 23rd and 03:00 on December 24th. The total rainfall volume is recorded as 27mm with a peak rainfall intensity of 4.4mm/hour. This single event saw just under half of the 55mm of rainfall which is expected for the whole month of December on average.

The River Great Ouse is located approximately 500m to the north-west of The Marsh. The river level at the nearest river gauge to Carlton is recorded to have risen above the 'typical high river level' in the early hours of December 22nd and stayed above this level until beyond December 26th. The 'typical high river level' at the nearest gauge station is identified as 44.1m 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 to be 44.45m AOD. The graph shows that the December 2020 river levels exceeded the 1998 level from approximately 02:00 on December 23rd.

SOURCE OF FLOODING: Surface Water

FLOOD EVENT & CAUSE

A residential property located off The Marsh experienced internal flooding between December 23rd and 24th, reporting a flood depth of 75mm across the ground floor and damaged furniture. It is reported that the heavy rainfall formed a flood flow route down School Lane (approximately 600m south of The Marsh), discharging into a ditch along Turvey Road. The ditch is then piped beneath Turvey Road to the east of St Mary's Church, where it becomes an open ditch flowing towards The Marsh. The ditch is piped around the houses fronting The Marsh prior to joining the ditch system to the north. It is reported that the trash screen at the upstream end of the piped system was partially blocked between the relevant dates in December. This is thought to have contributed the flooding experienced by causing water to back up across the adjacent field towards the property.

Another property along The Marsh was close to flooding but it was reported that residents were able to dig a trench to divert water westwards around the property and into the northern ditch system

December 2020 was a very wet month with an average rainfall of 108mm across East Anglia, which is 95% higher than the December average¹. The three months leading up to December also saw higher than average rainfall such that by December 23rd 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.

In addition, the British Geological Survey (BGS) mapping² shows that the geology beneath this part of Carlton is classified as an aquifer, which means that there is the potential for elevated groundwater. The lower-lying area of the Marsh may have experienced groundwater emerging at the surface due to the rainfall recording in the three months prior to December.

In conclusion, it is thought that a combination of saturated ground, elevated groundwater levels, high rainfall, and overland flow routes contributed to the flooding experienced.

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:** LLFA, Bedford Highways, and Bedfordshire Local Emergency Volunteers Executive Committee³ (BLEVEC) assist 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/clean up.

ACTIONS

Timescale	Action	Responsible Party
Complete	Clear the trash grill and agree a suitable maintenance regime with the Lead Local Flood Authority.	Riparian Owner
Complete	Set up 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
Ongoing	Continued engagement with and support of the community flood group.	Lead Local Flood Authority
Medium term (action started)	Liaison with the landowner to construct a bund along the southern end of the properties facing The Marsh to divert water to an existing ditch to the west.	Lead Local Flood Authority / Riparian Owner

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, December 2020 Flooding Great Ouse Catchment Summary.

² Aquifer Designation Map, <https://magic.defra.gov.uk/magicmap.aspx>. [accessed June 2021].

³ BLEVEC is the voluntary sector of the Bedfordshire Local Resilience Forum, consisting of the Bedfordshire Community Emergency Response Team (CERT) and other organisations such as Midshires Search and Rescue, the British Red Cross, Beds and Cambs 4x4 Recovery, and the Royal Voluntary Service.