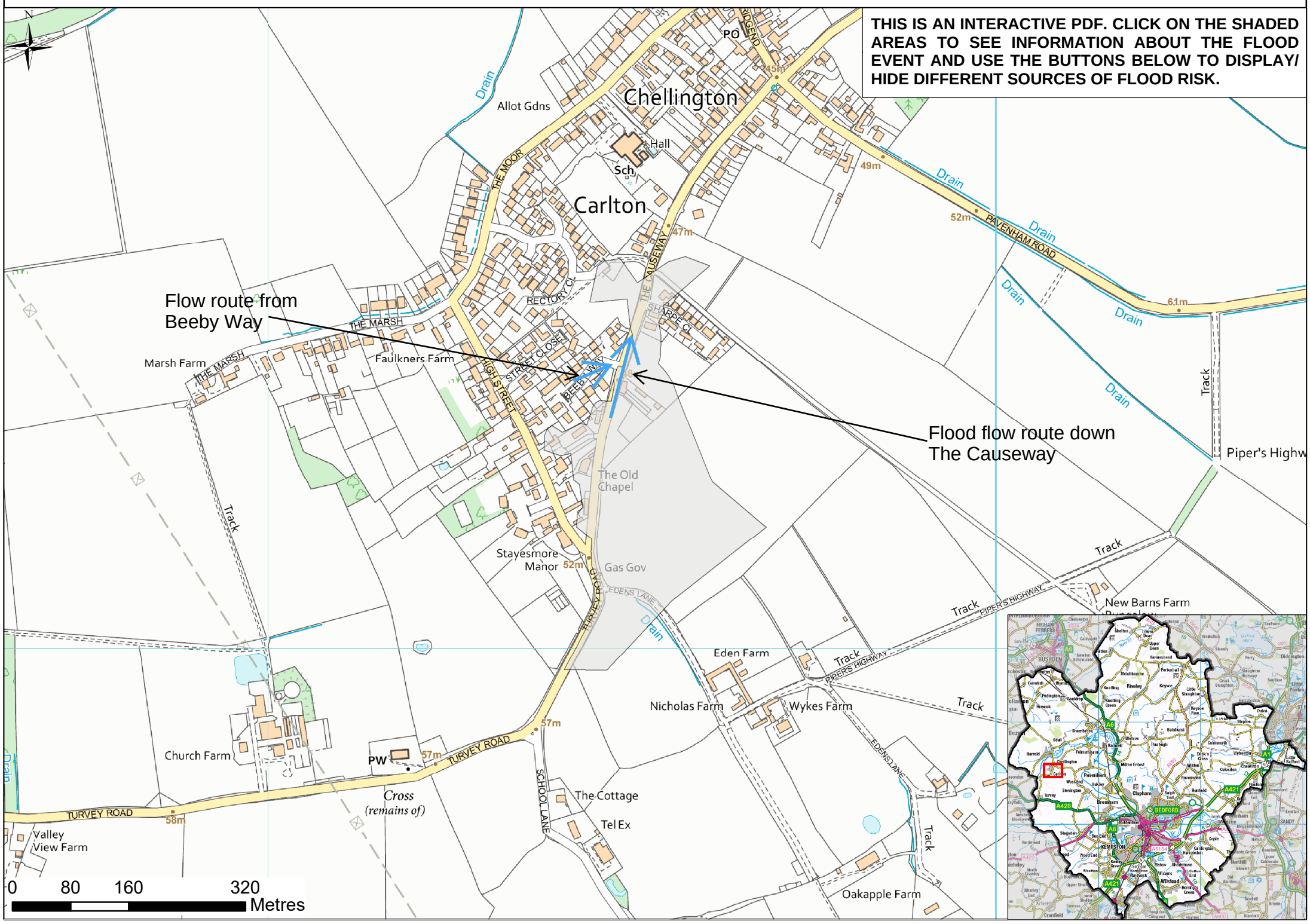
BEDFORD BOROUGH COUNCIL Section 19 Flood Investigation Report: Carlton - The Causeway

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.



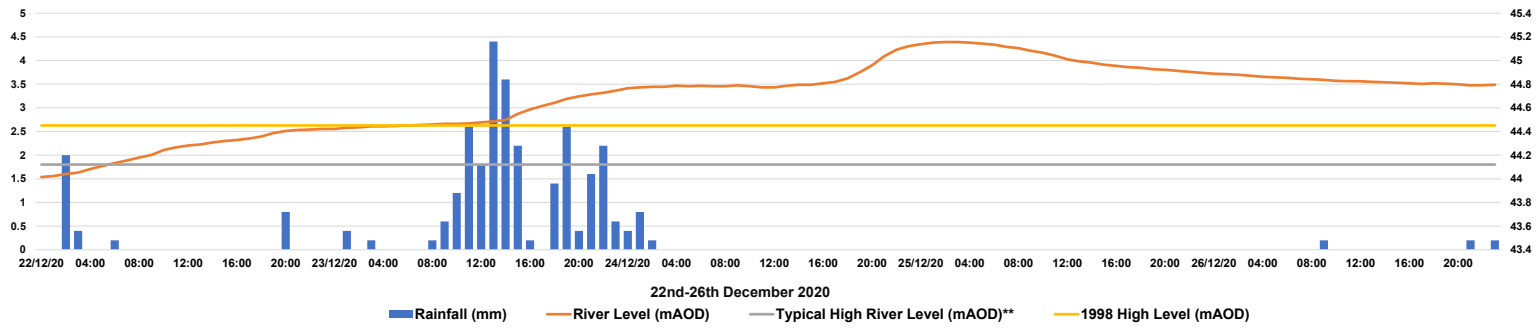
Legend

- Postcode Boundary
- **EA Flood Warning Areas**
  - Flood Warning Areas
- **Flood Map for Planning**
  - Flood Zone 3
  - Flood Zone 2
  - Areas benefitting from flood defences
- **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 Data *



Rainfall and River Gauges

Nearest Rain Gauge	Olney
Distance to Gauge	8.33 km
Nearest River Gauge	Turvey
Distance to Gauge	4.58 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 1.1km to the north of the affected area on The Causeway. 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.

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SOURCE OF FLOODING: Surface Water

FLOOD EVENT & CAUSE

Two residential properties off The Causeway reported internal flooding on December 23rd. One resident reported a small amount of standing water on the ground floor despite utilising six sandbags. The other resident reported flooding in the cellar. The damages to both properties were reported to be minor. A number of other properties along The Causeway came close to flooding but did not report water encroaching internally into buildings. The Causeway, Pavenham Road, and Bridgend in Carlton were reported to be impassable due to the floodwater.

One of the affected properties reported water encroaching the front door from The Causeway. The reported flood mechanism is partially consistent with the Environment Agency mapping[1], which shows that The Causeway is at 'low' risk of surface water flooding in this location, which means that the chance of flooding is between 0.1% and 1% in any given year. The other affected property reported water encroaching via a manhole cover, vents, and walls. This mechanism is also partially represented by the Environment Agency mapping, which shows an area prone to surface water ponding adjacent to the property suggesting the presence of a topographic low point in this area. The mapping also shows that a flood flow route is expected to form along The Causeway, taking runoff from the fields to the south as well as Beeby Way to the north.

December 2020 was a very wet month with an average rainfall of 108mm across East Anglia, which is 95% higher than the December average[2]. 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 ditches and form overland flood flow routes. In addition, the British Geological Survey (BGS) records[3] shows that the geology beneath this part of The Causeway is a designated aquifer, which means there is the potential for elevated groundwater.

In conclusion, it is thought that a combination of elevated groundwater, heavy rainfall, and overland flow routes contributed to the flooding. Blocked gullies were reported to Bedford Highways along the Causeway on December 30th and in January 2021, which is thought to have 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 Committee[4] (BLEVEC) assist on the ground.
- **23/12/2020 14:40 – 16:45**: Fire service provided flooding advice to residents in the area and delivered aqua sacs.
- **24/12/2020 daytime**: LLFA officers visited those who flooded on December 23rd to gain information on the damaged caused and offer assistance.
- **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	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
Complete	Investigate highway drainage in the area and clear any blockages. Gullies and drains were cleared along The Causeway in January 2021, and at the junction to Beeby Way in April 2021.	Bedford Highways
Ongoing	Continued engagement with and support of the community flood group to enable preparedness in advance of a future flood.	Lead Local Flood Authority
Medium term (6-12 months)	Liaise with landowners to ensure the ditches to the east of The Causeway are maintained to reduce the amount of water that is directed onto the road in a flood event. Set a suitable inspection and maintenance regime as necessary.	Lead Local Flood Authority / Bedford Highways

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[1] Environment Agency Flood Risk from Surface Water mapping, https://flood-warning-information.service.gov.uk/long-term-flood-risk [accessed June 2021].
[2] Environment Agency, December 2020 Flooding Great Ouse Catchment Summary.
[3] Aquifer Designation Map, https://magic.defra.gov.uk/magicmap.aspx. [accessed June 2021[.
[4] 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.