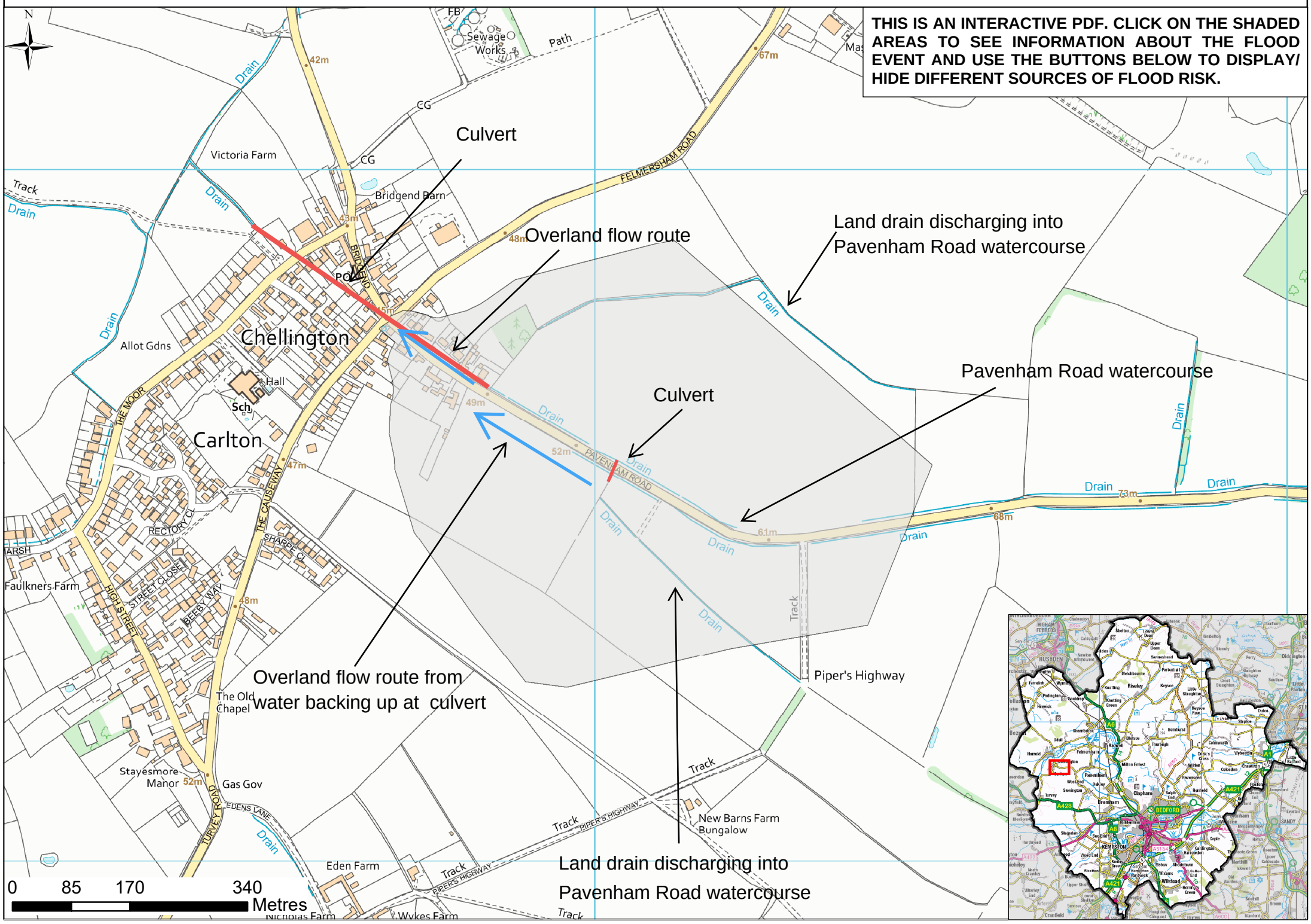
BEDFORD BOROUGH COUNCIL Section 19 Flood Investigation Report: Carlton - Pavenham Road

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.



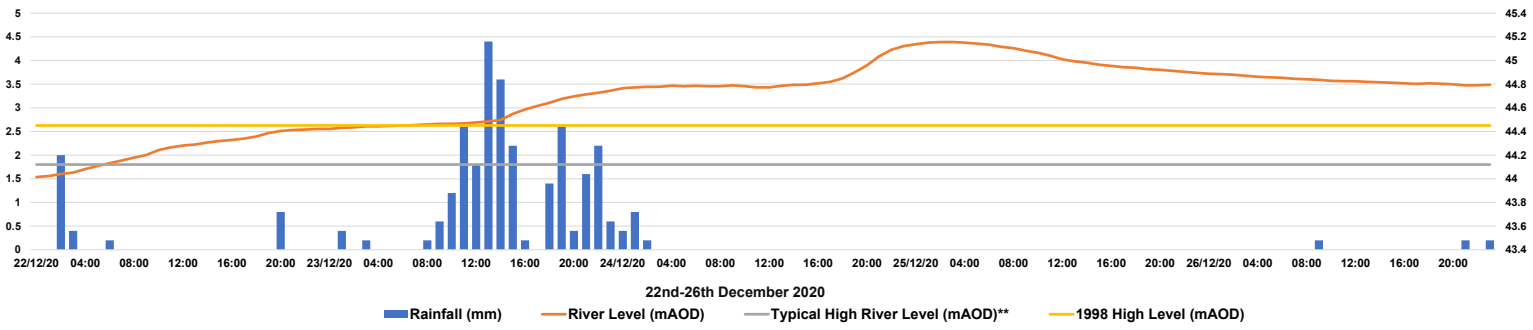
Legend

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

Rainfall and River Gauges

Nearest Rain Gauge	Olney
Distance to Gauge	7.75 km
Nearest River Gauge	Turvey
Distance to Gauge	4.07 km

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 800m to the north of the affected area on Pavenham Road. 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.

ORIGINATED	BG	14/07/2021	**CHECKED**	NB	15/07/2021	**VERIFIED**	MT	16/07/2021

AECOM

Section 19 Flood Investigation Report: Carlton Pavenham Road

SOURCE OF FLOODING: Watercourse / Surface Water

FLOOD EVENT & CAUSE

Two residential properties reported internal flooding in the afternoon of December 23rd, causing damage to floors and carpets. One resident reported flood depths up to 300mm on the ground floor despite having utilised 13 sandbags. One of the affected properties is located to the south of Pavenham Road and reported water encroaching from the back door. The other affected property is located to the north of Pavenham Road and reported flood water entering from the front door. Pavenham Road, The Causeway, and Bridgend in Carlton were reported to be impassable due to the floodwater.

There is a watercourse running alongside Pavenham Road, with two land drains discharging into it from the north and south. The Pavenham Road watercourse and land drains convey surface water runoff from a catchment area of approximately 93ha[1] and it is thought that the flow in the watercourse is closely related and responsive to rainfall. The southern land drain is piped beneath Pavenham Road to join the watercourse along the northern side of the road. The watercourse then runs culverted for approximately 350m beneath Carlton. It becomes open channel to the northwest of the Moor, and discharges into the River Great Ouse approximately 650m further north. This culvert is an important asset for the functioning of the drainage mechanism in the community, and should be investigated and maintained appropriately.

It is thought that the heavy rainfall overwhelmed the capacity of the culvert beneath Pavenham Road, such that water backed up and followed local topography along the adjacent field. The culvert and a highway gully was reported to be in need of maintenance to Bedford Highways in January 2021, which is thought to have contributed to the flooding experienced at one of the properties. It is also thought that water from the watercourse and/or land drain from the north overtopped onto Pavenham Road which contributed to the flooding experienced at the other property. The Environment Agency mapping[2] shows the properties to be within/immediately adjacent to areas at 'high' risk of surface water flooding, which means that the chance of flooding is greater than 3.3% in any given year.

December 2020 was a very wet month with an average rainfall of 108mm across East Anglia, which is 95% higher than the December average[3]. 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 the Pavenham Road watercourse and land drains, as well as form overland flow routes. In addition, the high levels in the River Great Ouse would have prevented the watercourse from discharging freely. In conclusion, it is thought that a combination of heavy rainfall and elevated levels in the River Great Ouse contributed to the flooding. It is thought that the volume of water overwhelmed the capacity of the culvert beneath Pavenham Road, but the identified maintenance issue would have exacerbated 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.
- **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 the highway drainage on Pavenham Road including the culvert beneath the road and clear any debris. This was completed in March 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
Short term (1-6 months)	Liaise with landowners to ensure the Pavenham Road watercourse and land drains are maintained, and set a suitable inspection and maintenance regime as necessary.	Lead Local Flood Authority / Bedford Highways
Medium term (6-12 months)	Investigate the condition and capacity of the existing drainage on Pavenham Road, including the culvert beneath Pavenham Road and the culvert that conveys the watercourse beneath Carlton, to understand the potential for improvement works.	Bedford Highways / Lead Local Flood Authority
Medium term (6-12 months)	Investigate the potential benefit of constructing a ditch running parallel to one of the affected properties and constructing a bund along its southern edge to provide a level of protection against the overland flow route from the adjacent field.	Lead Local Flood Authority

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

[1] Flood Estimation Handbook (FEH) web service, https://fehweb.ceh.ac.uk/ [accessed June 2021].
[2] Environment Agency Flood Risk from Surface Water map, https://flood-warning-information.service.gov.uk/. [accessed June 2021].
[3] Environment Agency, December 2020 Flooding Great Ouse Catchment Summary.
[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.