Section 19 Flood and Water Management Act 2010

Bredfield Flood Investigation

Storm Babet 2023

	Name	Date
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Executive Summary

Storm Babet caused significant disruption to communities across Suffolk between 18th - 21st October 2023. Bredfield was a community that was significantly impacted, with approximately seven properties suffering internal flooding as well as disruption to infrastructure and services. Suffolk County Council, as Lead Local Flood Authority, have therefore undertaken a Section 19 Flood Investigation. The resulting report will:

- highlight the probable causes of flooding
- identify options to reduce future flood risk and increase property resilience
- make recommendations for actions by relevant responsible organisations, landowners or homeowners.

Bredfield is located in an area at significant risk of pluvial (surface water) flooding and the nature of the surrounding topography and geology contributes to the susceptibility of the community to flooding. Areas of Bredfield are low-lying, surrounded by a relatively shallow rural catchment. The local geology and soils are susceptible to high run off, making a high number of properties in the village vulnerable to flooding due to intense rainfall events.

Storm Babet delivered significant rainfall to the catchment, following an extended period of above average rainfall. Impacts within Bredfield were widespread and for the purposes of this report, the affected areas have been categorised into three zones. The description of the flood events detailed in the report have been compiled using data submitted to Suffolk County Council, as well as information from Risk Management Authorities (e.g. Suffolk County Council Highways and Anglian Water) and the community.

A comprehensive summary for each zone is provided within the report, outlining the context of the event and the impact. Key findings are that Bredfield was severely impacted by flooding due to the intensity and duration of rainfall which overwhelmed the natural flow routes and the capacity of watercourses and drainage infrastructure. This situation was compounded when overland flow paths converged and saw the resultant internal flooding of property.

Short, medium and longer term recommendations have been published and each have a potential role to improve resilience and reduce the risk of flooding to Bredfield.

Justification for Investigation

Suffolk County Council, Lead Local Flood Authority (LLFA) has determined that in accordance with our criteria, it is considered necessary and appropriate to carry out an investigation into this flood event.

This is in accordance with Section 19 (1) of the Flood and Water Management Act 2010, and in accordance with Section 19 (2) of the Flood and Water Management Act 2010, to publish the results and notify the relevant risk management authorities (RMAs).

Section 19 Local authorities: investigations

(1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate—

> *(a) which risk management authorities have relevant flood risk management functions, and*
>
> *(b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.*

(2) Where an authority carries out an investigation under subsection (1) it must—

> *(a) publish the results of its investigation, and*
>
> *(b) notify any relevant risk management authorities*

Criteria for an investigation (as per Appendix D of the Suffolk Flood Risk Management Strategy):	
There was a risk to life because of flooding?	
Internal flooding of one property (domestic or business) has been experienced on more than one occasion?	
Internal flooding of five properties has been experienced during one single flood incident	✓
Where a major transport route was closed for more than 10 hours because of flooding	
Critical infrastructure was affected by flooding	
There is ambiguity surrounding the source or responsibility of a flood incident	

Understanding the flood context

1. What happened during Storm Babet

A succession of weather fronts between the 11th and 13th of October 2023 brought significant rainfall to the region. Readings indicate that between 30mm and 50mm of rain fell across Suffolk compared with an average of just less than 65mm across the whole month of October according to Meteorological Office weather data (Met Office, 1991- 2020). This significant rainfall in a short space of time resulted in saturated land and rivers reaching their capacity. Shortly after this, Storm Babet followed on the 18th to 21st of October 2023. The storm brought between 50 mm and 80 mm of rain to much of central and northern East Anglia, with some Suffolk weather stations recording the wettest October day on record.

The Environment Agency River level gauging stations indicated many flows close to or exceeding their highest on record, and the weather remained wetter than average for the rest of the month. October 2023 was the joint wettest on record in the east of England since 1871. During Storm Babet, Suffolk saw the heaviest rainfall across East Anglia causing significant flooding of roads and properties. The river systems rose rapidly across whole catchments due to the existing conditions, which was unusual as storms will often impact a small area and result in a steady progression of flood water downstream. A major incident was declared by Suffolk Resilience Forum (SRF) in the afternoon of the 20th of October due to significant impacts on communities and disruption to the road and rail networks.

The following maps illustrate the extent to which the rainfall in the months preceding Storm Babet exceeded the average monthly rainfall for July to October in recent years in Suffolk.

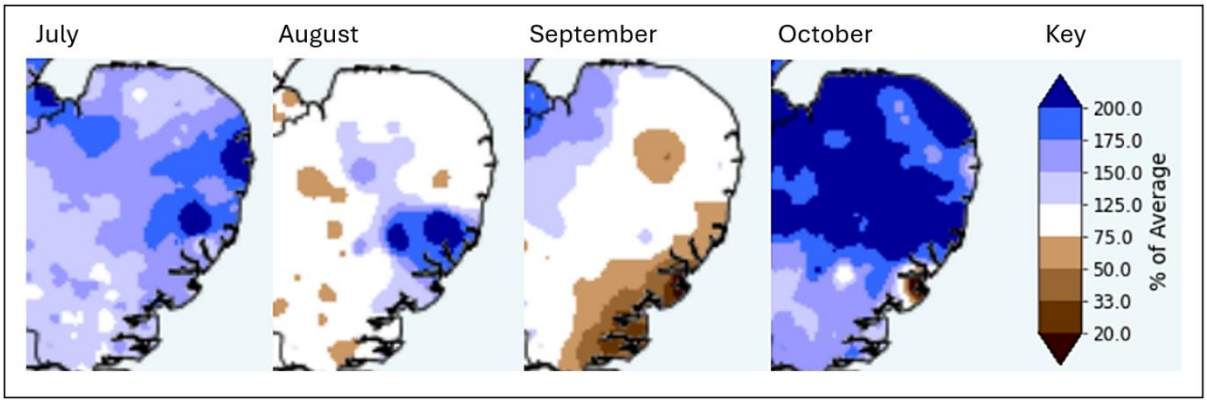

Fig. 1. Average monthly rainfall (July – October 2023) as a percentage of the historic average monthly rainfall

The following report acknowledges that October 2023 and particularly Storm Babet, was an extreme event and will assess the probable causes and impacts. The report will recommend measures to reduce the risk of flooding within the location, in line with best practice, ranging from large to small scale interventions and be targeted at a range of stakeholders. It should be noted that Storm Babet was a significant event,

with a low probability of recurrence. The recommendations will provide advice about reducing flood risk. However, they should not be relied upon as a guaranteed failsafe to mitigate against all future flooding.

2. Location of flooding

The village of Bredfield is located in the district of East Suffolk District Council, approximately 2½ miles north of the town of Woodbridge and 2½ miles southwest of the village of Wickham Market (Fig. 2).

Fig. 2. Investigation area map

Figs. 3 and 4 show the location of main rivers and significant ordinary watercourses in the vicinity of Bredfield. Main rivers did not have a role in the observed flooding, but ordinary watercourses, including Byng Brook, did have a role in the flooding at Bredfield.

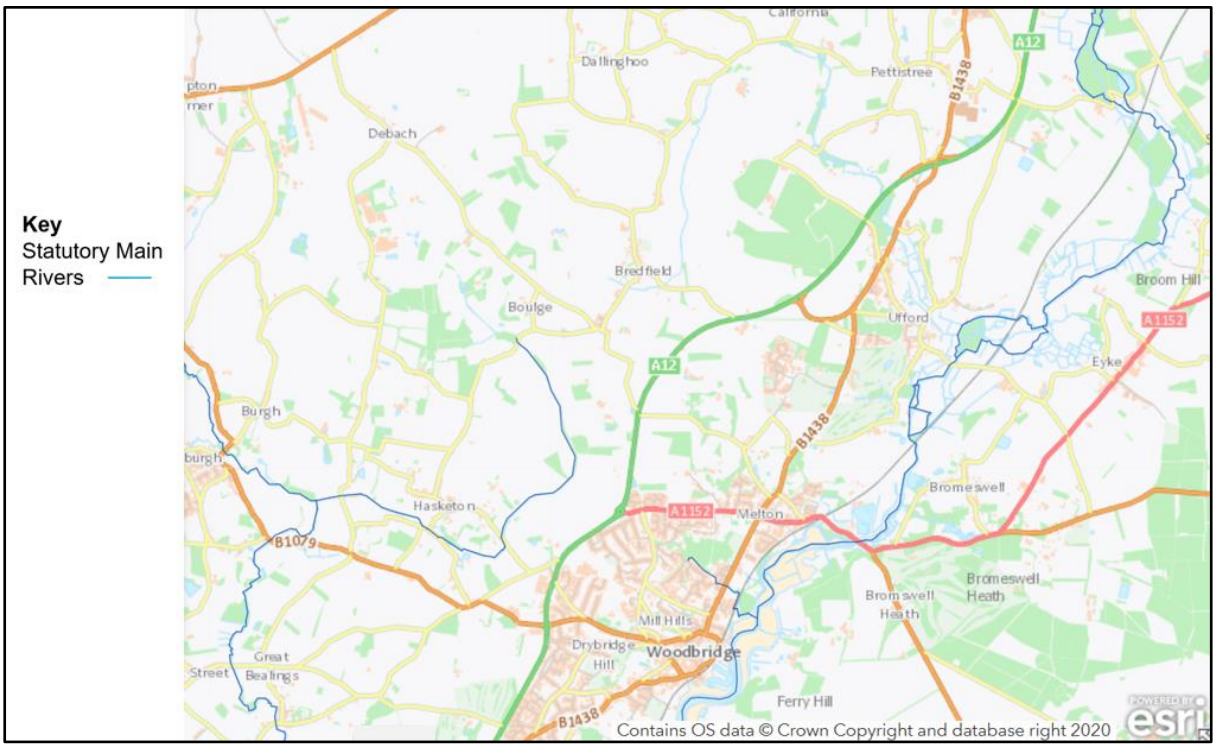

Fig. 3 Location of statutory main rivers

Fig. 4 Location of Byng Brook, ordinary watercourse (National River Flow Archive)

The Environment Agency has permissive powers to carry out maintenance, improvement or construction work on statutory main rivers to manage flood risk. Lead Local Flood Authorities (LLFAs) and Internal Drainage Boards (IDBs) manage the flood risk from ordinary watercourses but responsibility for maintaining watercourses rests with the Riparian Landowner, defined as those who have a river, stream or ditch which runs next to or through their land or property.

On the 20th October 2023, Storm Babet resulted in significant rainfall across Suffolk on already saturated ground due to above average rainfall in the preceding weeks. Bredfield was significantly impacted with approximately seven properties reporting internal flooding. Flood water was described as coming from several sources including surface water runoff from surrounding fields (pluvial), the overtopping of local watercourses (fluvial) and overwhelmed drainage systems. Within this report, the term 'flood water' may be used to describe all types of flooding.

For the purposes of this investigation the various areas affected by flooding have been separated into three distinct zones:

1. Woodbridge Road
2. Potash Corner (road C309)
3. Ufford Road

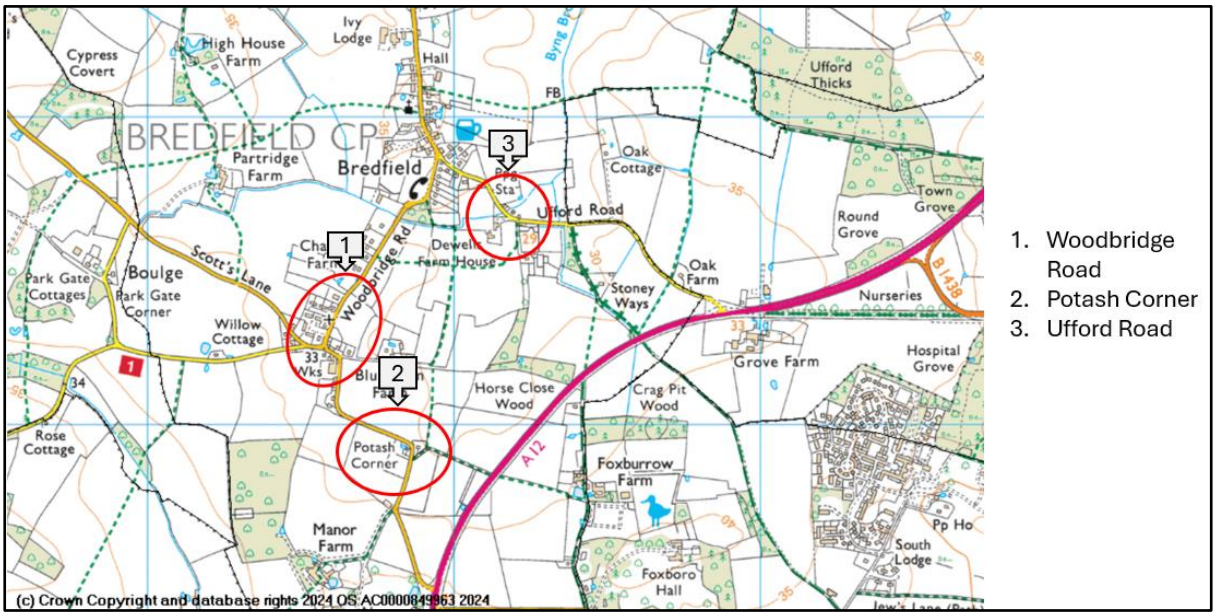

Fig. 5 Distinct flood zones where property was internally flooded

3. Records of any historical flooding

A review of Suffolk County Council's Highways reporting tool, local and social media reports indicated previous incidents of internal flooding of property in Ufford Road, Bredfield in 2000.

Information received from local residents also suggests that property in Woodbridge Road flooded internally again in Storm Henk (2nd January 2024).

Anglian Water have no reports of internal flooding to properties in Bredfield.

4. Predicted Flood Risk

The parish of Bredfield is at significant risk of pluvial flooding (Fig. 6). Areas of surface water flood risk which are projected in areas of property affected by internal flooding are mostly located to the west, south and east of the northern Bredfield village settlement.

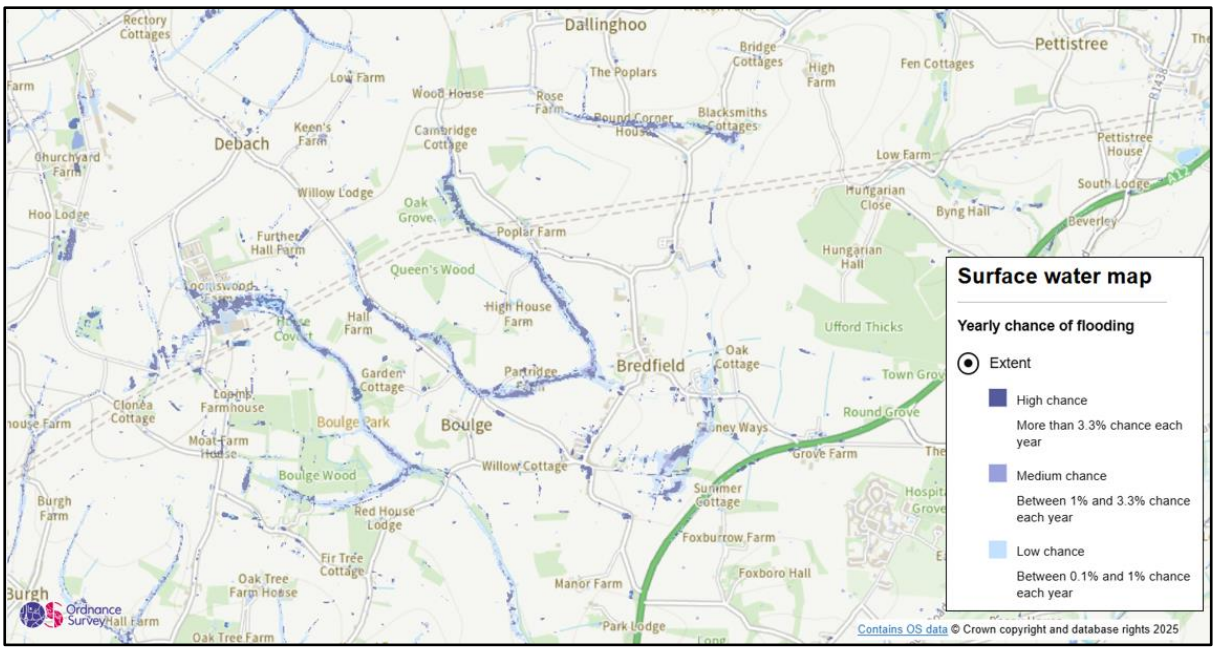

Fig. 6 Predicted flood risk from surface water

Fluvial flood risk in Bredfield is associated with Byng Brook, which follows an arc from west to east, on the south side of the northern Bredfield village settlement.

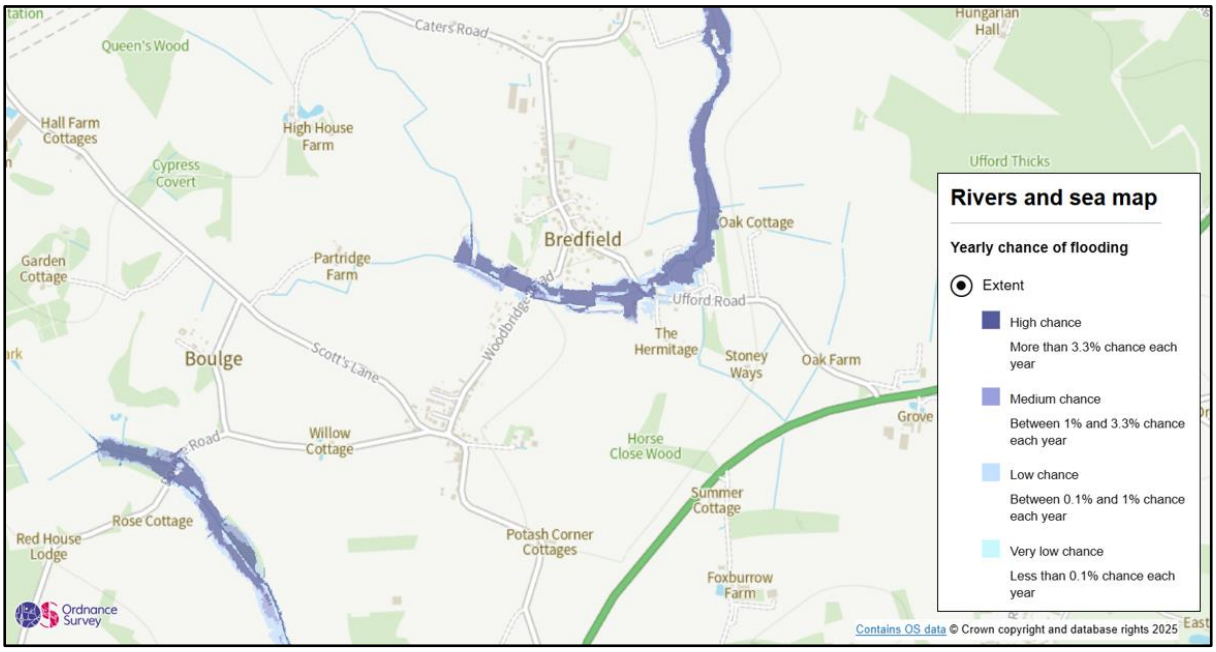

Fig. 7. Predicted flood risk from rivers

5. Catchment characteristics

The parish of Bredfield is situated in a relatively flat rural area with farmland used predominantly for arable agriculture, drained by field drains and ditches. Surface water flow paths from the northwest contribute to the flow of Byng Brook.

The low-lying nature of areas of the village means that during high rainfall events considerable flows of water converge and then drain away relatively slowly (see Fig. 8). Overwhelmed infrastructure and watercourses may be observed during these intense rainfall events.

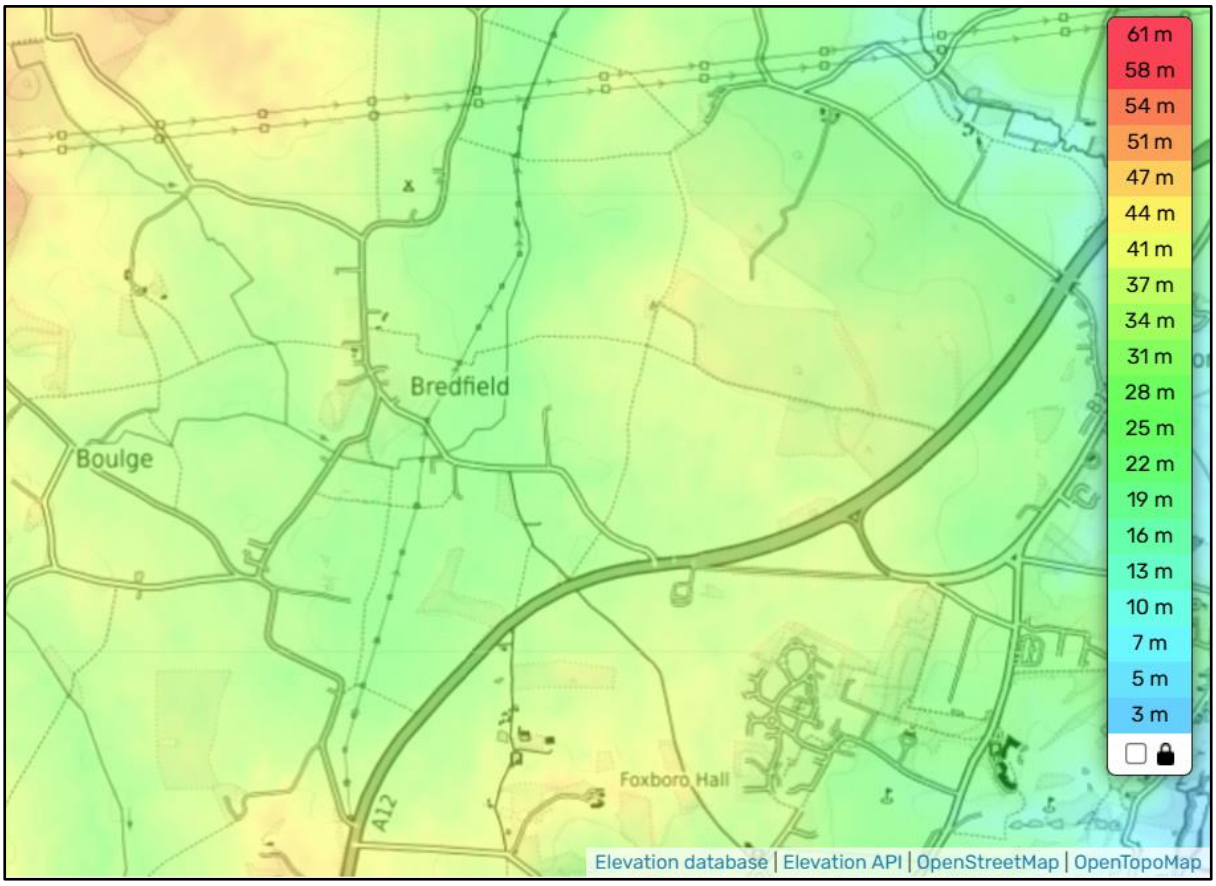

Fig. 8 Elevation map of catchment area

The soils surrounding Bredfield are loamy and clayey with impeded drainage, meaning that water permeates more slowly and surface water runoff is greater, particularly during intense rainfall (Fig. 8). However, the saturated nature of the soils leading up to the event would also have prevented some infiltration.

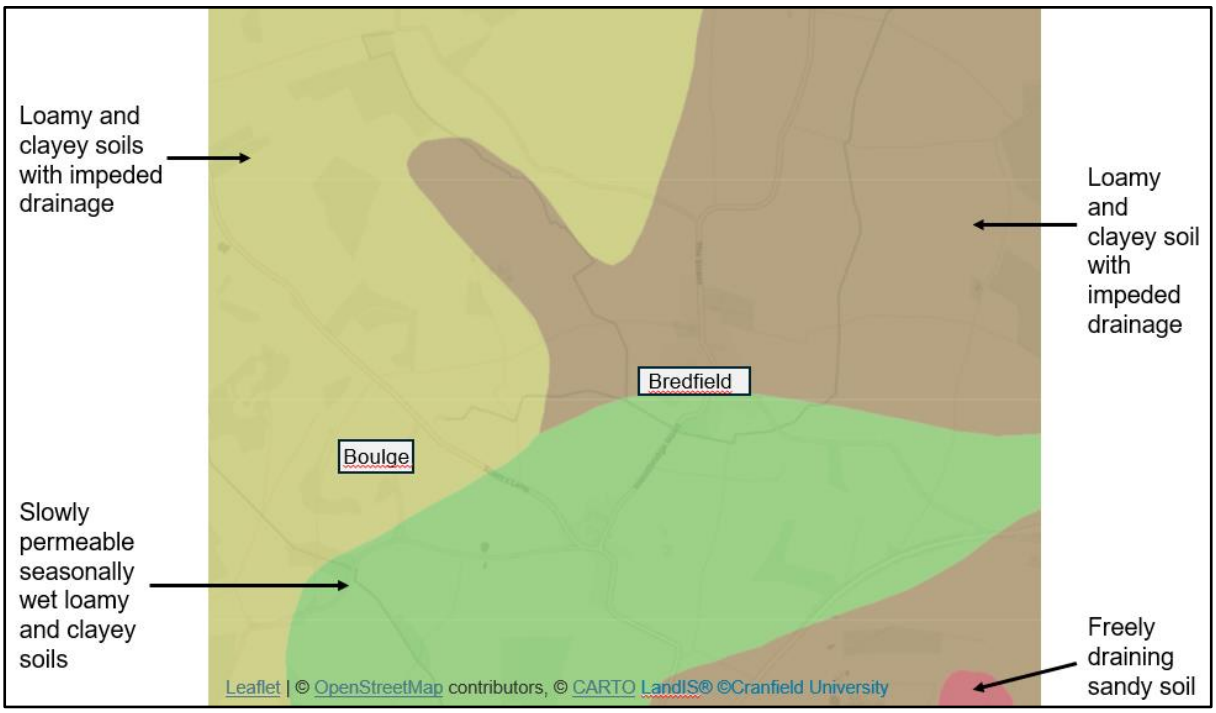

Fig. 7. Soil map of catchment area (LandIS Soilscapes)

Fig. 10 shows that much of the superficial geology surrounding Bredfield is made up of 'Lowestoft Formation – Diamicton' which is described by the British Geological Survey as a diverse mixture of clay, sand, gravel, and boulders varying widely in size and shape. This is sometimes known as boulder clay. This generally has a low permeability meaning water will tend to flow off it before it can infiltrate, which also reflects the reports collected during Storm Babet.

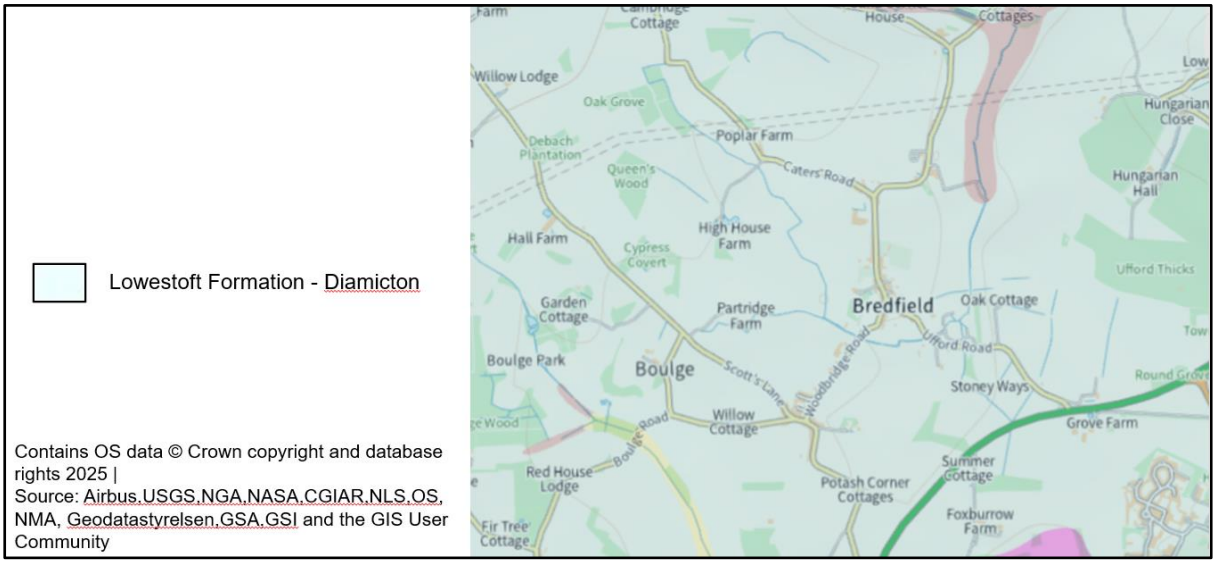

Fig. 8. Superficial geology (British Geological Society)

The bedrock in Bredfield and the surrounding area is a mixture of Thames Group - Clay, silt and sand; Red Crag Formation – Sand and Thanet Formation and Lambeth Group - Clay, silt and sand (Fig. 11).

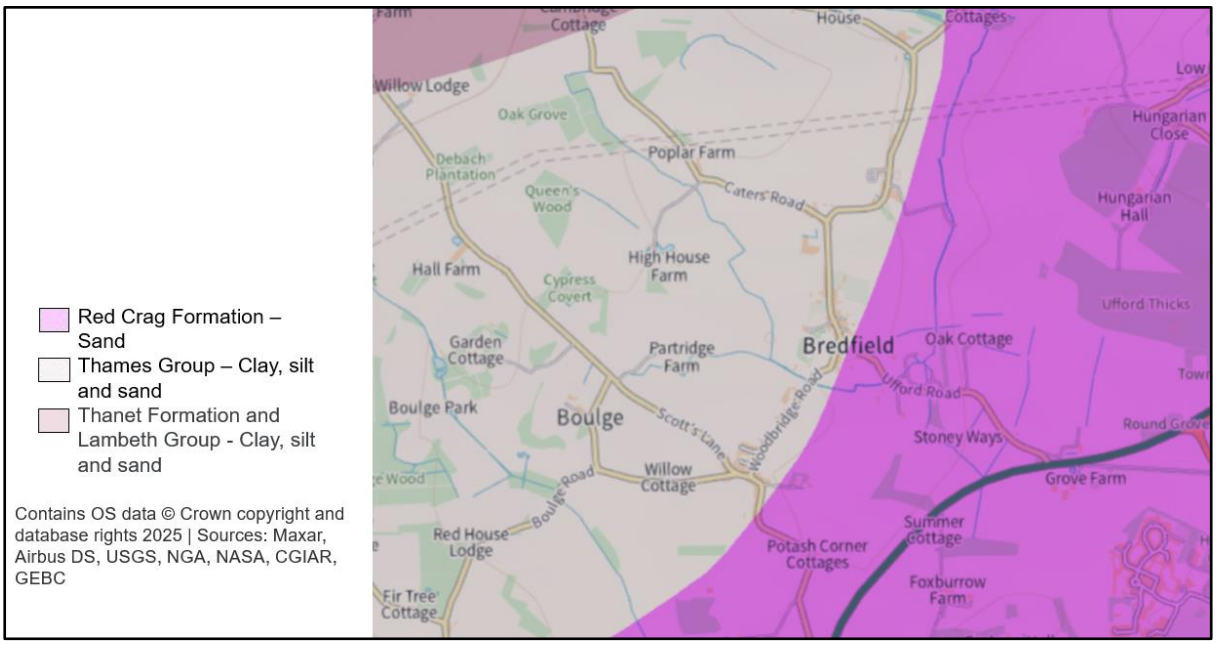

Figure 9 Bedrock geology (British Geology Society)

During short term intense rainfall events, soil composition and superficial geology become more influential in affecting the volume of surface water runoff. Combined with the topography within the catchment, these make Bredfield susceptible to extreme rainfall events. Saturated ground and high rainfall, like that of Storm Babet, will further emphasise the vulnerability of the parish and localised flooding could be experienced.

Flooding Sources, Pathways & Receptors

Storm Babet was an extreme event which came at a time when Suffolk had experienced a significant amount of rainfall in the preceding weeks.

Data from surrounding Environment Agency rain gauges indicates that a significant volume of rain was experienced during Storm Babet. The nearest rainfall gauge to Bredfield is at Woodbridge, where 51.4mm of rainfall was recorded on 20th October 2023, with 40.2mm recorded between 5.45am and 14.45.

The description of the flood events described below will discuss the probable sources of flooding, the observed flow paths through the community and the receptors which have been affected. The term ‘floodwater’ may be used to describe both fluvial (water from a watercourse) and pluvial (surface water run-off) flooding. This section has been prepared using reports submitted to Suffolk County Council via the online Highways Reporting Tool, community data and site visits.

Detailed descriptions of each investigation area can be found below.

1. Woodbridge Road

In the southern part of Bredfield village, property was internally flooded to the south of Jubilee Meadow and west of Woodbridge Road. Further south, east of the junction between Scott's Lane and Woodbridge Road, property on the south side of Woodbridge Road was impacted by internal flooding. Four properties were reported to have flooded internally in the Woodbridge Road area. All affected property in this area was projected to be at high risk of surface water flooding and no risk of fluvial flooding.

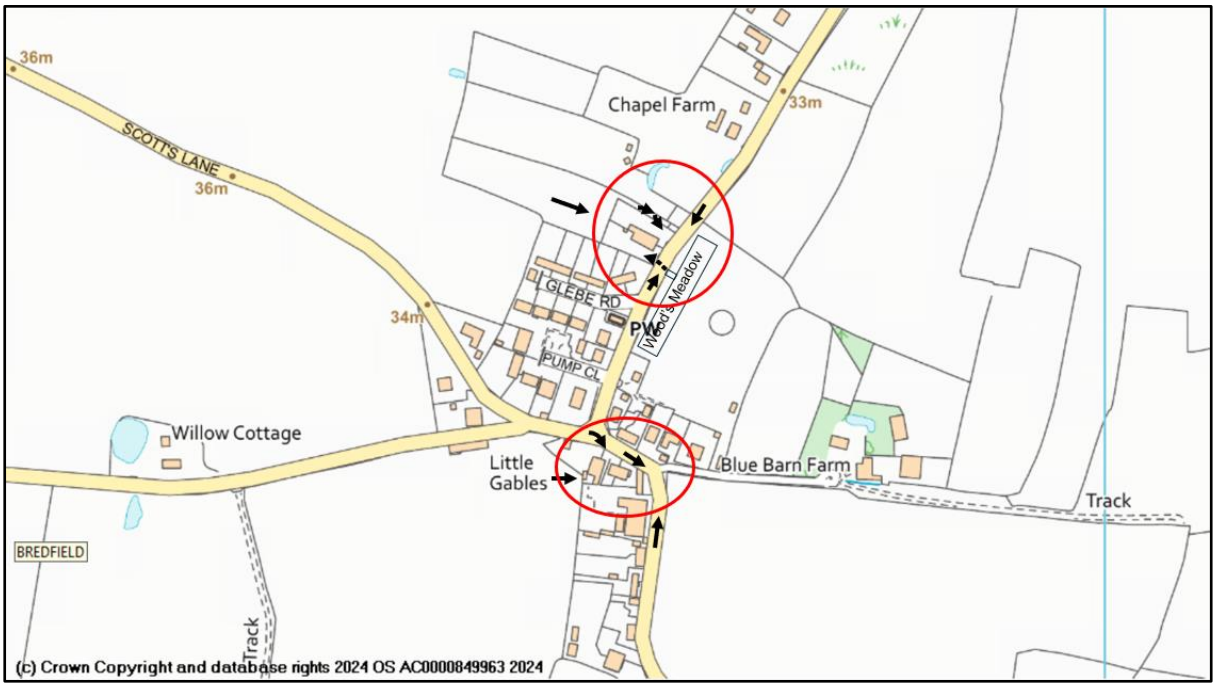

Fig. 10. Approximate floodwater flow paths, Woodbridge Road

Significant rainfall caused large quantities of surface water to flow from arable fields and field drainage ditches on the west side of Woodbridge Road. The pipe in a culverted watercourse, taking flow from a ditch on the south side of Jubilee Meadow towards Woodbridge Road was also reported to be broken, causing water to back up in the ditch and overtop close to Woodbridge Road. This ditch was reported to be silted up. (The broken pipe between Jubilee Meadow and Woodbridge Road has been repaired and the ditch adjacent to Jubilee Meadow has been cleared subsequent to Storm Babet. However, silt is reported to have then partly blocked the pipe under Woodbridge Road). A piped section of a watercourse on the east side of Woodbridge Road opposite this area was also reported to be blocked, causing water to back up and surcharge from a manhole in a garden on the west side of Woodbridge Road. (This blockage has been cleared since Storm Babet). Surface water also flowed west off Woodbridge Road into driveways that are situated lower than the highway. Flood water from fields to the west of Woodbridge Road, from the ditch on the south side of Jubilee Meadow and from the surcharging manhole merged together, causing internal flooding of property to a level of 6cm. Flooding of property in this location occurred

again in Storm Henk (2nd January, 2024). Gullies in the vicinity of this location were reported to be operational during Storm Babet.

In the area on the south side of Woodbridge Road, it was reported that surface water flowed off the fields at the rear of affected property and water flowed off the road at the front of property. This was exacerbated by driveways being a lower than the highway. Floodwater was reported to have entered houses in this area at 11am. and floodwater reached internal levels of 25cm. Drains were reported to be blocked. However, all gullies in the vicinity were checked during cyclical maintenance and found to be operational in the last visit before and first visit after Storm Babet. The extreme rainfall conditions caused the drainage system to be overwhelmed and exceed capacity.

Sewage was also reported to be in floodwater south of Woodbridge Road. However, Anglian Water did not receive reports of this, but the extreme rainfall may have caused the combined sewers to surcharge.

In summary:

- Intense and prolonged rainfall exceeded the capacity of field ditches and surface water flowed across fields from the west of Woodbridge Road.
- A pipe in a culverted watercourse flowing from a ditch south of Jubilee Meadow towards Woodbridge Road was broken, blocking flow.
- This caused the water to back up, overtopping the ditch, which was silted up.
- Subsequent pipe repair between Jubilee Meadow and Woodbridge Road released silt which may have then blocked the pipe under Woodbridge Road.
- A piped section of watercourse on the east side of Woodbridge Road was blocked, causing water to back up and surcharge a manhole in a garden on the west side of Woodbridge Road. This blockage has been cleared subsequently.
- Flood water from fields west of Woodbridge Road, from the ditch on the south side of Jubilee Meadow and from the surcharging manhole merged together with floodwater flowing west off Woodbridge Road into lower level driveways to flood property internally.
- Floodwater from fields to the south of Woodbridge Road merged with surface water flowing down lower level driveways to flood property south of Woodbridge Road.
- Sewage was reported to be present in floodwater south of Woodbridge Road. No reports were received by Anglian Water but this may have been due to the combined sewer surcharging.

Recommended actions:

- Residents to install Property Flood Resilience (PFR) via grant funded scheme.
- SCC Highways to investigate potential blockage in piped watercourse under Woodbridge Road in the vicinity of Jubilee Meadow.

- Landowners to carry out watercourse maintenance to reduce flood risk as necessary in accordance with their riparian responsibilities.

2. Potash Corner (C309)

Affected property in this area on the west of the road C309 is projected to be at high surface water risk of flooding. On the east side, affected property is projected to be at low risk of surface water flooding, ie. at risk during extreme rainfall events. Neither are at fluvial (river) flood risk. Two properties were affected by internal flooding on the east and west side of road C309.

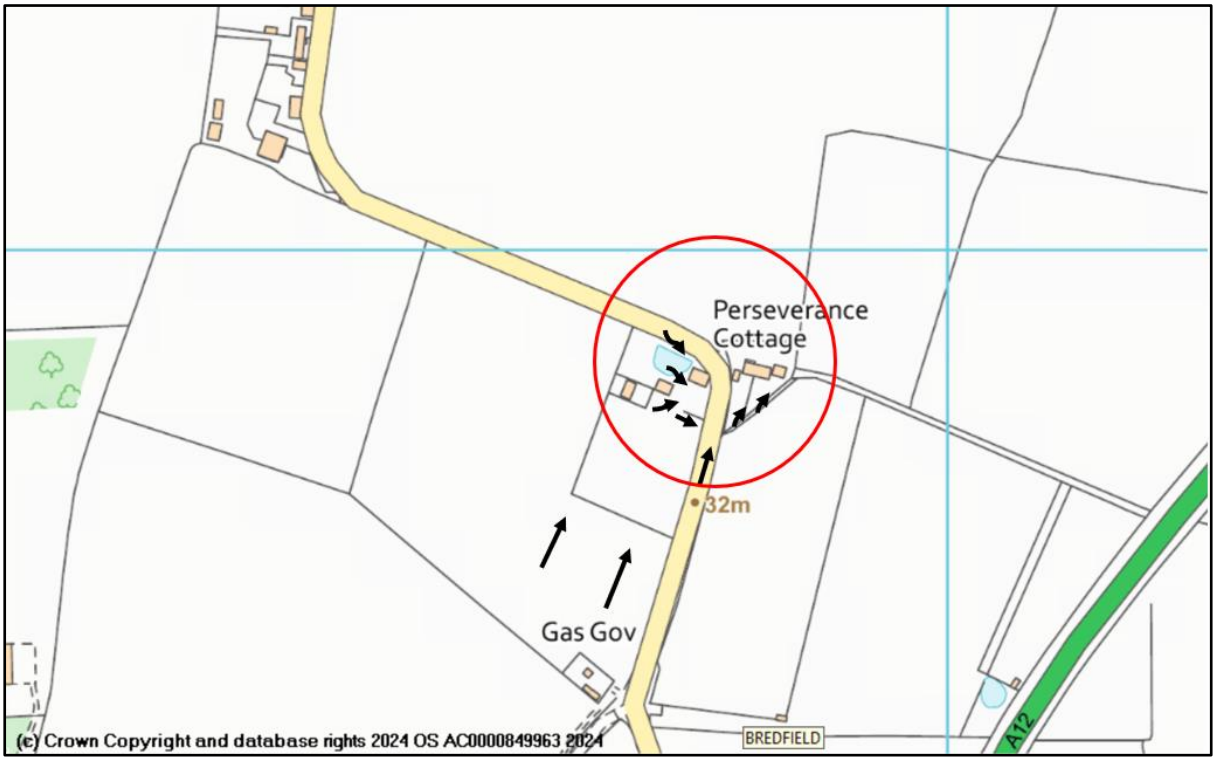

Fig. 11. Approximate floodwater flow paths in Potash Corner (C309)

A pond adjacent to property on the southwest side of the road C309 at Potash Corner receives surface water from highway gullies and fields to the south. Pipes for inflows to the pond are reported to be larger than the outflow. The pond overtopped due to a combination of extreme quantities of surface water runoff from fields and the highway causing the drainage system to exceed capacity. Surface water also flowed from the south down the highway to this low-lying area. Floodwater on the corner of the road C309 at Potash Corner reached approximately 15cm at 1.43pm on 20th October. All gullies in the vicinity were operational at the time, with the possible exception of one. However, grips were partly overgrown. Fully functional grips, particularly on the north side of the road where land adjacent to the road is at a significantly lower level, would have enabled some more water to flow away more rapidly from the highway. Floodwater from the overtopped pond combined with further surface water flowing

directly from the fields and the highway to flood property on the west side of the highway to an internal level of approximately 30cm.

Excess water from the pond flows into a ditch which continues eastwards through a small diameter piped culvert under the road and into another ditch flowing east at the rear of property on the eastern side of the road C309. This small ditch overtopped and combined with surface water runoff from fields on the east side which had exceeded the capacity of field drainage systems. Some drainage ditches in the vicinity were reported not to have been kept clear prior to Storm Babet.

In summary:

- Surface water from highway gullies and fields to the south drain into a pond on the southwest side of the road C309.
- Pipes for inflows to the pond are reported to be larger than the outflow.
- The pond overtopped due to a combination of extreme quantities of surface water runoff from fields and the highway causing the drainage system to exceed capacity.
- All of the gullies in the vicinity were operational at the time, with the possible exception of one.
- Excess water from the pond flows into a ditch which flows east through a small diameter pipe under the road C309 and past the rear of properties on the east side of the road.
- This ditch overtopped, adding to further surface water flowing directly from fields which had exceeded the capacity of field drainage systems and also surface water from the highway which both flowed from the south to this low-lying area.
- Some field drainage ditches in the vicinity were reported not to have been kept clear prior to Storm Babet.

Recommended actions:

- Residents to install Property Flood Resilience (PFR) via grant funded scheme.
- Landowners to carry out watercourse maintenance to reduce flood risk as necessary in accordance with their riparian responsibilities.
- SCC Highways to recut grips flowing to lower field
  SCC Highways to investigate ditch ownership and action works to ditch levels accordingly.

3. Ufford Road

The northernmost area where property was affected by internal flooding was on the south side of Ufford Road, close to Byng Brook (Fig. 12). One property is known to have internally flooded. Affected property on Ufford Road is projected to be in a high risk area for both surface water and fluvial flooding. Byng Brook is reported to have

overtopped its banks and fluvial water flowed south, combining with surface water flowing from the southwest from fields. Flood water had entered property by 12.09 on the 20th October and reached a level of 30cm. It had receded by 5pm.

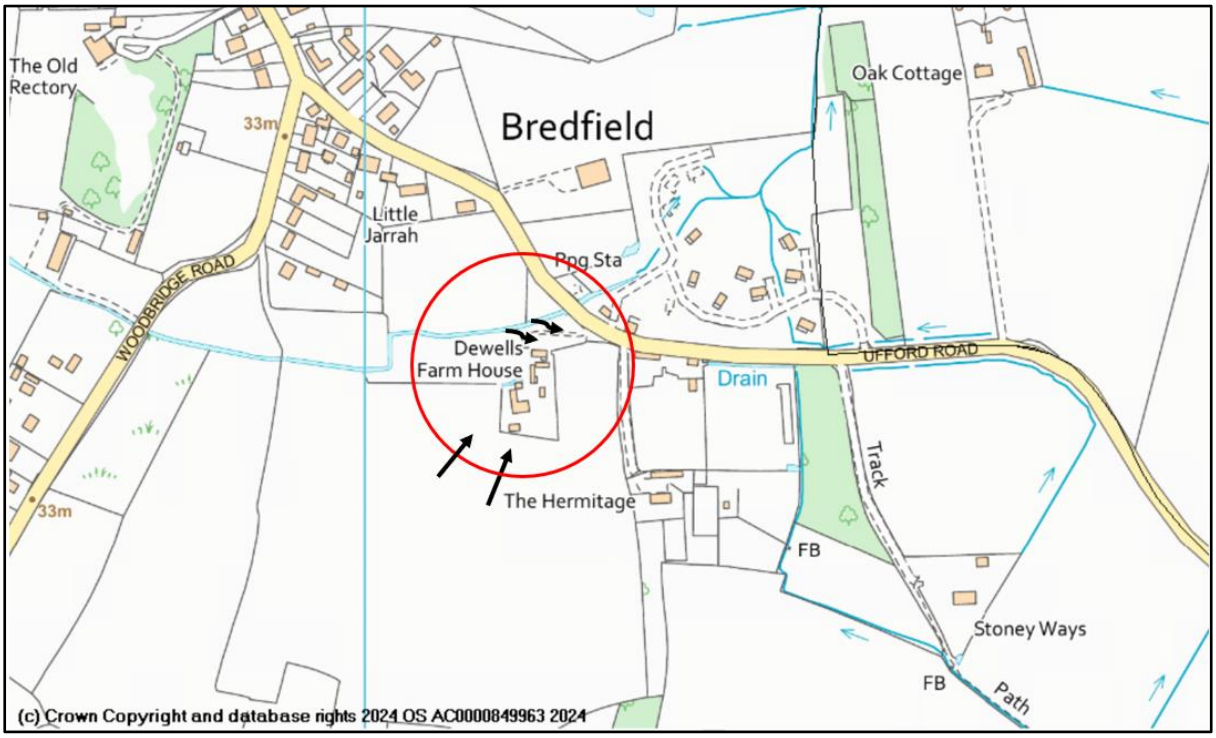

Fig. 12 Approximate floodwater flowpaths, Ufford Road

In summary:

- Intense and prolonged rainfall caused Byng Brook to overtop its banks and fluvial water to flow south.
- This fluvial water combined with surface water flowing northeast from fields.

Recommended actions:

- Residents to install Property Flood Resilience (PFR) via grant funded scheme.
- Landowners to carry out watercourse maintenance to reduce flood risk as necessary in accordance with their riparian responsibilities.

Risk Management Authorities, Non-Risk Management Authorities and flood risk functions

Risk Management Authority	**Relevant Flood Risk Function(s)**
Suffolk County Council	Lead Local Flood Authority, Highways Authority & Asset Owner
Environment Agency	Lead organisation for providing flood risk management under its permissive powers and warning of flooding from main rivers
East Suffolk District Council	Local Planning Authority & Asset Owner
Anglian Water	Asset Owner
Non-Risk Management Authority	**Relevant Flood Risk Function(s)**
Private Landowners	Riparian Responsibilities and management of water from land or/ watercourses
Private Homeowners	Improving flood resilience to property and some riparian responsibilities if adjacent to watercourses.
Parish Council	Manage flood risk at a community level, prepare and produce flood action plans and maintain watercourses where present on land they own.

Action(s) completed to date:

The following section acknowledges actions that RMA's and Non-RMAs have implemented or are currently in progress since Storm Babet and prior to publishing of this report.

Action	**Responsible Party**	**Progress**
Offer of £5k Property Flood Resilience (PFR) grant funded scheme to eligible properties that flooded during Storms Babet	Suffolk County Council Lead Local Flood Authority (LLFA)	Ongoing (applications accepted until end May 2025)
Ensure riparian landowner responsibilities are understood with regard to watercourse management	SCC LLFA	SCC published "Flood Smart Living" handbook designed to increase flood resilience for residents, landowners and communities, November 2024

Clear ditches on parish council land and repair culvert between Jubilee Meadow and Woodbridge Road	Bredfield Parish Council	Ditches cleared and piped culvert repaired.
Ensure riparian landowner responsibilities are understood with regard to watercourse management	Bredfield Parish Council	Letters sent to landowner farmers to remind of Riparian responsibilities and riparian responsibilities publicised to community

LLFA Recommended Action(s):

The following section provides a range of flood mitigation measures that could be implemented to reduce the risk of flooding in Bredfield. They have been derived from data and evidence collated as part of the report and have been included having been considered realistic in their implementation. The implementation of actions falls to the responsible party. Progress on the action will be monitored by Suffolk County Council but it should be acknowledged that the council has limited powers to enforce the implementation of recommended actions.

Action	Responsible Party	Timescale for response	Latest Progress Update for Actions
Short Term Actions (e.g. standard maintenance activity and initial investigation of options that can be undertaken with limited need for forward planning)			
Establish a Community Emergency Plan that includes plans to manage future flood events – Liaison with Suffolk Joint Emergency Planning Unit	Bredfield Parish Council	6 months	
Maximise the take up of the £5k PFR Grant currently available to residents before the May 2025 deadline	SCC LLFA / Residents	End May 2025	Grant applications open until end of May 2025, works and claims due by end of Dec 2025
Investigate piped watercourse for blockages under Woodbridge Road	SCC Highways	6 months	

(originating in front of access to Jubilee Meadow)			
Investigate and recut grips as appropriate at Potash Corner (C309)	SCC Highways	6 months	
Investigate ownership of ditch at Potash Corner (C309) and action accordingly	SCC Highways	6 months	
Riparan owners to ensure watercourses are managed and maintained as per their riparian responsibilities.	Riparian landowners/residents	N/A	SCC published "Flood Smart Living" handbook designed to increase flood resilience for residents, landowners and communities, November 2024. Details of riparian ownership are included.
Medium Term Actions (e.g. longer planning timescales and potential need to source funding but potential for greater impact)			
Investigate additional interventions, eg. NFM or PFR, which may improve flood resilience	Landowners and/residents, supported by relevant authority, resource dependant (SCC LLFA, EA)	12-24 months	
Long Term actions (significantly longer timescale and budget required with potentially greater positive impact)			
Deliver any interventions that are economically, technically and environmentally feasible and acceptable to improve the flood resilience of the village, eg. NFM or PFR measures.	Landowners and/residents, supported by relevant authority, resource dependant (SCC LLFA, EA)	As required	

Approval

This report will be reviewed and updated every 6 months until actions are marked as complete.

Reviewer	Date of Review

Disclaimer

This report has been prepared and published as part of Suffolk County Council's responsibilities under Section 19 of the Flood and Water Management Act 2010. It is intended to provide context and information to support the delivery of the local flood risk management strategy and should not be used for any other purpose.

The findings of the report are based on a subjective assessment of the information available by those undertaking the investigation and therefore while all reasonable efforts have been made to gather and verify such information may not include all relevant information. As such it should not be considered as a definitive assessment of all factors that may have triggered or contributed to the flood event. Should there be additional information available to develop the report, please email to floodinvestigations@suffolk.gov.uk.

The opinions, conclusions and recommendations in this Report are based on assumptions made by Suffolk County Council when preparing this report, including, but not limited to those key assumptions noted in the Report, including reliance on information provided by third parties.

Suffolk County Council expressly disclaims responsibility for any error in, or omission from, this report arising from or in connection with any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the time of preparation and Suffolk County Council expressly disclaims responsibility for any error in, or omission from this report arising from or in connection with those opinions, conclusions, and any recommendations.

The implications for producing Flood Investigation Reports and any consequences of blight have been considered. The process of gaining insurance for a property and/or purchasing/selling a property and any flooding issues identified are considered a separate and legally binding process placed upon property owners and this is independent of and does not relate to Suffolk County Council highlighting flooding to properties at a street level. Property owners and prospective purchasers or occupiers of property are advised to seek and rely on their own surveys and reports regarding any specific risk to any identified area of land.

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