Flood Investigation Report

Storm Henk

2nd January 2024

Frisby on the Wreake

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6.1 LOCAL DRAINAGE CONTEXT

Frisby on the Wreake is a small village located 5 km west of Melton Mowbray, within Melton District. The River Wreake (EA designated Main River) flows in a westerly direction to the north of the village as illustrated in Figure 6-1, and the majority of the settlement within the village is situated to the south of the river and the railway line. Water from rainfall on the upstream catchment to the south of Frisby on the Wreake makes its way towards the River Wreake via a network of drainage features including ditches and culverts, as illustrated in Figure 6-1 and Figure 6-2.

The areas impacted by Storm Henk (Flood Area A and B) are located on the hillside to the south of the Wreake. The responsible agency for managing the risk from Main Rivers is the EA. Details relating to RMA responsibilities can be found in Section 21 of the main Storm Henk report.

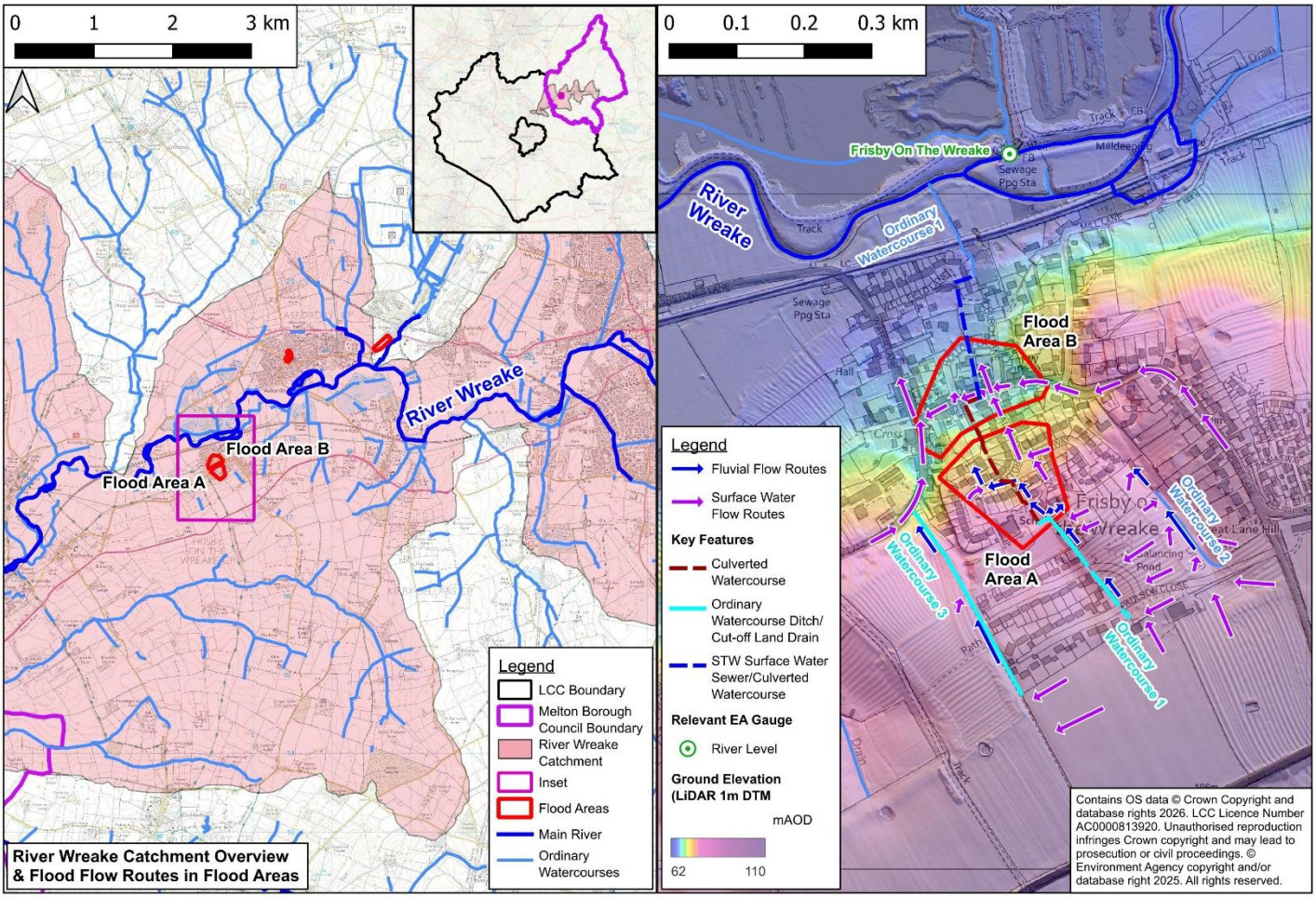

Figure 6-1: Frisby on the Wreake Location Plan, relevant Watercourse Catchment and Flow Routes through Flood Areas (INSET 4)

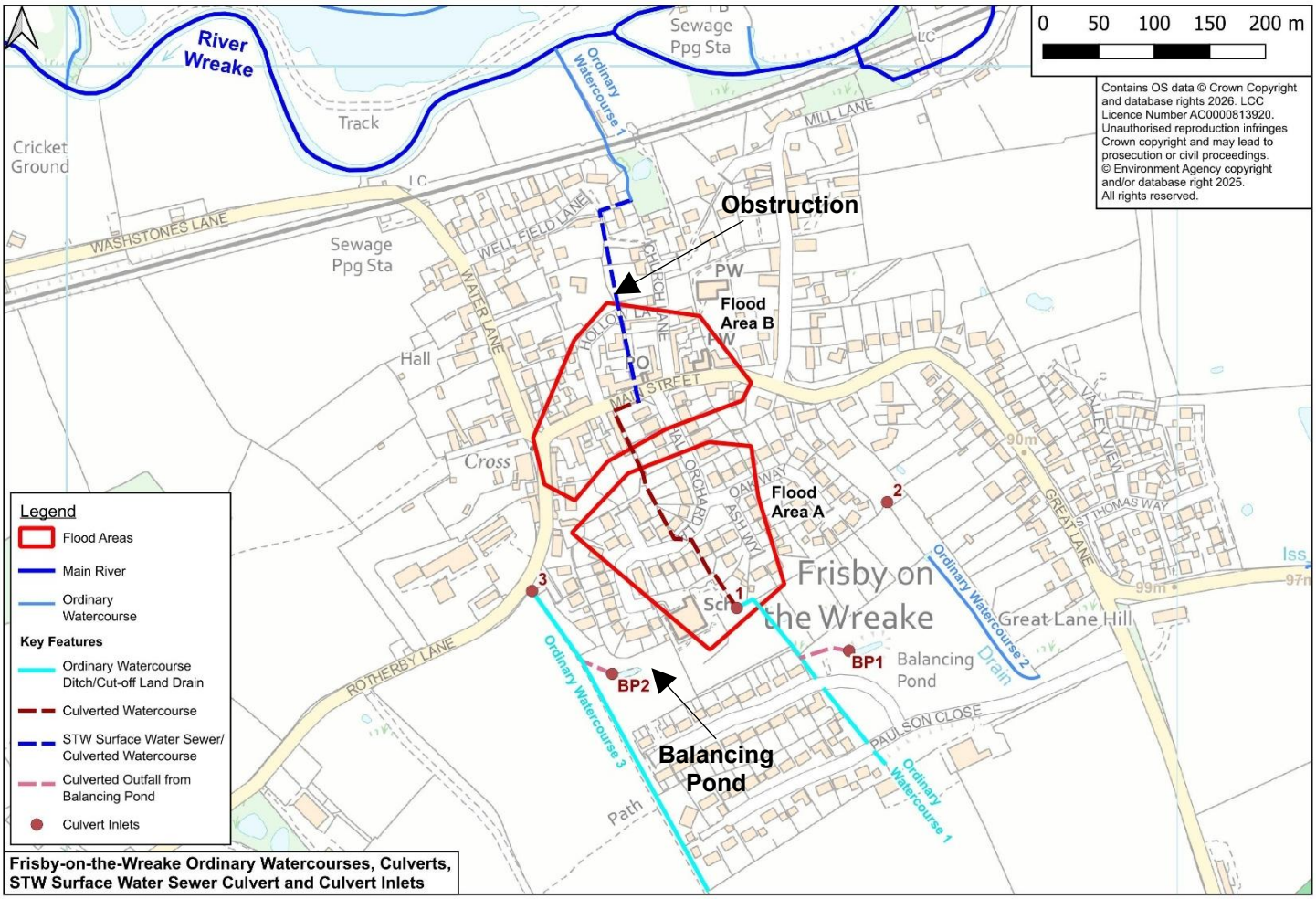

Figure 6-2: Frisby on the Wreake locations of culverted watercourse and key features (culvert inlets, balancing pond (BP) outfalls and obstruction in public surface water sewer)

The UK Centre for Ecology & Hydrology's Flood Estimate Handbook (FEH) Web Service[1] provides strategic level catchment mapping for Great Britain, however it does not distinguish this location in Frisby on the Wreake as within a discrete sub-catchment for the River Wreake, but includes it within its intervening catchment as confirmed by the EA's River Wreake catchment boundary illustrated in Figure 6-1. This intervening catchment is characterised by a series of surface water flow routes converging in the centre of the village near the junction of Main Street and Hall Orchard Lane as illustrated in Figure 6-1, and as described below.

ORDINARY WATERCOURSE 1

Unnamed Ordinary Watercourse 1, originates from land south of Robert Street where former underground field drainage ditches converge and flow within the hedgerow line north of Robert Street. These ditches have been upgraded as part of the recent Rotherby Manor development and replaced with a cut-off land drain system. This cut-off land drain proceeds for approximately 65m before passing beneath Paulson Close (as illustrated in Figure 6-2). (Note there are no connecting highway culverts beneath these roads).

[1] Centre for Ecology & Hydrology (2026) FEH Web Service https://fehweb.ceh.ac.uk/Map

The land drain continues from the north side of Paulson Close from at Ordnance Survey national grid reference (OSNGR) SK 69674 17450) to the east of the Rotherby Manor development and proceeds northwards towards the playing fields of Frisby Church of England (C of E) Junior School.

As it flows through the school land it then takes a 90 degree bend west before entering a 225 dia surface water culvert adjacent to the rear of gardens of properties along Ash Way (at OSNGR SK 69602 17512) (identified as Inlet 1 on Figure 6-2 and depicted in Photograph 6-1). The inlet to the culverted section is protected by an informal trash screen which is owned and maintained by Frisby C of E Junior School and the riparian landowner.

Photograph 6-1: Culvert Inlet 1 at Downstream Extent of Ordinary Watercourse 1 at Frisby Church of England Junior School

Ordinary Watercourse 1 culvert exits the school land at the north-east corner of the site and proceeds northwards through private land of residential properties, crossing beneath Hall Orchard Lane and then via rear gardens of properties within Skinners Yard (off Main Street). The exact alignment or composition of this culverted section of ordinary watercourse however is not fully confirmed. The culvert then takes a 90-degree bend to the east before becoming incorporated into the public surface water sewer network in Main Street (at OSNGR SK 69514 17702), which is owned and maintained by Severn Trent Water (STW).

This public surface water sewer in Main Street comprises a single 600mm diameter (dia) brick arched culvert and is joined from the south east by a 150mm dia surface water sewer draining Hall Orchard Lane. From Main Street, the surface water sewer flows northwards proceeding beneath private property and crossing Hollow Lane before taking a 90-degree turn east between two residential properties on Well Field Lane.

The surface water sewer discharges into an open channel reach in a field to the east of 16 Well Field Lane (at OSNGR SK 69508 17881) (identified as a continuation of Ordinary Watercourse 1 in Figure 6-1 and Figure 6-2). It is understood this flows northwards, under the railway line and eventually discharges into the River Wreake at OSNGR SK 69444 18011. This reach is privately owned and maintained by the respective riparian landowners with the exception of the culvert beneath the railway which is owned and maintained by Network Rail.

Surface water runoff collected from the Rotherby Manor development is directed into two balancing ponds where flows are attenuated. The eastern balancing pond (Photograph 6-2) discharges via an approved flow control chamber (identified as BP1 in Figure 6-2) (through a 375mm dia pipe into a HydroBrake followed by a 225mm dia pipe). This outfalls into Ordinary Watercourse 1 at the south east corner of the Frisby C o E Junior School playing field (at OSNGR SK 69666 17472).

Photograph 6-2: Rotherby Manor Eastern Balancing Pond and Out-fall Headwall into Ordinary Watercourse 1

The western balancing pond (Photograph 6-3) discharges via an approved flow control chamber (identified as BP2 in Figure 6-2) (through a 450mm dia pipe into a HydroBrake followed by a 225mm dia pipe). This outfalls into Ordinary Watercourse 3 (described below) (at OSNGR SK 69461 17470) located to the west.

Photograph 6-3: Rotherby Manor Western Balancing Pond and Outfall Headwall into Ordinary Watercourse 3

Whilst construction had not been completed within this development at the time of the event, the ponds and flow control chambers had been constructed and were operational. It is noted that balancing pond are intended to manage surface water runoff from on-site hardstanding only (not adjacent fields), with the flow control limiting surface water discharge to the approved pre-development greenfield runoff rate from the same area. Excess surface water runoff to this rate is retained within the balancing pond (usually designed up to the 1% annual chance of flooding including climate change allowances for new developments since the National Planning Policy Framework (NPPF) and previous Planning Practice Guidance Note 25 (PPG25) became national policy).

ORDINARY WATERCOURSE 2

Unnamed Ordinary Watercourse 2 originates on the northern side of Robert Street as an open channel field ditch, as illustrated in Figure 6-2 and depicted in Photograph 6-4. Ordinary Watercourse 2 flows along the eastern perimeter of the Rotherby Manor estate before entering a pond where it is shown to cease in the OS mapping. It is understood however to proceed northwards, firstly via a continuation of the channel through the next field to the north, then into a 225 dia culvert located at the north-eastern corner of this field (identified as Inlet 2 in Figure 6-2 and depicted in Photograph 6-5). The inlet for this culvert has a trash screen. This culvert is understood to run beneath private gardens east of Oak Way towards Great Lane, along the course of the former natural channel as illustrated from historic mapping and as indicated by ground elevation data.

Photograph 6-4: Looking northwards towards Ordinary Watercourse 2

Photograph 6-5: Culvert Inlet 2 at Downstream Extent of Ordinary Watercourse 2

This culvert is believed to eventually connect into the STW 600mm dia brick arched surface water sewer in Main Street via a local culverted drainage network, but the exact alignment, condition and sizing of this is unknown so has not been illustrated on Figures within this report.

ORDINARY WATERCOURSE 3

Unnamed Ordinary Watercourse 3 drains the agricultural fields to the west of Rotherby Manor, as illustrated in Figure 6-2 and Photograph 6-6. It comprises an open channel ditch which flows northwards and enters a piped highway drainage network beneath Rotherby Lane via a twin culvert inlet (one 150mm dia culvert and one 100mm dia culvert) with a trash screen, as illustrated in Photograph 6-7 (identified as Inlet 3 in Figure 6-2), at OSNGR 469424 317531 .

Photograph 6-6: Looking southwards upstream along Ordinary Watercourse 3 from path south of Rotherby Lane

Photograph 6-7: Twin Culvert Inlet at downstream extent of Ordinary Watercourse 3 on the southern side of Rotherby Lane looking northwards

This highway drainage network continues northwards towards the centre of the village then beneath Water Lane; however, its exact alignment, condition and sizing is not known so has not been illustrated on Figures within this report. As noted above, the western balancing pond of the Rotherby Manor site also discharges via an outfall into Ordinary Watercourse 3, south of Rotherby Lane.

6.1.1 GEOLOGY

The agricultural catchment to the south of Frisby on the Wreake falls steeply towards the village. Historic land management practices, including field drainage and channel modifications, have accelerated runoff from agricultural areas, reducing natural attenuation. As a result, Frisby is vulnerable to 'flashy' surface water flooding events following short-duration rainfall events.

The upstream catchment to the south has Lime-rich loamy and clayey soils with impeded drainage[2]. Anecdotal evidence supports the presence of high groundwater levels to the north of the village near the River Wreake as a result of this geological composition. This is known to impact the ability of the local drainage network north of the railway line to discharge effectively into the River Wreake which has high water levels due to the large volume of baseflow contributions from the adjacent land.

[2] LandIS (2024) Soilscapes https://www.landis.org.uk/soilscapes/

6.1.2 HYDROMETRY

The EA monitor river levels along the River Wreake at the Frisby on the Wreake gauge[3] located at OSNGR SK 69560 18060, as illustrated in Figure 6-3. The gauge itself did not record the peak water level of the Storm Henk event, to compare directly to the network, due to an issue at the gauge, but it exceeded a river level of 3.3 metres above the gauge station datum (mASD) before the issue arose.

The Flood Areas however are at a low fluvial risk (Flood Zone 1) from the River Wreake (see Figure 6-3), and bank-side ground elevations at the Wreake channel are 2m+ below the downstream extent of the STW surface water sewer culverted watercourse, which is also in Flood Zone 1. The river levels observed at this gauge are not therefore significant to the Flood Areas in this investigation as they were unlikely to influence/restrict the ability of this sewer to discharge.

6.1.3 FLOOD WARNINGS

The EA provides a Flood Warning service for the River Wreake at Frisby on the-Wreake[4] (Code: 034FWFWRFRISWRKE). On 2nd January 2024 at 12:18 hours, the EA issued a Flood Warning for this area. It covers properties located within the River Wreake corridor to the north including areas north of the railway line, around the Washstones Lane, Mill Lane, and west of Water Lane affected by the Main River, but not any properties within the Flood Areas of this investigation. So, whilst it was issued for the River Wreake, no warning was available for this section of the community affected by the ordinary watercourses and surface water flooding.

[3] Defra (2026) Hydrology Data Explorer – Frisby on the-Wreake river level gauge. https://environment.data.gov.uk/hydrology/station/3fcaa5fd-4c75-4af8-9497-b4c4859b0f87

[4] Environment Agency (2026) River Wreake at Frisby-on-the-Wreake flood warning area. https://check-for-flooding.service.gov.uk/target-area/034FWFWRFRISWRKE

6.1.4 NATIONAL SCALE PREDICTIVE FLOOD MAPPING

The EA provides flood risk mapping nationally for both rivers and surface water as detailed within Section 2.7.6 of the main Storm Henk report. The EA's Flood Map for Planning (NaFRA2) identifies that Flood Areas A and B are both entirely located within Flood Zone 1 (low risk, less than a 0.1% annual chance of flooding from rivers and the sea) as illustrated in Figure 6-3.

The EA's Risk of Flooding from Surface Water (RoFSW) map (NaFRA2) identifies that there is a high, medium and low risk of surface water flooding across the village, as illustrated in Figure 6-3. In particular, south of Orchard Lane (Flood Area A) and along Main Street northwards (Flood Area B). This risk however within the high level RoFSW mapping can be exacerbated by localised ground elevations, the presence of drainage infrastructure not included in the modelling, or drainage infrastructure limitations which are not always implicitly represented.

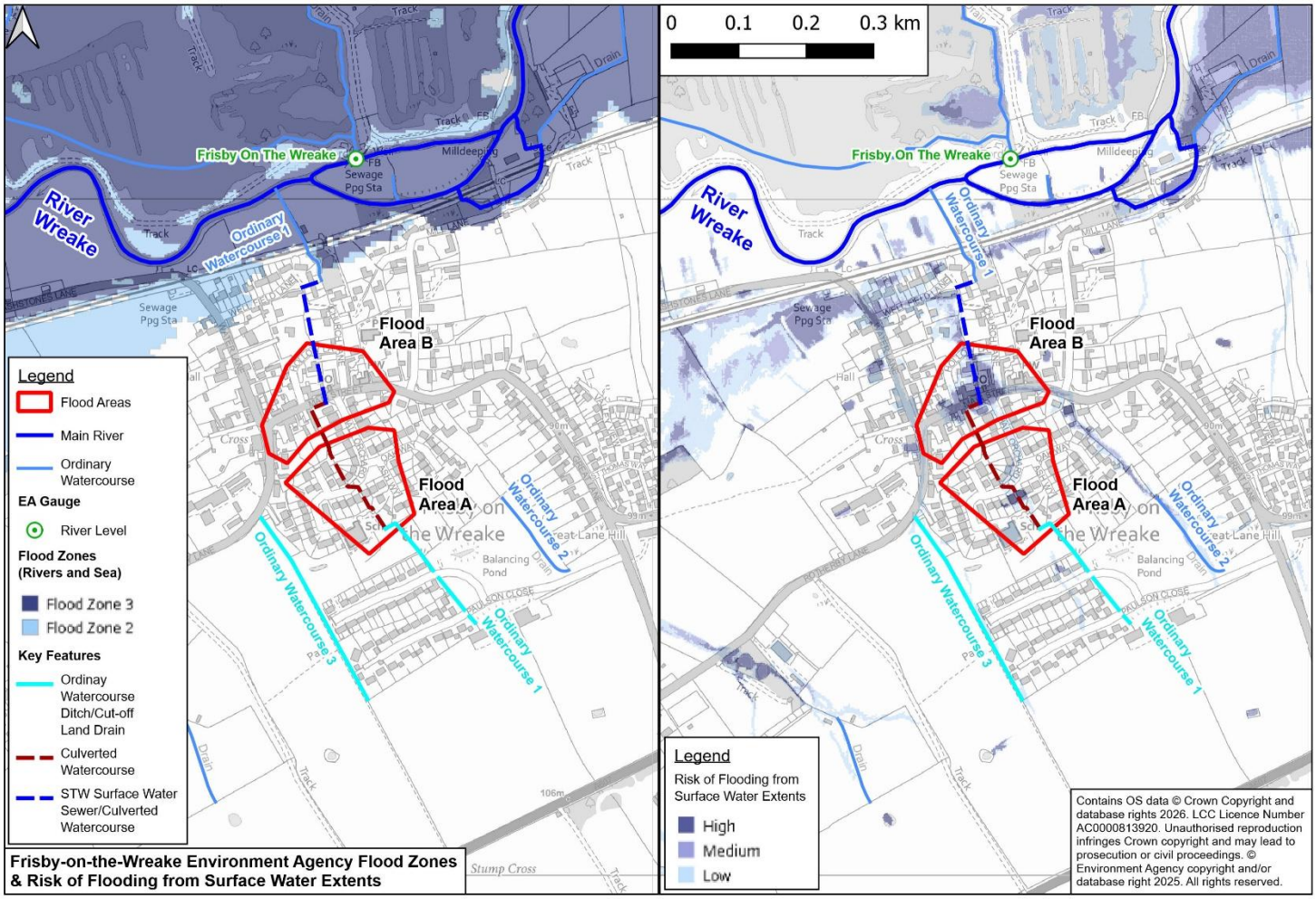

Figure 6-3: Frisby on the Wreake EA Flood Map for Planning Flood Zones[5] and Risk of Flooding from Surface Water[6] Extents in Flood Areas (INSET 4)

[5] Environment Agency (2026) Flood Map for Planning – Flood Zones https://flood-map-for-planning.service.gov.uk/map
[6] Environment Agency (2026) Risk of Flooding from Surface Water map. https://check-long-term-flood-risk.service.gov.uk/map

6.2 WHAT HAPPENED AND WHY?

WHO OR WHAT WAS AFFECTED?

16 properties reported as internally flooded

At least 1 property reported as externally flooded

The high-intensity heavy rainfall from Storm Henk (see Section 2.3 of the main Storm Henk report) fell on an already saturated steep sided catchment resulting in significant surface water overland flow across agricultural fields, various sections of the highway and through gardens and private land converging at the centre of the village around Main Street (as illustrated on Figure 6-1). The volume of rainfall overwhelmed the entire local drainage network.

6.2.1 FLOOD AREA A

Following the Storm Henk event, Leicestershire County Council (LCC), as the Lead Local Flood Authority (LLFA), received three reports of internal property flooding on Hall Orchard Lane. Rear gardens in Oak Way flooded when flows from the catchment exceeded the capacity of Ordinary Watercourse 1, overspilling the channel banks at the 90-degree bend within the north-eastern corner of the Frisby C of E school playing field. Flood water then proceeded to flow over land within gardens towards the rear of properties within Hall Orchard Lane where it exceeded property thresholds and caused internal flooding.

The flooding which occurred in Flood Area A closely matches the predicted surface water flooding as identified in the EA's RoFSW map illustrated in Figure 6-3.

Anecdotal reports were received by LCC LLFA stating that the development contributed towards the flooding and that the balancing pond were not functioning correctly. No evidence has been found to verify that this was the case. The balancing pond were not reported to be overtopping, whilst these and the flow controls discharging to Ordinary Watercourse 1 and Ordinary Watercourse 3 were investigated by the LCC LLFA and MBC following the event and were found to be constructed as per the approved designs.

Anecdotal reports were also received relating to vegetation overgrowth having affected access to Ordinary Watercourse 1 for maintenance or inspection. Following the event, the condition of the ditch was investigated as a part of a multi-agency site walkover. No obstructions were found and no evidence has been submitted to corroborate these reports.

6.2.2 FLOOD AREA B

A series of local drainage networks all converge at Main Street draining into the STW public surface water sewer system. This includes Ordinary Watercourse 1, the local highway drainage network (including water from Ordinary Watercourse 3) and a 150mm dia STW surface water drainage system (which drains Hall Orchard Lane to the south). During Storm Henk, multiple surface water flow routes also converged with the local drainage networks from agricultural land to the south which also used the local highway network (Great Lane and Rotherby Lane) as a conduit.

On 2nd January 2024, several manholes in Main Street and adjacent gardens began to surcharge. This water, along with surface water flows, collected in the highway and in gardens and eventually exceeded property thresholds, causing internal flooding to thirteen properties on Main Street. This was anecdotally reported as being to a depth of approximately twenty inches. Most properties are reported to have started flooding at midday, with some properties flooding later at around 15:00 hours, and lasting for six hours.

Following the flood event, STW commissioned a camera and cleanse of the public sewer network in the village. This included the section of 600mm brick culvert flowing north from the centre of the village to its outfall. The survey could not be completed in its entirety due to a near complete obstruction of the 600mm brick culvert due to a root mass near Hollow Lane. This obstruction was later removed, with an access manhole installed in Hollow Lane to improve future maintenance access. STW were not aware of this obstruction prior to Storm Henk and had received no reports of any concerns relating to this culvert prior to the flood event. It is therefore not known how long the obstruction had been present or to what extent it covered the culvert before the flood event. No previous reports of flooding were made to either STW or LCC, suggesting there may not have been a complete obstruction.

The sheer volume of rainfall during the event and the additional surface water that accumulated at Main Street (via Great Lane to the southeast and Rotherby Lane to the southwest from the agricultural fields) overwhelmed the highway drainage which was further exacerbated by the obstruction. Typically, road drainage networks are designed to accommodate limited rainfall events on the contributing area of highway itself, but not for any additional volumes of overland flow originating from land adjacent to the highways or when watercourses have overtopped. As flood water enters into the drainage systems it can naturally draw in debris, particularly around gully grates. It is possible that additional debris may have been drawn into the STW public sewer system exacerbating a possible existing blockage at the time of the flood event. It is not possible to say to what extent, however.

It is believed that the obstruction in the 600mm brick culvert most likely caused the local drainage network upstream of this obstruction to surcharge, via existing manholes and the highway drainage system as the water could not get away quick enough. No evidence was found during the investigation of any further obstructions downstream and the outfall of the culvert was also found to be unimpeded.

The locations of internal flooding and flood extents which occurred in Flood Area B closely match the predicted surface water flooding as identified in the EA RoFSW, illustrated in Figure 6-3. The national RoFSW model (NaFRA2) does not provide detailed representation of below-ground drainage networks within the village, only an allowance for the losses for averaged infiltration rates they provide.

In the absence of detailed hydraulic modelling, it is not possible to confirm whether the obstruction alone was responsible for all recorded internal flooding incidents, particularly given the exceptional rainfall intensity during the event. However, it can reasonably be concluded that the extent of flooding may have been reduced had no obstruction been present within the STW public sewer system.

6.3 WHAT HAS BEEN DONE?

Since the Storm Henk event the developer of the Rotherby Manor site, Bowbridge Homes, has undertaken works including a reconfigured drainage network within the site, directing Ordinary Watercourse 1 to drain via the eastern balancing pond and existing flow control. This work was not requested by LCC LLFA and was completed without consent under the Town and Country Planning Act (1990) and the Land Drainage Act (1991). The applicant has however committed to fully evidencing the drainage remedial works via a retrospective application for planning consent. The works to the watercourse have been logged by LCC LLFA as unconsented and the developer has been notified.

A summary table of the actions undertaken by the relevant RMAs across Leicestershire is provided in Section 2.7 of the main Storm Henk report. A summary table of actions and any relevant next steps specific to Frisby on the Wreake is provided in Section 6.4.

Whilst the actions from this investigation will help to reduce flood risk, communities should also take steps to be prepared for future flooding, especially with climate change increasing the risk of occurrence. More information can be found in Section 21.8 of the main Storm Henk report.

6.4 FRISBY ON THE WREAKE ACTIONS

The following actions will be monitored by LCC LLFA through their local coordination role. This action plan is live and will be subject to change as actions are progressed.

Actions taken during and in the immediate aftermaths of the event, such as the closure of roads and set-up of rest centres are not detailed. Further details on RMAs and their roles, and how they work in partnership, can be found in the Leicestershire Local Flood Risk Management Strategy[7].

ACTION	ACTION DETAIL	LEAD RMA	CURRENT STATUS
Multi-agency Site Walkover	Following Storm Henk, multi-agency site walkovers were undertaken on 5th, 18th, and 30th January 2024 to witness the devastation and collect information to help identify actions to help mitigate future flooding.	RMAs	Complete
Local Highway Network Maintenance	Following the event, LCC, as the Local Highways Authority (LHA), completed a reactive cleanse of highway gulleys across the county, targeting affected areas and ensuring residual debris within catchments washed into the network was removed. LCC LHA has raised gulleys on Water Lane and Well Field Lane from a Priority (P) 2 to a P1, the highest level of priority.	LCC LHA	Complete
Public Sewer Asset Improvements	STW surveyed the culvert running north from Main Street and found a significant root mass. This was removed after the event, the culvert lined and an additional manhole installed for improved maintenance access.	STW	Complete

[7] Leicestershire County Council (2024) Leicestershire Local Flood Risk Management Strategy - https://www.leicestershire.gov.uk/environment-and-planning/flooding-and-drainage/lead-local-flood-authority/flood-risk-management

ACTION	ACTION DETAIL	LEAD RMA	CURRENT STATUS
Review of Catchment Hydrology	Further work to understand the catchment and how it reacts to different rainfall events in more detail. Review findings and consider any possible cost-effective next steps to help mitigate future flooding.	STW, LCC LLFA	Ongoing
Property Flood Recovery Grant Scheme Support	Assist residents to apply for and install Property Flood Resilience (PFR) measures under the Property Flood Resilience Repair Grant Scheme, which launched in April 2024.	LCC LLFA	Complete
Ongoing Scrutiny of Planning Proposals	LCC LLFA to continue to work closely with MBC, within its remit, to ensure any surface water drainage and possible flood mitigation is considered appropriately for any prospective development in the area.	LCC LLFA MBC	Ongoing
Unconsented Works Investigation	The additional works connecting Ordinary Watercourse 1 to the eastern development pond has been logged as unconsented. An investigation into unconsented activity under the Land Drainage Act 1991 will be undertaken. Bowbridge Homes has committed to submitting a retrospective planning application to Melton Borough Council to ensure the drainage remedial works can be reviewed in full and approved by the relevant parties.	LCC LLFA MBC	Underway Underway
Riparian Responsibilities Engagement	LCC LLFA will work with the community and riparian landowners to better understand the route of the culverted sections of Ordinary Watercourse 1. This will include raising awareness of the responsibilities of riparian landowners. If funding opportunities are presented, LCC LLFA will consider the possibility of surveying the culverted extents of Ordinary Watercourse 1.	LCC LLFA	Ongoing