

Summary of the 2023 modelling report - Wortwell

In April 2022 the Environment Agency commissioned a hydraulic modelling study for the mill sluices at Wainford, Wortwell and Hoxne on the River Waveney.

Previous modelling undertaken in 2012 focused on removing the main sluices at these locations because at the time, this was seen as the scenario that could have the greatest impact on flood risk to people and property. However, this study did not focus specifically on the mill sluices that we are proposing to withdraw maintenance responsibility for and the flood risk to people and property if these assets were left closed during a flood event.

This document provides a summary of the findings from the latest modelling study which focuses on the impact of the gates on the mill sluice being closed during a range of flood events. Please note that the maps that have been included here are those found in the modelling report and are designed to illustrate the changes in flood extent and flood depth that were observed during the modelling runs. Where the changes were negligible, a written summary of the outputs has been provided here.

The structures at Wortwell Mill

The four main structures at Wortwell Mill are:

- The main sluice located upstream of the mill building at TM2809984430. This is shown in Photograph 4 on the Citizen Space web page.
- A fixed crest weir located upstream of the mill building at the top of the mill race at TM2809584455.
- The mill sluice located upstream of mill building within the mill race at TM2816284464. This is shown in Photograph 3 on the Citizen Space web page and is the structure that we are proposing to withdraw our maintenance responsibility for.
- A second mill sluice is located at the mill itself at TM2818684456. This mill sluice is already owned, operated, and maintained by the landowner and therefore is not part of our withdrawal proposal.

Modelling Approach

- A Baseline Scenario was run for the 50%, 20%, 5% and 1% Annual Exceedance Probability (AEP) events. The mill sluice gates were modelled as open to provide a comparison with the second scenario below.
- A simulation was then run for the 50%, 20%, 5% and 1% AEP events but with the mill sluice gates closed for the duration of the storm event (42 hours). All other gates were operated as normal. This is referred to as Scenario 1 below.
- A 50% AEP event is a flood event with a 50% chance of occurring in any given year. A 1% AEP event has a 1% chance of occurring in any given year etc.

NB. The mill sluice is referred to as the Wortwell Tilting Gates in the maps provided in this summary document.

Summary of outputs

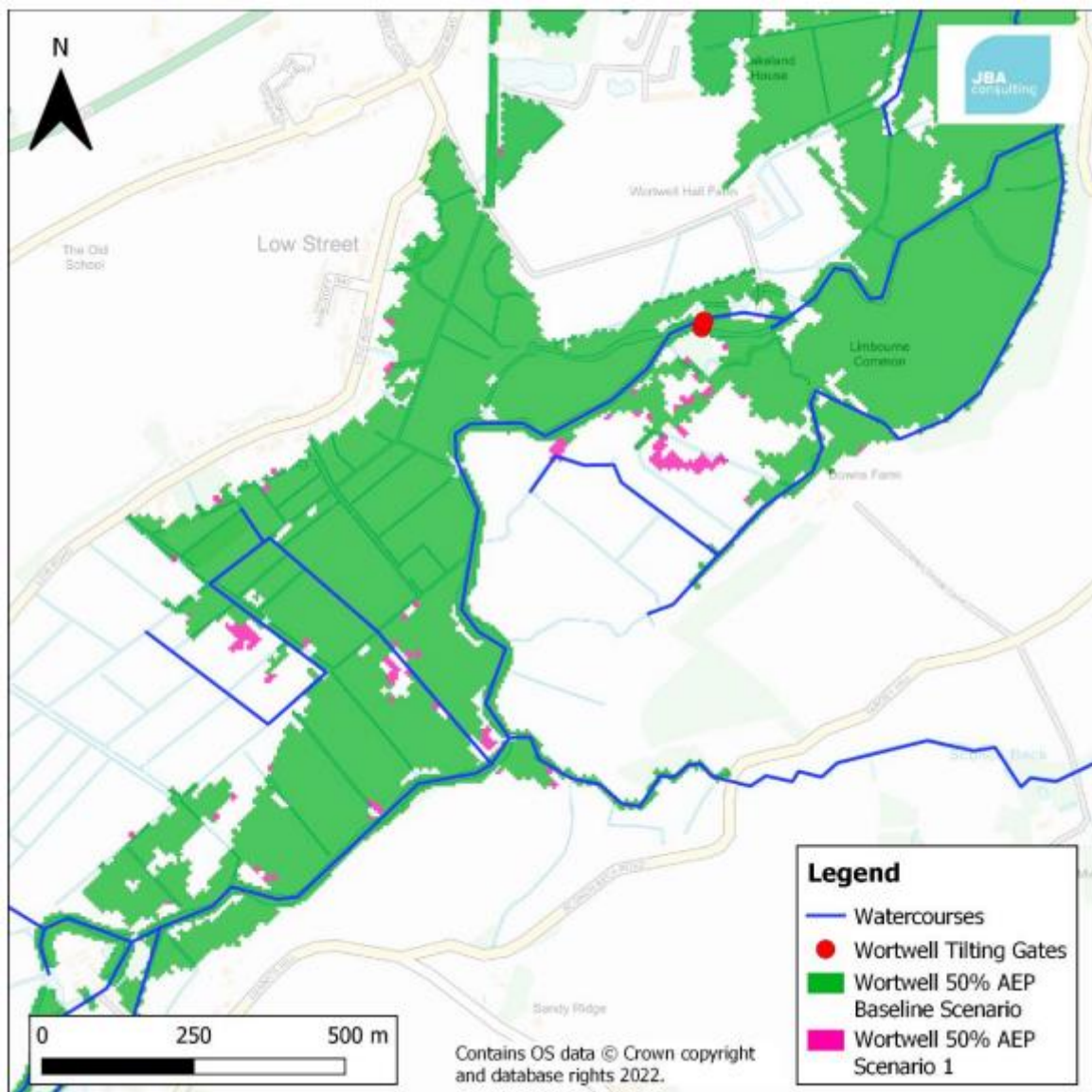
a) Flood extent

For all modelled AEP events, there appears to be a minimal change in flood extent with the mill sluice gates closed (Scenario 1) in comparison with the Baseline Scenario (gates open).

Map 1 shows the minor increase in flood extent (shown in pink) in the rural areas upstream of the mill sluice for the 50% AEP event.

For the 20% AEP event the increases in flood extent are also minor and on the perimeter of the area that is flooded during the Baseline Scenario. By the 5% and 1% AEP events there are no notable changes in flood extent.

Map 1: Flood extent comparison at Wortwell for the 50% AEP event

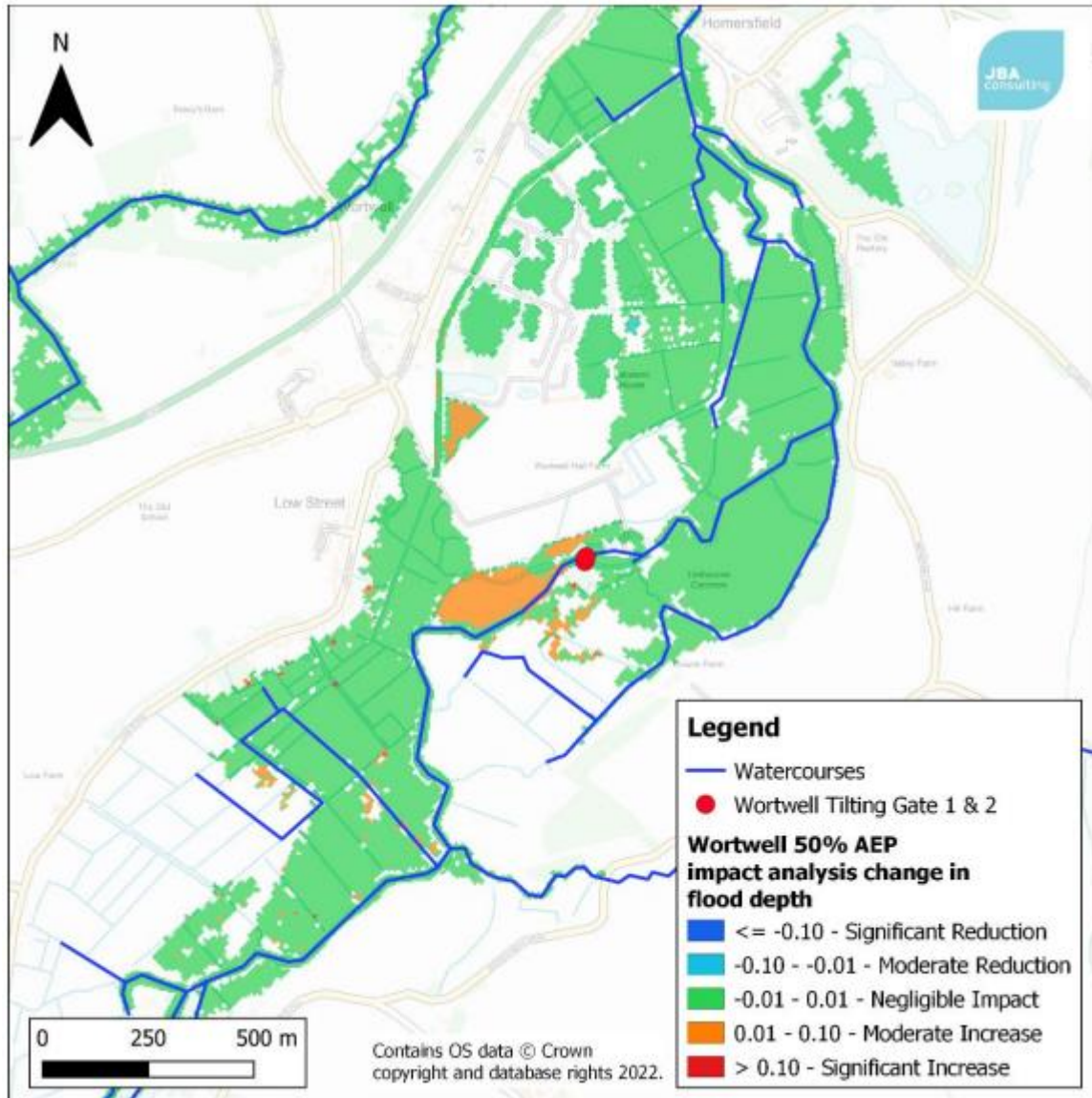


b) Maximum flood depth

For all AEP events, there is an increase in maximum flood depth upstream of the mill sluice and a negligible change downstream with the sluice gates closed (Scenario 1).

Map 2 shows the changes in maximum flood depth for Scenario 1 when compared to the Baseline Scenario for the 50% AEP event. Directly upstream of the structure there is an increase in flood depth of approximately 0.011m. There are further increases located along the perimeter of the flood extent that corresponds to newly flooded land.

Map 2 – Change in maximum flood depth at Wortwell for the 50% AEP event



There is also an increase in peak flood depth of up to approximately 0.1m in the ponded area to the north-west of Wortwell Mill during the 50% AEP. During the 20% AEP event, the ponded region just north of this location has an increase of up to approximately 0.15m compared to the Baseline Scenario. For the 1% AEP event, there is an increase of 0.013m in flood depth in this area.

During the 5% AEP event there are only slight increases in flood depth of up to approximately 0.04m when the sluice gates are closed, and these occur immediately upstream of the structure.

c) In-channel peak water levels

A comparison of in-channel peak water levels at Wortwell for all modelled AEP events can be found in Table 1 below.

There is an increase of 0.01m during all modelled AEP events for Scenario 1 (gates closed) up to approximately 690m upstream of the sluice.

Table 1 - In-channel peak water levels at Wortwell

Scenario 1	50% AEP	20% AEP	5% AEP	1% AEP
Baseline Water Level (mAOD)	12.55	12.61	12.71	12.79
Scenario 1 Water Level (mAOD)	12.56	12.62	12.72	12.80
Difference (m)	+0.01	+0.01	+0.01	+0.01

d) Flooded properties

Table 2 below shows that whilst there is a change in flood extent, flood depth and in-channel water levels as a result of the sluice gates being closed (Scenario 1), there is no increase in the number of properties flooded.

Table 2 - Additional flooded properties at risk at Wortwell

Scenario 1		50% AEP	20% AEP	5% AEP	1% AEP
Baseline property count		14	15	22	45
Scenario 1	Count	14	15	22	45
	Difference	0	0	0	0

Summary of findings

- Scenario 1 simulated the impact of closing the gates of the mill sluice at Wortwell. All other gates were operated as normal. The gates were modelled as open during the Baseline Scenario.
- With the mill sluice gates closed, the modelled flood extents increase slightly upstream of the structure and along the perimeter of the flooded area from the Baseline Scenario. There is no noticeable change in flood extent downstream of the mill sluice.
- There is a moderate increase in flood depth upstream of the structure during all modelled AEP events. The increase in maximum flood depth is most noticeable during the 20% AEP event (up to 0.15m in the ponded area to the north of the mill).
- With regards to peak in-channel water levels, there is an increase of 0.01m across all modelled AEP events.
- The flood extent and depth, and in-channel water levels all increase upstream of the sluice during Scenario 1 because the closure of the gates reduces the conveyance of water through the structure and so water backs up upstream of the asset.
- Despite the changes in flood extent, depth and in-channel water levels, no additional properties are flooded when the sluice gates are closed.