

Summary of the 2023 modelling report - Wainford

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 gate 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 outputs from the events where the greatest changes in flood extent and flood depth were observed during the modelling runs. Where the changes were negligible, a written summary of the outputs has been provided here.

The structures at Wainford Mill

The three main structures at Wainford Mill are:

- The main sluice located around 75m upstream of the mill buildings at TM3497890094 and shown in Photograph 2 on the Citizen Space web page.
- A fixed crest weir located around 35m upstream of the mill buildings at TM3502190094.
- The mill sluice located at TM3507690085 and shown in Photograph 1 on the Citizen Space web page. This is the structure that we are proposing to withdraw our maintenance responsibility for and transfer ownership to a third-party riparian owner.

Modelling

- A Baseline Scenario was run for the 50%, 20%, 5% and 1% Annual Exceedance Probability (AEP) events. The mill sluice gate was 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 gate 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 Wainford Sluice in the maps provided in this summary document.

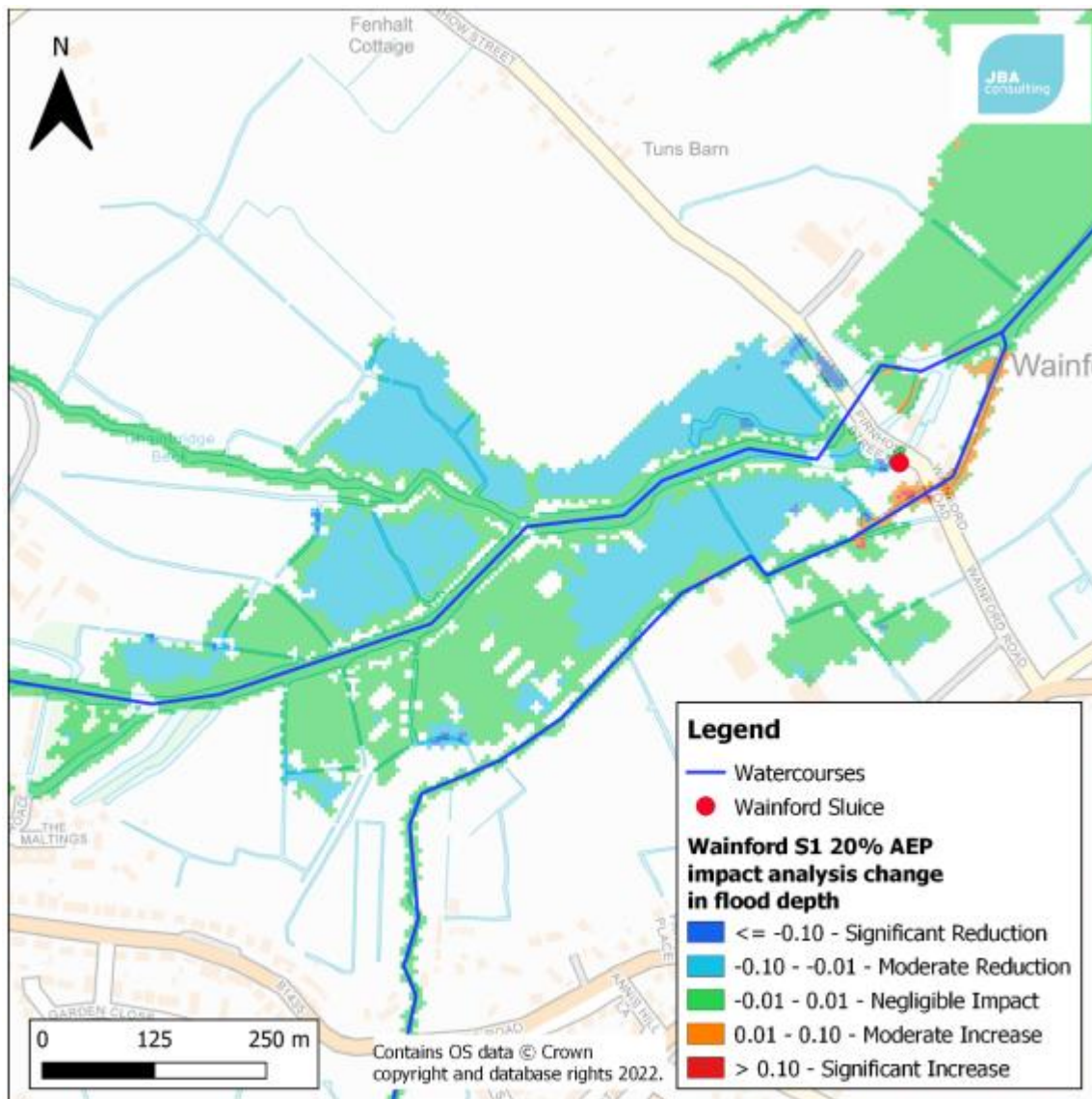
Summary of outputs

a) Flood extent

Flood extents are similar during the Baseline Scenario (gate open) and Scenario 1 (gate closed) for all modelled AEP events and therefore overall, the position of the gate has minimal impact on flood extent. Any slight changes in flood extent are more prominent downstream of the mill sluice.

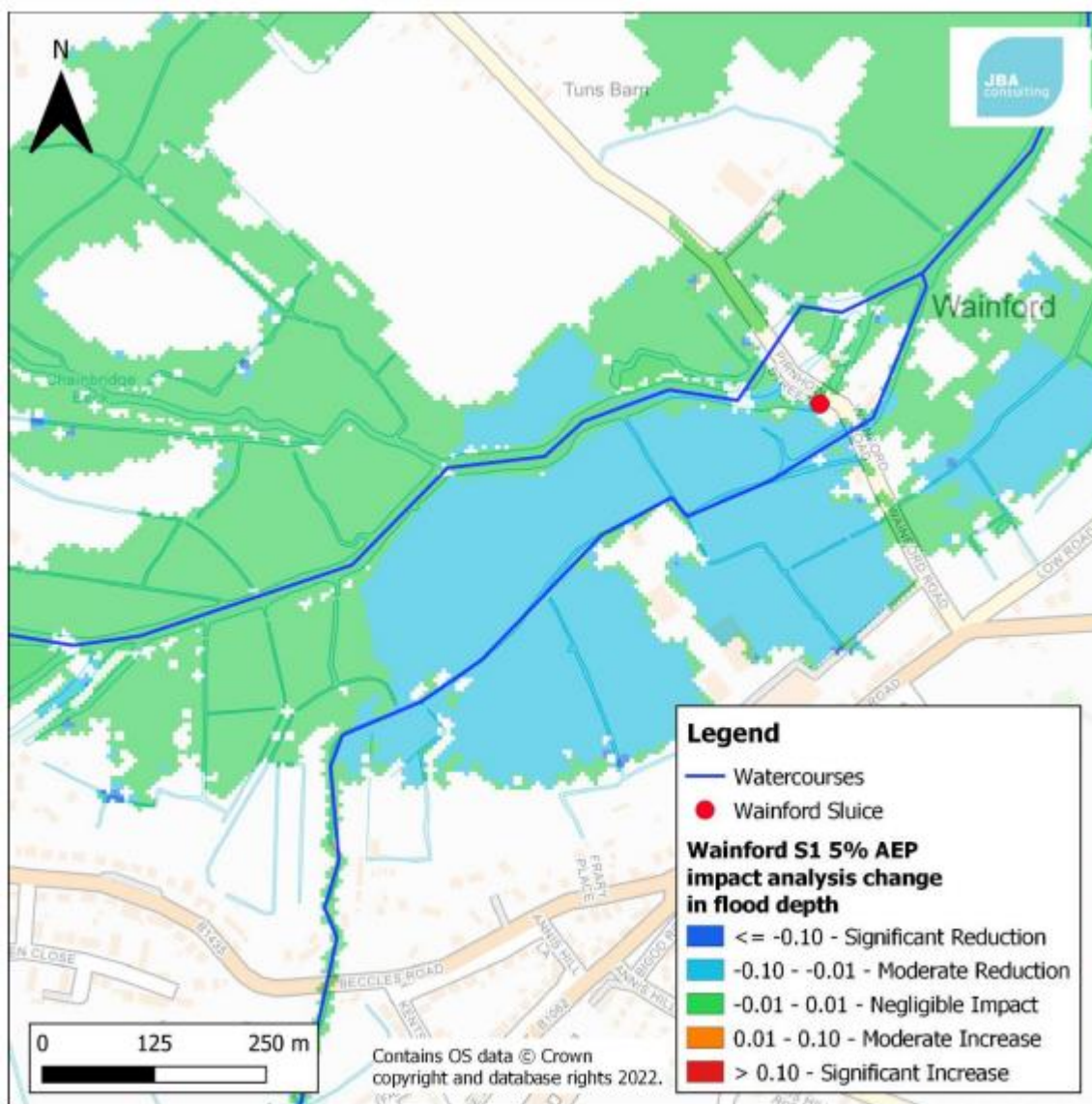
There was no apparent change in flood extent between the Baseline Scenario (gate open) and Scenario 1 (gate closed) during the 50% AEP event.

Map 2 – Change in maximum flood depth at Wainford for the 20% AEP event



The change in flood depth during the 5% AEP event is shown in Map 3 below. There is a reduction of approximately 0.02m in flood depth directly upstream of the sluice. During this event, the reduction in flood depth extends up to 525m upstream of the structure. There is no notable increase in flood depth during this event upstream or downstream of the structure.

Map 3 – Change in maximum flood depth at Wainford for the 5% AEP event



During both the 50% and 1% AEP events, there is very minimal impact to the flood depth if the mill sluice gate is closed.

During the 50% AEP event, there is a negligible impact both upstream and downstream of the structure. For the 1% AEP event, there is a decrease of 0.01m at National Grid Reference TM3523290002 approximately 185m south-east of Wainford. Aside from this there is a negligible change in flood depth at this return period.

c) In-channel peak water levels

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

There is an increase of 0.01m in in-channel water level during all modelled AEP events apart from the 5% AEP event where there is no change when the gate of the mill sluice is closed (Scenario 1). The change in peak water level is minimal in the scenarios where an increase is seen and therefore overall, there is no significant change in peak water level when Scenario 1 is applied along any of the river channels at Wainford.

Table 1 - In-channel peak water levels at Wainford

Scenario 1	50% AEP	20% AEP	5% AEP	1% AEP
Baseline Water Level (mAOD)	3.28	3.52	3.77	3.98
Scenario 1 Water Level (mAOD)	3.29	3.53	3.77	3.99
Difference (m)	+0.01	+0.01	0	+0.01

d) Flooded properties

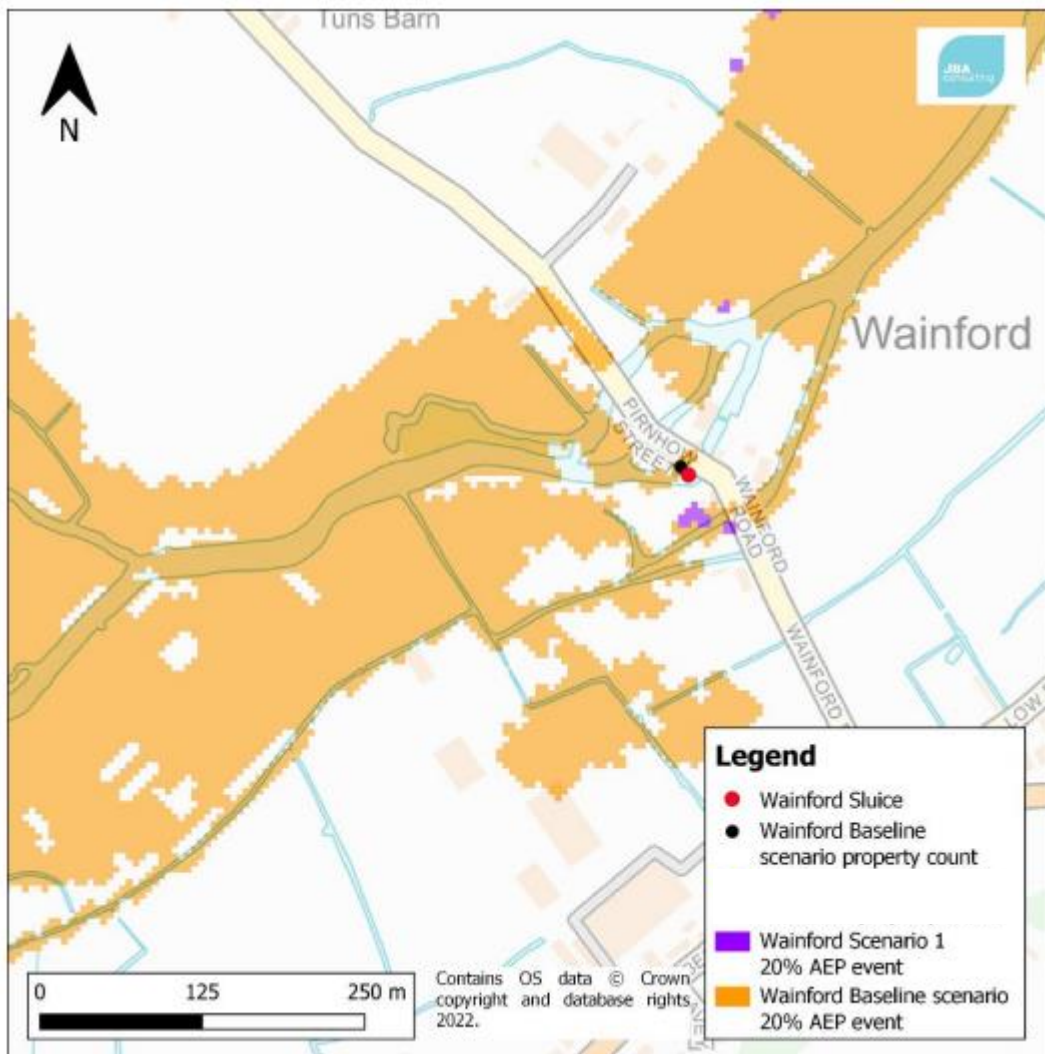
Table 2 shows that whilst there is a slight change in flood extent surrounding Wainford, there is no increase in number of properties flooded when the gate of the mill sluice is closed (Scenario 1).

There is a decrease of one less flooded property during the 20% AEP event when the gate is closed. This is shown by the black dot in Map 4 below and is located downstream of the mill sluice. This change may be due to a very marginal change in flood extent; however, the conclusion from the modellers is that this can be discounted as the change to flood extent is so small.

Table 2 - Additional flooded properties at risk at Wainford

Blockage Scenario		50% AEP	20% AEP	5% AEP	1% AEP
Baseline property count		0	1	3	4
Scenario 1	Count	0	0	3	4
	Difference	0	-1	0	0

Map 4 – Flood extent and one less flooded property for the 20% AEP event



Summary of findings

- Scenario 1 simulated the impact of closing the mill sluice gate at Wainford. The gate was modelled as open during the Baseline Scenario.
- With the sluice gate closed, there is a minimal change in flood extent when compared with the Baseline Scenario for all modelled AEP events. Whilst very small changes are observed for the 20% AEP (predominantly downstream of the structure), the position of the gate has minimal impact on flood extent.
- With regards to changes in flood depth, there is a decrease in maximum flood depth upstream of the structure during all modelled AEP events. In the 5% AEP event this is approximately -0.02m. During the 20% AEP event there is a slight increase of approximately 0.06m downstream of the mill sluice. For the remaining modelled AEP events, there is a negligible change in flood depth downstream of the structure.
- When in-channel peak water levels are compared there is no notable change in water level along any of the three river channels at Wainford when the mill sluice gate is closed. Based on these outputs, the position of this gate does not have a significant impact on water level.

- No additional properties are flooded when comparing the Baseline Scenario and Scenario 1. One less property is flooded during the 20% AEP event, but this can be discounted as the change to the flood extent is only marginal.