Note / Memo

HaskoningDHV UK Ltd.
Water & Maritime

To:	Southwold Harbour Management Committee and Stakeholder Advisory Group
From:	Amy Savage
Date:	Friday, 09 September 2022
Our reference:	PB9485-RHD-ZZ-XX-NT-Z-0002
Classification:	Project related
Subject:	**Southwold Harbour Investment Plan** **Update to Harbour Management Committee (Sept 2022)**

1 Progress update

This memo provides an update on progress with finalising the recommendations of the Southwold Harbour Investment Plan, and the associated technical analysis.

The draft project reports were issued for comment in January 2022 and presented to the project's stakeholder group and the new HMC in March 2022. Various comments were received, including a request for additional assessment of a 'passive' spillway option.

Following discussion with the HMC and East Suffolk Council about the next steps for the project, it was agreed in late July 2022 that additional tidal modelling and associated analysis should be undertaken to review the following additional option:

- *Improving the standard of protection provided by the estuary defences, plus passive spillway(s) constructed within the embankments to Tinker's and/or Reydon Marshes.*

2 Summary of approach to the additional modelling

The assessment of the additional option began with considering a 500m long spillway within the flood bank to Tinker's Marsh, to the north of the Bailey Bridge, as shown in Figure 1 below. A long spillway is more likely to be effective. A spillway into Reydon Marsh was not considered at this stage, with the aim of minimising construction works and flood risk to Southwold.

Figure 1 - Location of proposed spillway into Tinker's Marsh

The following input conditions have been applied in the tidal model runs for the passive spillway option:

- **Spillway level 2.55m**, i.e. about 100mm lower than the 1:100 water level in the channel at the location of the proposed spillway, for the tide level that occurred during the 2013 flood event (3.1m at harbour entrance).
- **Spillway level 2.35m**, for tide levels of 3.1m and 3.57m (climate change scenario).
- **Spillway level 2.20m**, for a tide level of 2.7m.
- **Spillway level 2.00m**, for tide levels of 3.1m and 2.7m.

For all of the above options, the estuary flood banks were assumed to be raised to the level required to prevent overtopping, so any overflow is focussed at the spillway.

The influence of the Walberswick dunes was considered, with the model run both with and without overtopping of the dunes for some of the input conditions.

3 Results of additional modelling

The tidal modelling was undertaken during August and early September and the assessment of the results is ongoing. As this modelling has only just been completed, it should be noted that our internal review is not fully complete at the time of drafting this note.

The key findings to date from the additional model runs are shown in Figures 2 and 3, and are summarised below:

- The most effective spillway arrangement assessed to date is a spill level of 2.00m.
- For this spillway arrangement combined with improvements to the flood banks to Tinkers Marsh and Robinsons Marsh, the peak water level at the Blackshore during a flood event equivalent to 2013 would be about 2.45m.
- The peak flood level at the Blackshore is about 5cm lower than occurred during the 2013 event, and 23cm lower than if the estuary flood banks were raised to prevent flooding. Closer to the harbour entrance, the peak flood level is reduced by up to 180mm compared to the 2013 event.
- Overtopping of the spillway and associated flooding of Tinker's Marsh would occur for tide levels with a 1:10 year return period (tide level approx. 2.6m or higher at the harbour entrance). The return period causing overtopping of the spillway would be expected to reduce to 1:1 years by 2070.
- To prevent overtopping at locations other than the spillway, the flood bank to Robinsons Marsh would need to be raised to at least 2.65m at the south-east end, reducing to 2.45m at the Bailey Bridge. The flood banks to Tinker's Marsh, to the north-west of the proposed spillway, would need to be raised to at least 2.45m over a length of about 750m. The level of the flood banks would need to be raised by up to 500mm, or about 250mm on average.

Further model runs could be undertaken to optimise the preferred spillway solution, e.g.:

- Lower spillway level;
- Increase / reduce spillway length;
- Increasing spill of flood water into Robinson's Marsh;
- Including a spillway into Reydon Marsh;
- Including the narrowed channel option (rock groyne); and/or
- Assess performance for higher/lower water level events.

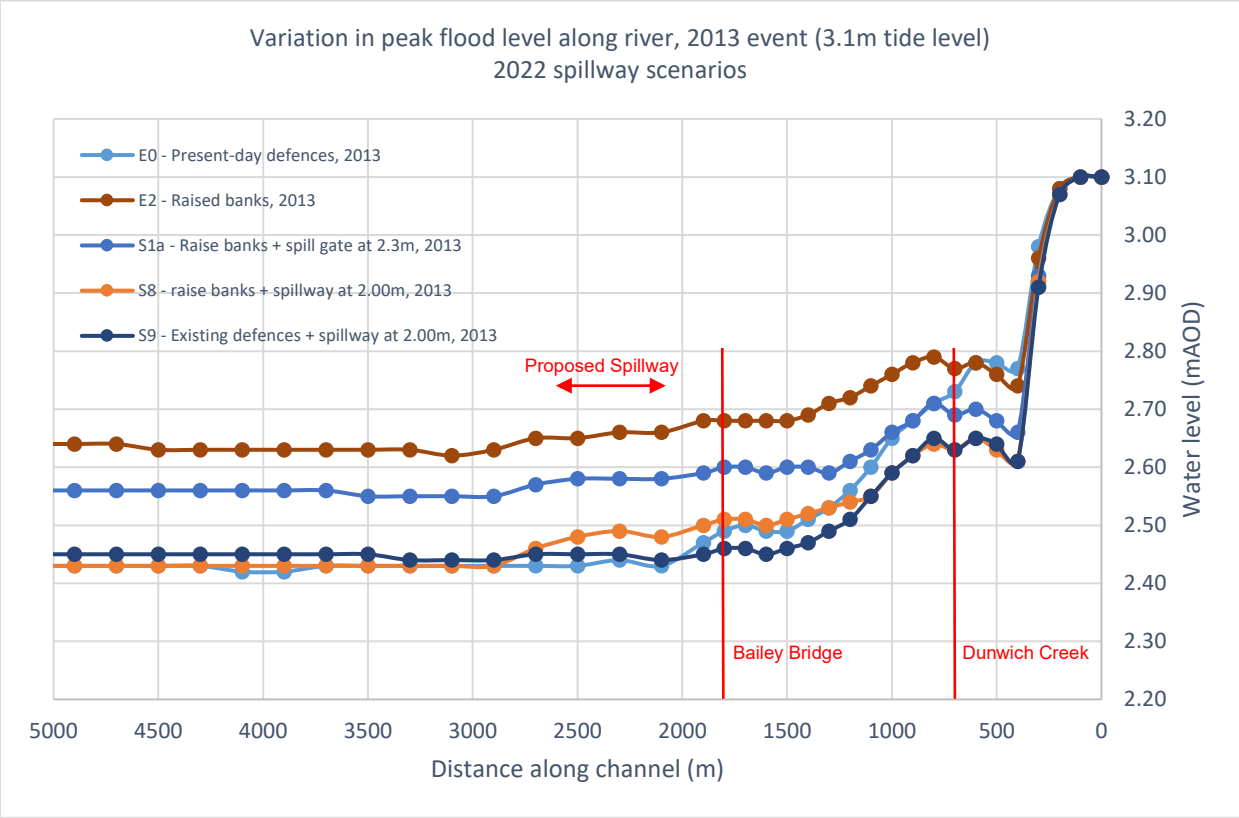

Figure 2 – Peak water levels in river channel with most effective spillway option

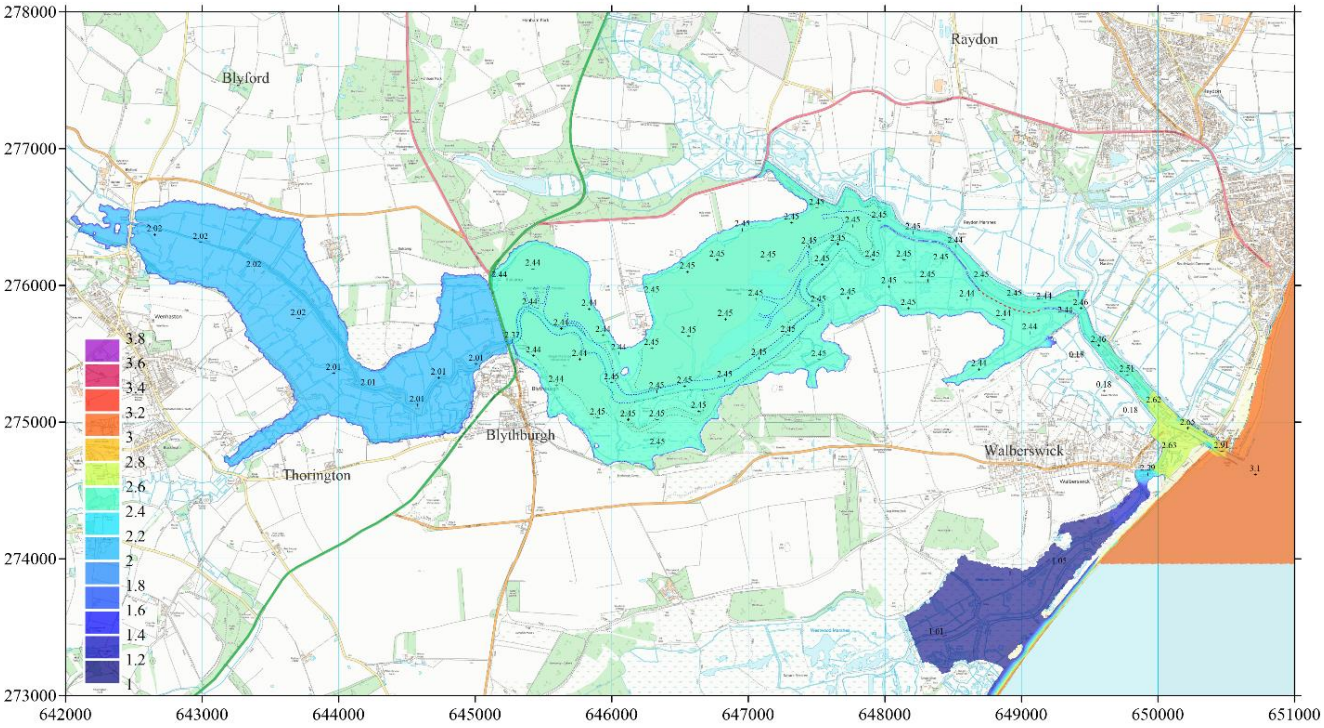

Figure 3 – Flood extent and depth with 2.0m spillway into Tinker's Marsh plus improvements to the flood defences to Tinker's and Robinsons Marshes

4 Proposed changes to Investment Plan

Based on the initial review of the modelling results described above, we currently expect to update the project report to recommend that the preferred option for the future management of the estuary defences would be improvements to the flood banks to Tinker's and Robinsons Marshes, plus construction of a reinforced spillway. The recommendations for works to replace the South pier would be unchanged.

5 Next steps

By the end of September, we aim to have completed the following outstanding actions relating to the assessment of the additional modelling results:

- Complete assessment of additional model runs, including flow rate at harbour entrance;
- Agree and undertake optimisation model runs (up to 3 more runs are within the current scope);
- Complete assessment of existing standard of protection provided by estuary flood banks, and process of overtopping on extreme events;
- Confirm cost estimate for preferred passive spillway option;

The project report will then be updated to include the further analysis and updated recommendations and will be issued to East Suffolk Council and relevant stakeholders for review and approval.

The project report will include recommendations for the next steps to progress the delivery of the recommended solutions, which we expect to include the following:

<u>Development of a Management Plan for the Estuary Flood Banks</u>

1. Condition assessment of embankment defences, and associated reporting, in a format compatible with the Environment Agency's AIMS database.
2. Topographic survey of the Harbour Road and the flood banks to Robinsons and Tinker's Marshes.
3. Review the potential for phasing of the proposed improvement works to the estuary flood banks.
4. Update the capital cost estimate for the preferred option, and the maintenance cost estimates for the other flood banks based on the condition assessment and recognising current construction cost risks.
5. Engagement with the Environment Agency, landowners and environmental stakeholders about the preferred option, followed by environmental assessment.
6. Preparation of a Business Case for the proposed works to the estuary flood banks, considering both costs and economic benefits, in support of potential funding applications.

<u>Design Development for Replacement of the South Pier</u>

7. Modelling of culverts – 3D hydraulic modelling of entrance channel to assess the influence of the proposed culverts hydraulic performance of the culvert.
8. Removal of shoal bank – qualitative assessment of the potential benefits of excavating the bank of sediment opposite the North Wall. Modelling may be required following this initial assessment.
9. Narrow channel – further consultation regarding the benefits/constraints of the rock groyne proposed for opposite the North Wall.
10. Confirm requirements for tie-in of the new breakwater at the landward end, to minimise the risk of wash-through of sand from the Walberswick dunes.
11. Environmental assessment and consultation in relation to the proposed South Pier works.
12. Preparation of a Business Case for the proposed works to the South Pier, considering both costs and economic benefits, to enable funding to be sought as soon as possible.
13. Engagement with harbour users to plan for improved resilience of businesses and the Harbour Road.