Flood Modeller Pro

Two-dimensional estuary inception modelling, Lowestoft, England (UK)

In order to map flood risk from a potential tidal storm surge propagating up the Lowestoft Estuary and into Lake Lothing, the Flood Modeller 2D ADI solver was used to develop a two-dimensional model to incorporate the estuary, Lake Lothing and the Kirkley Stream channel.

Lowestoft is sited on the North Sea coast of England and is susceptible to storm surges. It is has a history of tidal flooding and is situated on the edge of the Broads system - a large expanse of inland water bodies with an area of 300km2.

Lowestoft estuary and Lake Lothing are tidal up to Mutford Lock, which is the link between the Broads and Lake Lothing and acts as a control structure limiting the tidal influence. Bascule Bridge also lies at the entrance to Lake Lothing which acts as a constriction to flow. A further small tributary is Kirkley Stream, which drains the urban area of Kirkley before discharging into Lake Lothing.

In order to map flood risk from a potential tidal storm surge propagating up the Lowestoft Estuary and into Lake Lothing, the Flood Modeller 2D ADI solver was used to develop a two-dimensional model to incorporate the estuary, Lake Lothing and the Kirkley Stream channel.

Development of the 2D model

In order to develop the two-dimensional model, a high resolution (1m horizontal) digital terrain model was flown at low tide. This data was then mapped to a 10m grid using the Flood Modeller 2D ADI solver.

Tidal boundaries were produced for the North Sea at the mouth of Lake Lothing at Lowestoft and the mouth of the River Yare at Great Yarmouth, using methodology outlined in the Environment Agency's (EA) 'Coastal flood boundary conditions for UK mainland and islands' report.

Flood Modeller Pro can be used for a range of applications, including:

- 1D and 2D floodplain modelling
- Floodplain mapping
- Flood forecasting
- Hydrological analysis
- Embankment/levee failure
- Dam breach analysis
- Options appraisal
- Detailed design
- Structure blockage

Contact us

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With a legacy stretching back 40 years, Flood Modeller allows users to model rivers, floodplains and urban areas, using our powerful 1D and 2D solvers.

Baseline extreme water levels for the required return periods were also identified using GIS layers which were produced as part of the EA 'Parameters for Tidal Flood Risk Assessment - 9W1539' study.

Data from the UKCIP09 climate change impacts online user interface was also obtained allowing a tidal boundary to be produced for each of the four climate change scenarios outlined in the Environment Agency's 'Adapting to Climate Change' report.

Coastal defence locations were extracted from the National Flood and Coastal Defence Database. Additionally, a coastal defence survey was undertaken to provide point elevation data along the coast and within the estuary.
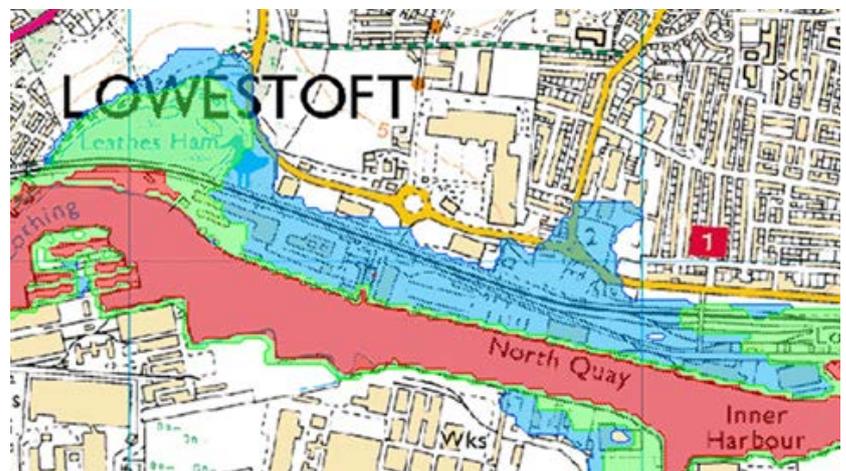
Water levels for the downstream boundary were obtained from a 1D-2D linked model, linking a 2D ADI model of Lowestoft with an existing 1D model of the Broads.

Results analysis

On completion of the 2D model, visual inspection of result output grids was carried out for depth, water elevation and velocity. This involved post processing of model outputs into a suitable GIS grid formats.

Tools in our software were used to inspect vector qualities such as velocity direction and magnitude. Additionally, the results animation functionality was very useful in determining overall flooding mechanism in critical areas such as Bascule Bridge, Mutford Lock and overtopping into Kirkley Stream.

It was identified that Bascule Bridge was important in reducing tidal levels in the estuary and that Mutford Lock was critical in preventing tidal surge entering the Broads.

Viewing modelling outputs in our software's built-in GIS map interface