Thames 2D base model

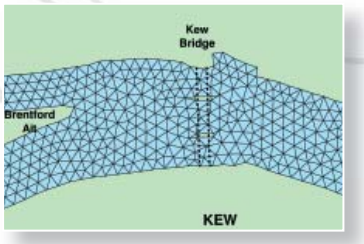
PORT OF LONDON AUTHORITY

Environment Agency

HR Wallingford
Working with water

Rationale

Both the Environment Agency and the Port of London Authority (PLA) need a range of modelling tools to help them understand and predict the effects of natural evolution and various development/dredging schemes, and to assess their impact on the environmental and other interests for which they are responsible.



Over the years both organisations have separately developed a wide variety of models, typically on a project-by-project basis. Comparison of the results from these project-specific models can be difficult given the different sets of conditions modelled.

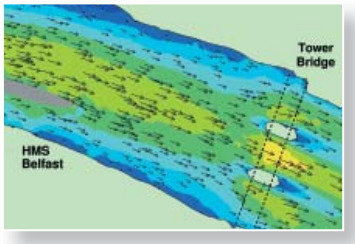
To overcome this problem a 2D base model has been set-up. The model helps the Environment Agency and the PLA with their evolving responsibilities, implementation of new regulations and directives, as well as day to day operation and planning requirements. The model also provides base data for other modelling studies so that all tidal Thames models can be driven by the same data sets. This enables direct and reliable comparison of different studies and modelling techniques to be made.

The Environment Agency and the PLA jointly funded HR Wallingford to undertake the establishment of a 2D (depth averaged) numerical model of the whole tidal Thames between Teddington and Southend.

Model establishment

HR Wallingford applied the state-of–the-art model TELEMAC-2D to the tidal Thames. TELEMAC-2D has been used in preference to other flow modelling tools because the flexible model grid:

- permits a completely varying grid size (smaller in the upper river and larger in the lower estuary for example);
- allows arbitrary shapes of the coastline to be well represented;
- can be modified to include new or proposed structures and locally refined for particular areas of interest.



The established base model extends from the tidal limit at Teddington to a seaward boundary, which lies between Foulness Point in Essex to Whitstable in Kent. The grid size varies between 15m in the Upper Estuary to 700m at Southend. The fluvial River Thames flow at Teddington, other fluvial discharges and tidal creeks have also been included.

The model has been subjected to an extensive series of tests. These simulated the wide range of typical and extreme fluvial flows, neap, spring and large spring tide ranges and weather conditions including surge tides. For the extreme tidal conditions the full operational rules of the Thames Barrier were included in the simulation.

TE2100

The model was extensively used for the Environment Agency's Thames Estuary Flood Risk Management studies (TE2100). This included intensive validation against discharge data collected at 12 estuary cross–sections located along the length of the Estuary collected in Autumn 2004 as part of TE2100.

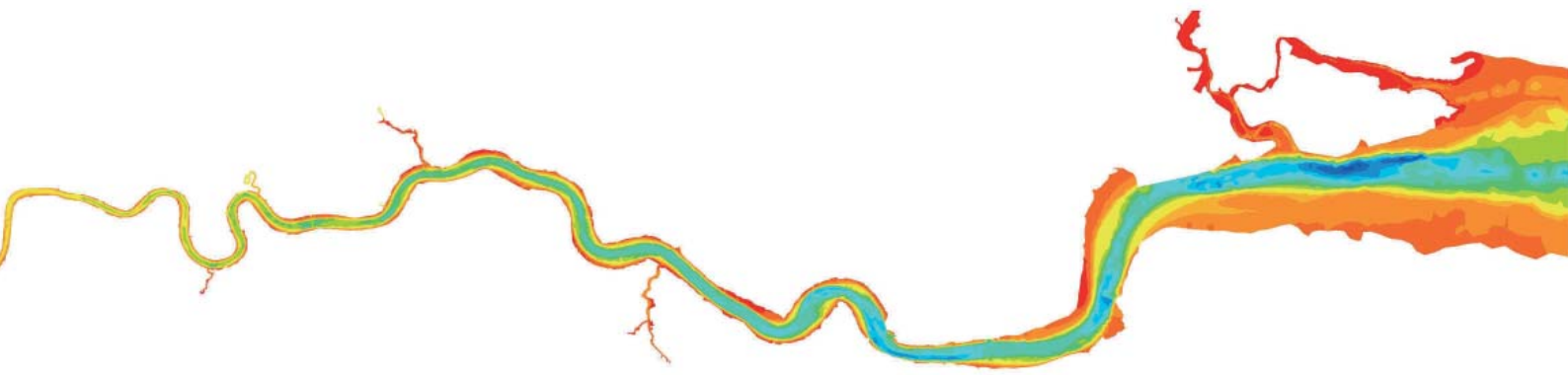
Use of the base model

The model, with permission from the Environment Agency and the PLA, can be applied to studies for other organisations subject to a small license fee. Use of the 2D model means studies can be carried out quickly and, for most uses, without the need for a site measurement programme. The licensing and permission procedure is required for each project undertaken using the model. Results, or models derived from the results, cannot be used for subsequent projects without paying the license fee.

The 2D base model can be employed to assess the impacts of changes to the tidal Thames which may be in the form of new pontoons, jetties or reclamations, or they may be changes to bed levels arising from dredging operations. Impacts can include changes to tidal levels and hence to flood risk, or adjustments to the current speeds and distribution that may impact on the sediments, which may cause scour or deposition. The model can also help to optimise the alignment of jetties, reducing the flow impact and the potential for sedimentation.

Results from the 2D base model can provide input to other modelling suites, for example the HR Wallingford plume dispersion model, SEDPLUME. This model simulates the fate of suspended materials caused by dredging operations. It allows the prediction of deposition and sediment concentration at nearby sensitive receivers such as other riparian users or environmentally sensitive sites such as the Sites of Special Scientific Interest and areas protected by the Habitats Directive within the Thames.

The 2D model can also be run in 3D mode to determine local 3D impacts as both models share a common horizontal grid and input files.



Recent applications

The Thames 2D base model has been applied to a wide variety of projects along the length of the tidal Thames. Recent examples include:

- proposed passenger pier at various locations
- a new dredging strategy at berths in Woolwich Reach
- proposed moorings in Battersea area
- current speeds and directions around the Thames Barrier
- dredging at sites in Woolwich and Erith Reaches
- proposed mooring of a ship in the Upper Pool
- plough dredging in Long Reach
- proposed moorings in Syon Reach
- Thames Estuary Flood Risk Management (TE2100) EP5 Sediment Transport
- Thames Estuary Flood Risk Management (TE2100) EP6 Morphological Change in the Thames Estuary

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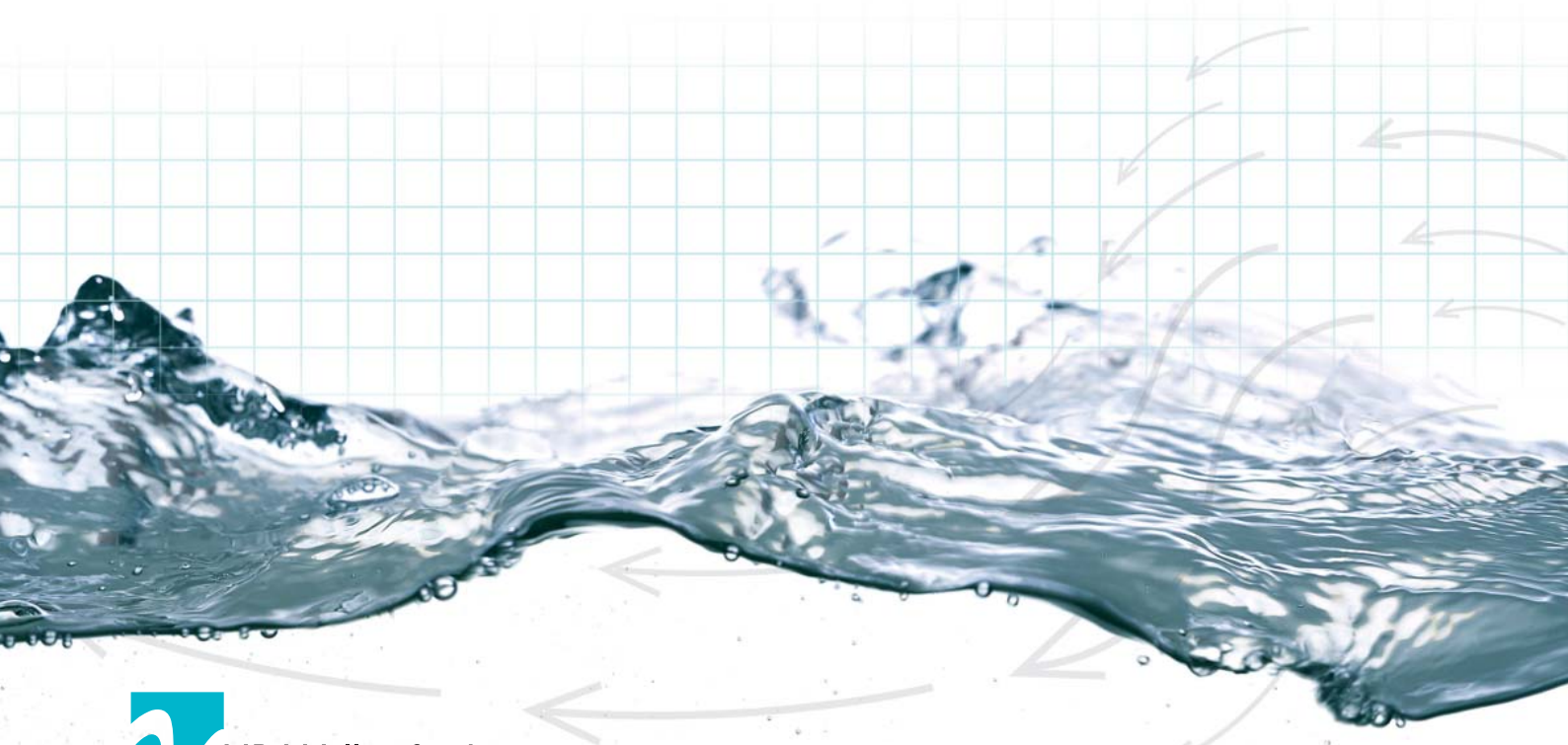

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