

**TRANSPORT AND WORKS ACT 1992
TRANSPORT AND WORKS (INQUIRIES PROCEDURE) RULES 2004
TOWN AND COUNTRY PLANNING ACT 1990
BOSTON BARRIER ORDER**

**DOCUMENT EA/4/1
PROOF OF EVIDENCE
OF
GILLIAN WATSON
NAVIGATION SIMULATIONS**

**FOR
ENVIRONMENT AGENCY**

MARCH 2017

SUMMARY PROOF OF EVIDENCE

1 Qualifications and Experience

- 1.1 My name is Gillian Watson. I am employed by HR Wallingford Ltd as a Principal Engineer within the 'Ships Group' team.
- 1.2 I have a BA and MA (Cantab.) in Engineering from the University of Cambridge. I also have a MSc in Marine Resource Development and Protection from Heriot Watt University. I am a member of the International Navigation Association (PIANC).
- 1.3 I have worked with the marine and port industries in the fields of civil engineering and environmental hydraulics for over 24 years. Since 2003, I have been a vessel navigation specialist. I have managed consultancy services projects that have informed, assessed and supported port and marine terminal development projects at sites not only in the UK, but throughout the world. These have covered a wide range of navigation situations, and vessel types.
- 1.4 In addition, I have sailed a variety of boats and yachts since early childhood. I currently have RYA Yachtmaster Offshore and Yachtmaster Ocean qualifications and I own and regularly sail an 8.1m (27 foot) sailing yacht.
- 1.5 Since August 2016 I have managed HR Wallingford's contract (with Mott MacDonald) to provide navigation simulation services to support of the Transport and Works Act Order (**TWAO**) application for the Boston Barrier Scheme. I also led HR Wallingford's Boston Barrier navigation simulation study.

2 Scope of Evidence

- 2.1 I am presenting evidence on behalf of the Environment Agency.
- 2.2 My evidence discusses the navigation situation on the Haven at present as well as the main navigation features of the Scheme. I also describe the process of navigation simulation and present an overview of the navigation simulations that have been undertaken to support the TWAO application for the Boston Barrier Scheme. I discuss the navigation context for the Navigation Management Plan (**NMP**) (please see the appendices to Peter Mallin's proof of evidence (**EA/3/2**)) that has been developed for the Scheme, and consider the residual impact of the Scheme on navigation on the Haven once the NMP is implemented. I also present a summary review of alternative schemes for managing the tidal flood risk at Boston from a navigation viewpoint.

3 Summary of my Evidence

- 3.1 The Haven is important to navigation because it links the Port of Boston (**PoB**) with the coastal waters of the Wash. It also acts as a gateway access point and link between otherwise separated inland waterways networks. The Haven is also the base for the Boston fishing fleet and for a range of local and visiting recreational river users.

- 3.2 The Haven is not, however, an easy waterway to navigate. The river channel through the Haven is relatively narrow, with several significant river bends. The water level in the river varies significantly with both the tidal conditions and with the freshwater river and sluice discharge conditions. As the water level varies, the width of the navigation channel also varies. Navigation on the river is dominated by the river conditions. Flows through the Haven can be moderate to strong at times. There are also numerous existing hazards to navigation on the Haven.
- 3.3 When compared with many UK ports and harbours there is a low volume of marine traffic on the Haven. Almost all vessel movements, however, tend to occur during relatively short 'tidal operating windows', usually over the high water period.
- 3.4 Construction and operation of the Boston Barrier Scheme will alter the navigation situation on the Haven to some extent, particularly in the immediate vicinity of the barrier site. The main navigation considerations associated with the Scheme are the siting of the barrier on a bend in the river, the modified sight lines with the structures in place, the width of the navigable channel and the flow conditions at the site.
- 3.5 The Boston Barrier navigation simulation study conducted by HR Wallingford has demonstrated that all vessel types that transit this section of the Haven at present can navigate the barrier navigation channel successfully in all reasonable navigation conditions. Furthermore all vessel types except the PoB dredger can navigate through the cofferdam navigation channel during the construction phase of the Scheme.
- 3.6 There is no doubt that from a navigational viewpoint siting the barrier on a bend in the river is not ideal. However, the navigation simulations have clearly demonstrated that the turn through the barrier channel is achievable in a safe manner.
- 3.7 The barrier navigation channel is obviously narrower than the full width of the river at this location at present, but with a guaranteed navigable width of 25m the barrier navigation channel is also wider than the existing navigable channel at present when a grain ship is moored on the Silo Berth.
- 3.8 The sight lines at the barrier and cofferdam are poor, but no worse than at present when there is a grain ship moored on the Silo Berth.
- 3.9 The presence of the Scheme cofferdam and barrier structures modifies the flow pattern to some extent within about 150m of the structure, but flows are little changed beyond this area. Peak currents (up to approximately 3.7 knots) may be experienced at the barrier in 'difficult' winter conditions, which is an increase up to approximately 1.2 knots at the barrier site when compared to the present river layout.
- 3.10 The navigation simulations showed that all of the vessels considered could navigate the barrier successfully in reasonable conditions (i.e. up to and including the conditions most severe river conditions in which river users have indicated they would, in practice, consider navigating their vessels within the Haven at present).
- 3.11 Based on the insights gained during the navigation simulation study, I consider that the navigation situation with Boston Barrier Scheme structures (the cofferdam or the barrier) is similar overall to the existing navigation situation when a grain ship moored on the Silo Berth. Vessels are able to navigate successfully in these circumstances at present and so navigation

should continue to be feasible with the Scheme without any significant alteration with regard to the risks that presently exist.

- 3.12 I recommend, however, that additional navigation risk mitigation measures would be both beneficial and appropriate to ensure that the risk level is not only acceptable but is also reduced as far as reasonably practical. These mitigation measures should include additional marine traffic management and control at the barrier site.
- 3.13 A draft Navigation Management Plan (**NMP**) (please see the appendices to Peter Mallin's proof of evidence (**EA/3/2**)) has been developed that sets out the procedures to be followed and aids to navigation to be provided to mitigate the risks to navigation arising from the construction and operation of the Boston Barrier Scheme.
- 3.14 In my professional opinion the mitigation measures detailed in the draft NMP are both suitable and practical in the context of the site, and should be effective in reducing the navigation risk at both the cofferdam and barrier not only to an acceptable level, but also as far as reasonably practical.
- 3.15 During the Scheme construction phase, I consider the impact of most construction activities on navigation on the Haven to be low, both at the barrier site and on the Haven as a whole. In most circumstances, vessels passing the barrier site may be delayed by up to a few minutes. In a worst case, e.g. during critical construction tasks, there could be periods of few hours up to a few days when the cofferdam is unpassable.
- 3.16 Post-construction, navigation of PoB ships will not be affected by the Scheme. I also expect the impact of the Scheme on other navigation on the Haven will be generally low. In most circumstances, vessels passing the barrier site may be delayed by up to a few minutes. During barrier maintenance periods the barrier will be unpassable for short periods. This section of the river will be closed to navigation for generally less than 2 hours and the maintenance is expected to be scheduled to coincide with periods of little or no navigation activity on the Haven (e.g. over low water). The barrier will also be unpassable when the barrier gate is raised during a tidal flood event, but these are both extreme and rare. It is not reasonable, however, to expect vessels to be navigating on the Haven in general in 'extreme' tidal flood conditions as the navigation risks are excessively high and therefore unacceptable. In this respect, the navigation situation is no different to at present.
- 3.17 I have also conducted a brief review of alternative schemes for managing the tidal flood risk at Boston from a navigation viewpoint. Overall, I consider that for navigation a barrier is preferable to a barrage, and that there is no better location for a barrier than the location proposed by the Environment Agency.