APPENDIX 8
ADDITIONAL MODEL VERIFICATION – WATER LEVEL

The model has been calibrated against the December 2013 tidal event, i.e. the largest tidal event in the last 60 years in terms of water levels. It has also been calibrated against five other different magnitudes of fluvial and tidal event in terms of water levels too, as described in Section 6.3 under the heading of model calibration.

This Appendix provides technical details of the additional model verification undertaken by Mott MacDonald, to further demonstrate the robustness and accuracy of the model in predicting water levels for large fluvial event.

The following summary details model performance and verification in terms of replicating the observed water levels for the 2008 fluvial event which is the largest fluvial event recorded that had occurred in the Witham catchment since gauge records began.

1 Verification to 22nd January 2008 Event (Large Fluvial Flood on Record)

Gauge records and model set-up

1.1 For the following discussion refer map of key locations in Figure A8 – 1 below.

1.2 The January 2008 event is the largest on record at Kirkstead Bridge and Chapel Hill gauges on the River Witham and Billinghay on the Kyme Eau sub-catchment. The January 2008 event is within 3m$^3$/s of the June 2007 event on record at Langrick Bridge.
1.3 The gauged records between 10/01/2008 00:00 and 02/02/2008 00:00 were applied to the model as follows:

(a) Flows at Langrick Bridge and Black Sluice have been derived from the river level records, and were 90(m$^3$/s) and 57(m$^3$/s) respectively;

(b) The operation of Grand Sluice was based on the records of the gate openings provided by the Environment Agency. The lock gate is assumed to be closed during this period.

(c) The pumps at Black Sluice were not operated on this date.

(d) The tidal conditions at the downstream end of the model were based on the recorded tide levels at Hobhole gauge, with peak tide level of 4.19mAOD.

Model Results

1.4 The model predicted water level (blue profile line) was within 0.1m of the maximum gauged water levels (black crosses) at all locations (Figure A8-2). For this event, despite flooding further upstream, the flood water was contained in bank along the Witham downstream of Tattershall Bridge, and contained within the channel in the Haven. The model predicted water level also shows that the water level is below crest level of the defences between Tattershall Bridge and Grand Sluice, with water contained in the Haven too.

Figure A8 - 2  Comparison of Model predicted Water Level Profile with Observed levels along the Lower Witham and Haven (January 2008 event)

1.5 The model predicted water levels match closely with the gauged maximum water levels at key locations along the Witham and Haven (Figures A8-3(a) to A8-3(e)).
1.6 The model does show some overestimations in water levels at low tides at Black Sluice, Maud Foster and Hobhole (Figures A8-3 (a) to A8-3(e)). That might be due to the overestimation of flows through Grand Sluice at low tides.

Figure A8-3: Comparison of Observed (Gauged) and Modelled Water levels at Key Locations

(a) Grand Sluice Upstream

(b) Grand Sluice Downstream
(c) Black Sluice Downstream

(d) Maud Foster

(e) Hobhole

- Observations
- Modelled
Conclusions

1.7 The model calibration results for the six historical events discussed in Section 6.3 under the heading of model of calibration and the additional model verification results presented in this Appendix 8 have clearly demonstrated that the Boston Barrier 1D/2D model:

a) can not only reliably reproduce the water levels for large and medium magnitudes of historical tidal events and moderate sized fluvial events,

b) but can also realistically reproduce the flood levels for large fluvial flood events too.

Therefore, I am confident that model is robust, and capable of predicting flood levels with a good level of accuracy. The water levels predicted by the model are reliable.