APPENDIX 13

ADDITIONAL MODEL CALIBRATION – VELOCITY

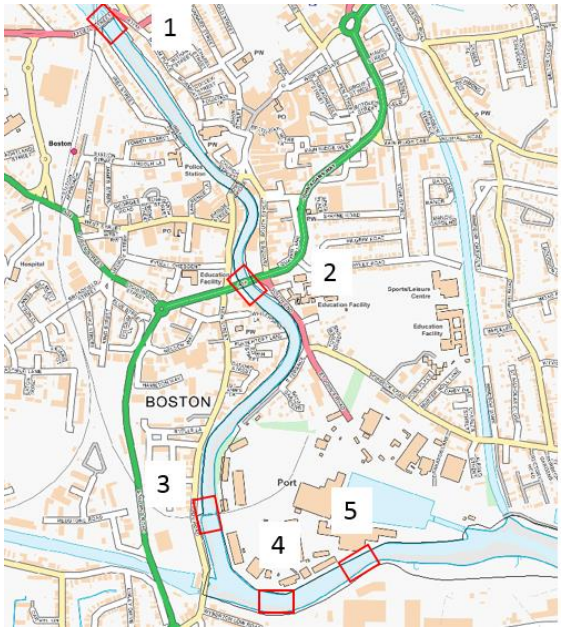
General information on the velocity experienced in the Haven is presented below, with discussion on the effects of the Boston Barrier Scheme on these velocities experienced in the channel.

1 Correlation with observed velocity conditions on 13th and 14 December 2016

1.1 In order to compare the modelled performance of the channel with observations of flow velocity and depth in the channel, survey of the channel was made during tidal events on the 13th and 14th December 2016. The velocity and depth survey was conducted at five locations by the EA across the river channel on the Haven, downstream of the Grand Sluice, namely:

- 1. Immediately downstream of the Grand Sluice
- 2. A52/John Adams Way
- 3. Swing Bridge
- 4. Proposed Boston Barrier Location
- 5. Geest Point

Figure A13-11.1 Survey Locations



1.2 In addition to velocity data, depth data was also collected during the observations on the 13th and 14th of December 2016. This depth information taken at intervals across the channel was examined to create a profile of the bed of the channel section by subtraction from the recorded water level during the survey. This bed profile was overlayed against the model bathymetry data to verify that the measurements taken during survey were valid for comparison against the modelled result based on a consistent channel profile.

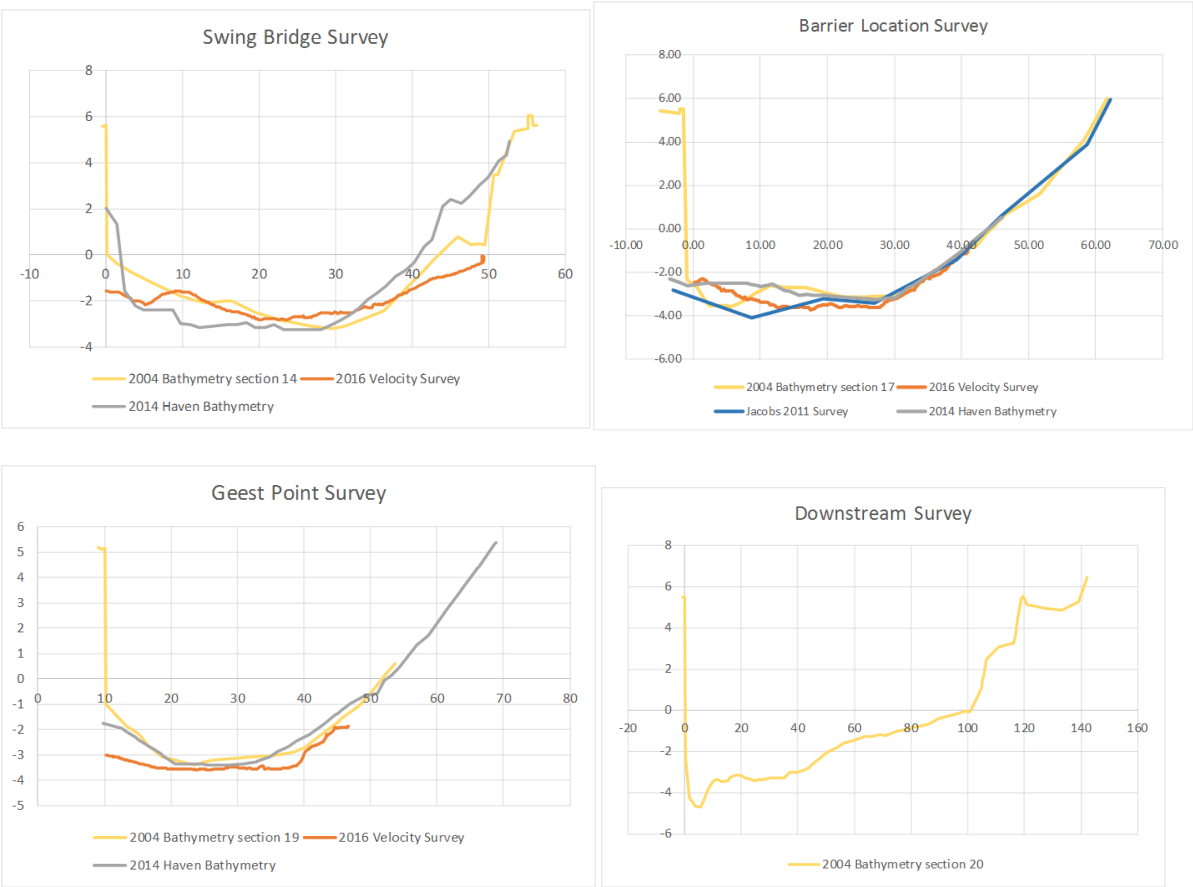
1.3 The velocity information gathered at these locations was compared with the modelled velocity results to determine the validity of the model in representing the flow regime in the channel.

Analysis of results

1.4 The comparison of the channel bed profile as measured during the survey on 13th and 14th December provided a reasonable correlation with the bed profile sections of the model. This indicated that the observed velocity data is a valid benchmark for the comparison with the modelled data, based on consistent bathymetry.

1.5 Minor changes in bed profile due to sediment deposition and scour were anticipated. At the Barrier location, 2004 and 2011 surveys suggest a slightly deeper section of channel adjacent the left bank, nearer the quay wall. 2014 and 2016 surveys suggest no deeper section in this location. At the Geest Point location, no significant changes in profile observed (Figure A13-2).

Figure A13-2 Survey and model bathymetry comparison



1.6 The velocities observed in the channel correlated well with the pattern of flow extracted from the model. Table A13-3 below indicates the variation in flow at different locations and confirms the pattern of flow in both the modelling and observed data. Note that the conditions at Grand Sluice were constant due to the proximity to the hydraulic structure, and observations here do not reveal the same variation in channel conditions as locations along the channel.

1.7 Appendix 12 summarises the data recorded during the observations of the 13th and 14th December 2016. The range of maximum velocities experienced was from 0.0m/s during transitions to maximum readings of 1.1m/s during the periods of higher velocities. Shown in

each image in Appendix 12 is the distribution of velocity values across the channel cross section, and a classification of the cross section into a colour scheme indicating higher and lower velocities.

1.8 Table A13-3 following indicates the rank of maximum velocities experienced in terms of the location where they occur. This pattern of maximum velocities observed is supported by inspection of the maximum velocities in the model.

Table A13-3 Maximum velocity pattern in observed and modelled flows

Location	Maximum Velocity Rank	
	Observed	Modelled
John Adams Way	2	2
Swing Bridge	1	1
Proposed Barrier	4	4
Geest Point	3	3

1.9 The maximum average velocities were determined from the observations during the data collection and compared with the modelled maximum average velocities from the modelling. This comparison serves to demonstrate that the model gives a valid and accurate representation of the velocities in the channel for the flow event under examination.

Table A13-4 Average velocity correlation in observed and modelled flows

Location	Average Velocities (m/s)	
	Observed	Maximum average range as modelled
John Adams Way	2	2
Swing Bridge	1	1
Proposed Barrier	4	4
Geest Point	3	3

Logical Reasoning

1.10 In terms of a qualitative assessment of channel velocities, common sense would suggest that similar velocities are experienced in the channel where the cross section is similar. It would also suggest that the velocity through a section of river would be faster given a narrower cross section, and slower through wider cross sections. It follows that the maximum velocities should be expected at the locations where the width is narrowest.

1.11 The velocities at the Barrier location are approximately the same as those observed at the Swing Bridge for the majority of the tide and are similar to velocities currently experienced at the Haven Bridge (A16 Crossing) consistently through the whole tide cycle. These findings correspond with velocity tests undertaken and also match with the common sense assessment. It is worthy of note that the proposed barrier is wider, with a 25m full navigable depth, compared with the A16/ Haven Bridge at 22m (variable navigable depths) and Swing bridge 16m (variable navigable depths).

1.12 Based on this assessment, the model is considered to be an accurate representation of the velocity in the channel, and is the best available tool for the simulation of the effect on velocity of the proposed Barrier Scheme.

Conclusion

1.13 It is anticipated that with the barrier in place there will be a changed flow regime as water moves through the constricted section of the structure. Based on the model analysis of the velocity of flows through the barrier cross section, the barrier will not create velocities of a higher order than those already experienced at various locations within the channel, where existing constrictions are present.