CONSERVATORS OF THE RIVER CAM **5**

MATTERS FOR DECISION

River traffic monitoring at Riverside and implications for the Conservators' Mooring Policy

1. Preamble

1.1 Purpose of the report

The purpose of this report is to review navigation along the Riverside retaining wall under Byelaw 3, by considering whether moorings in this area are restricting navigation access to other river users or hindering public safety. Byelaw 3 states that the master of every vessel shall obey and conform to the directions of the Control Officer[1] relating to the use, navigation, anchoring, berthing or mooring of such vessel.

1.2 Navigation

The minimum navigation width for two vessels to pass safely on the river Cam has been established by Conservators to be around 15 metres. However, there is reasonable justification to increase this fairway width, where channel geometry permits this, to 20 metres in order to accommodate passing rowing eights. The stretch of the river at Riverside is sinuous and this restricts visibility on the bends, meaning that safe navigation fairway may need to be greater than 15 metres in certain areas. Moorings at Riverside are almost always fully occupied by a mixture of narrow and wide-beam vessels, thereby exerting a permanent restriction on the channel width.

The Review of the Conservators' Mooring Policy in July 2009 lists channel widths (without moorings) taken from a digital OS map (2003 ed. Cambs County Council). It states that the actual width of the channel at Eights Marina to be 20.57 metres, whilst at Riverside opposite Priory Road the channel width is slightly wider at 21.51 metres. All measured locations along Riverside exceed the width of the channel adjacent to Eights Marina. The majority of Riverside, however, is narrowed by moorings, although the channel is still greater than the minimum navigation width of 15 metres.

The Conservators' Mooring Policy Review in February 2008 identified that many of the complaints concerning navigation were due to overhanging willow trees on the left bank of the river which were causing vessels to move further into the centre of the channel to pass them. However, it was also noted that the speed of vessels was reduced when avoiding the trees, lessening the risk of collision with other river traffic and the magnitude of any impact. The Mooring Policy Review in July 2009 stated that the overhanging trees had been trimmed back, and at present, the channel does not appear to be restricted.

[1] River Manager

There is a high density of rowing activity around Riverside. At this point in the river many rowing craft are picking up speed as they travel away from the boathouses; conversely, rowers may practice final pieces (short fast bursts) before finishing their outings. The sinuosity of the channel creates blind corners. These factors combined increase the likelihood of collision risk with other vessels underway or with moored craft, particularly at peak times. In recent years the number of vessels on the river has been increasing. Regarding powered craft, there is a trend towards owners favouring wide-beam vessels. Where these are moored, they may reduce the channel sufficiently to hinder the free movement of passing vessels.

2. Aims of this study

The purpose of this study was to use river traffic movement observations to assess whether the boat moorings along the Riverside retaining wall were restricting navigation to other river users by increasing the risk of collisions, accidental immersion or personal injury.

3. Monitoring

3.1 Study Sites

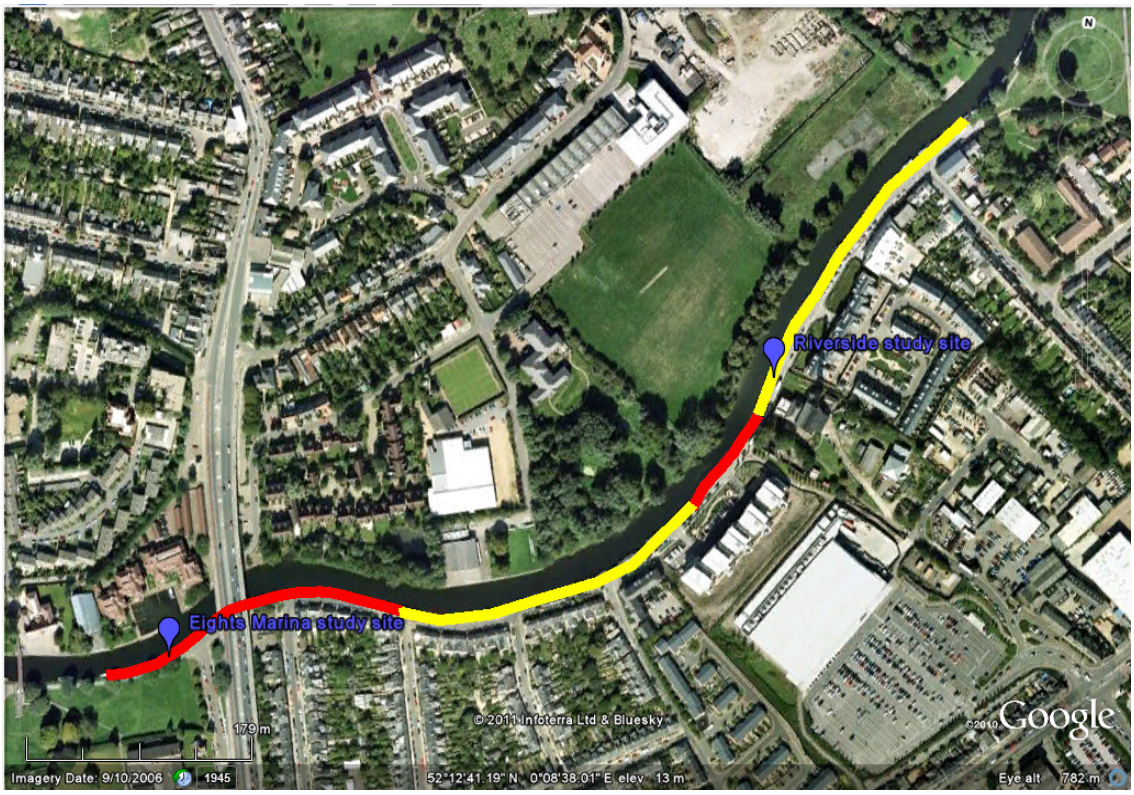
Information was collected from two study sites, the first being Riverside as the main purpose of the report. The second site selected was Eights Marina, a section of the river where mooring is prohibited on both banks but the channel has similar dimensions and sinuosity to sections of Riverside. This was used as a control site.

Riverside – near cyclebridge opposite Logan's Meadow Nature Reserve

View upstream along a zone of mooring. Mooring zones are currently situated along the banks of Riverside, except for a prohibited zone along the right bank in front of the Museum of Technology. Vegetation encroachment here is limited.

Opposite Eights Marina

View looking downstream towards Elizabeth Way Bridge.
Mooring on either bank opposite Eights Marina is prohibited by the Conservators



Mooring zones between Eights Marina and Stourbridge Common. Yellow areas are mooring zones, red areas are zones where mooring is prohibited. Markers are positions of the study sites, the left being the control opposite Eights Marina, the right being near the cyclebridge on Riverside (cyclebridge not seen on map).

3.2 Methodology

The observations were carried out by Conservancy staff on 73 different occasions, over a period of 41 weeks between August 2009 and May 2010. Each observation session had an advised minimum time frame of 30 minutes. Samples were taken over a randomised selection of mornings, afternoons, weekdays and weekends.

Observations that were recorded as incidents included:

- collision with the bank, moored vessels or moving vessels
- swerving to avoid the bank, moored vessels or moving vessels
- blade clashes
- slowing down, holding up/being held up by other river traffic
- overtaking

4. Results and Analysis

4.1 Observations

4.1.1 Riverside

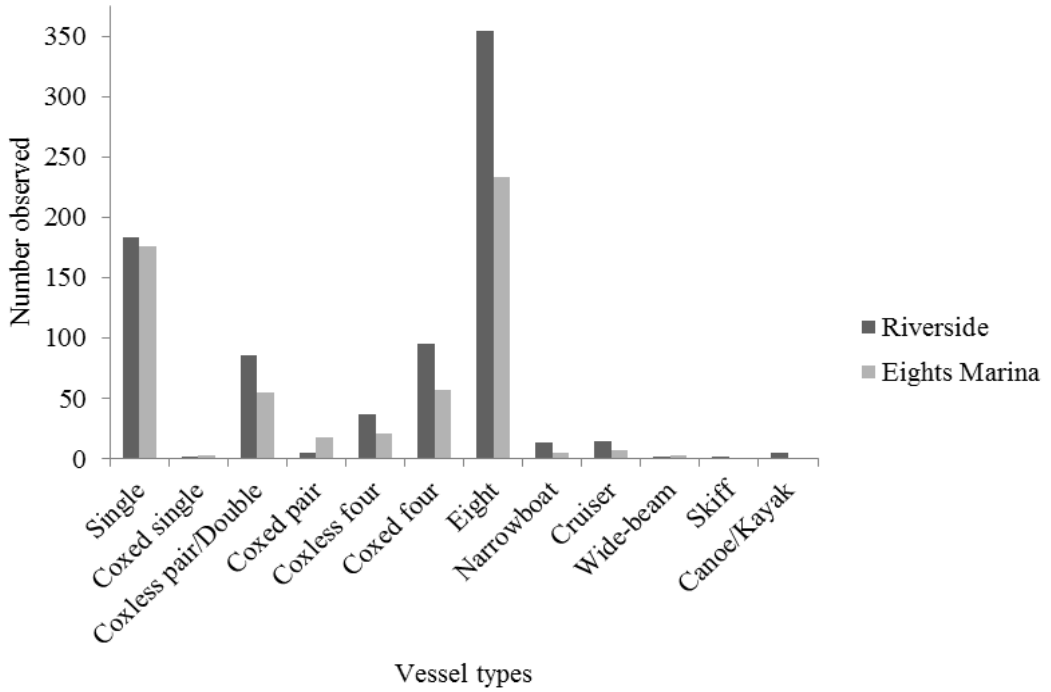
A total of 826 observations were made of vessels travelling in either direction between 29 August 2009 and 27 May 2010. Of these, 44 incidents were recorded (see Appendix).

4.1.2 Eights Marina

A total of 579 observations were made of vessels travelling in either direction at the control site between 11 September 2009 and 27 May 2010. Of these, 20 incidents were recorded (see Appendix).

4.2 Types of vessels

The majority of vessels observed at either location were rowing vessels of various sizes (see graph below). Eights were the most frequently observed vessel, particularly when observation sessions coincided with organised events. The occasional narrowboat or cruiser was also observed.



Total frequency of the different types of vessels observed between August 2009 and May 2010 at both study sites (72 days at Riverside, 69 days at Eights Marina).

4.3 Types of incidents

Rowing eights were the vessels most frequently involved in incidents, contributing factors being their numerical dominance, their size and their relative lack of manoeuvrability. Since they require more room to manoeuvre, rowing eights are more likely to hold up other vessels or be in danger of coming into contact with moored vessels or the bank. Almost all moving boat incidents over the period of the study involved rowing craft.

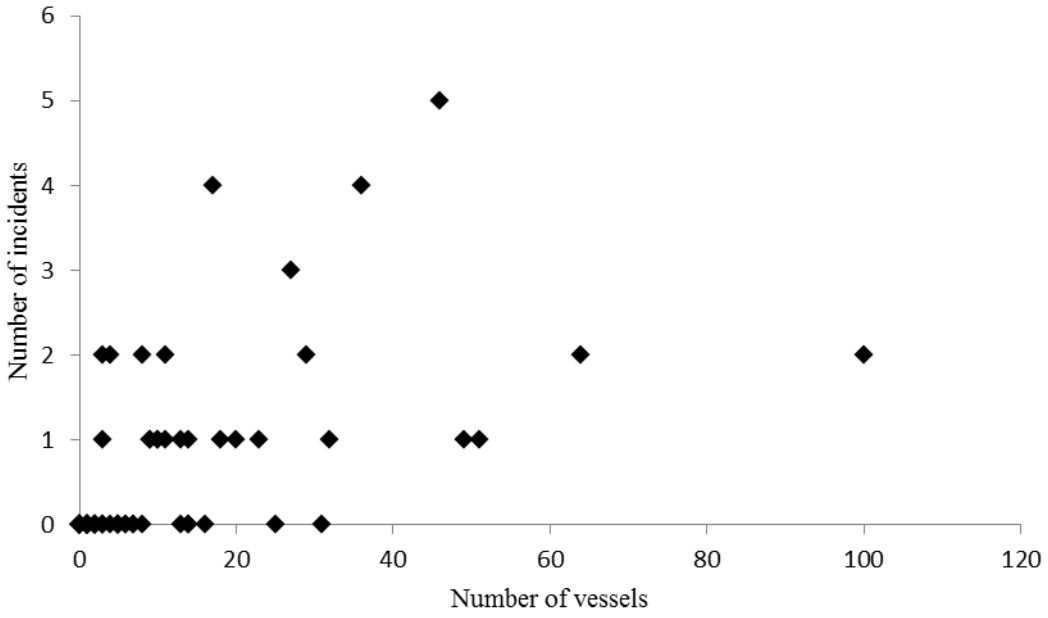
4.3.1 Riverside

There were 826 observations of passing craft. Navigational incidents only accounted for 5.3% of the total number of incidents (44 recorded incidents). Of these 44 incidents, 24 were due to congestion, often associated with an event. Many incidents were caused by rowers taking a centre line along the channel, forcing other rowers into the banks or having to pull their oars in to avoid moored vessels. Observers noted that some rowers were not keeping to the correct side of the channel when navigating, increasing the risk of a collision.

There were 6 incidents where rowers came into contact with moored wide-beamed barges and this tended to happen at times when the channel was congested. The 3 cases where rowers came into contact with moored narrowboats were due to user error and lack of awareness of the moored vessel's position. There were numerous incidents where rowers were not paying attention, resulting in them drifting into the vegetation along the left bank or bumping into moored vessels. However,

many incidents which were recorded were minor, including the clashing of blades, holding-up other vessels or slowing or stopping to allow other craft to pass.

Where incidents were recorded, 60% of these were during organised events. However, there were also several cases of congestion when no event was taking place.



The correlation between the number of vessels observed within each session and the number of incidents recorded within that session.

The correlation between the number of vessels and number of incidents within an observation period is fairly weak, with a low R^2 value of 0.31. At times of peak congestion, the rate of vessels passing the observation point never exceeded two per minute. Peak congestion was mostly during the autumn season. The number of novice rowers at this time of year may be a contributing factor. The limited ability of this user group, in addition to overcrowding of the river, increases the chances of an incident. In comparison, there were also event days where no incidents were recorded. During the CRA Winter League on 17th January 2010, a total of 100 observations were made in one session at Riverside and only two incidents were noted. There were 3 sessions where the number of observations in a 30 minute period exceeded 15 passing craft, but nothing of consequence was recorded.

4.3.2 Eights Marina

Navigational incidents occurred in 3.5% of total observations. This is similar to the incident rate at Riverside, suggesting that navigation is similarly compromised at this location. Of the 20 recorded incidents, 14 of these could be attributed to user error. Observations suggested that some rowers were not paying attention to their position. Eights Marina is very close to the boathouses. Many rowers travel at a slightly slower rate in this reach of the river.

A recurring observation at Eights Marina, accounting for a total of 10 out of the 20 incidents, was that a number of rowers either clipped or hit the wall on both banks. As a control site with no moorings, these observations suggest that rowers are likely to clip the banks here regardless of the width of the channel. The marina wall forces craft to over-steer and rowers are therefore more prone to leave their navigation lane, moving towards either bank. There were two cases where rowers clipped a narrowboat, on one occasion this being due to other rowers travelling in the opposite direction and taking a centre line up the channel.

On the days when incidents were recorded almost half (43.8%) coincided with an event. There were 7 days where the number of observations in 30 minutes exceeded 15 craft making passage, but no incidents were recorded. The prohibition on moorings in this area may be a positive influence in reducing the collision likelihood near Eights Marina.

4.4 Vegetation on left bank

Ten cases were observed at Riverside where the rowers came into contact with vegetation on the left bank (Chesterton side of the river). Many of the incidents where rowers came into contact with vegetation were due to user error from not paying attention. It has already been noted that there is no significant encroachment of vegetation into the river. The vegetation is most dense opposite the Museum of Technology and here, the Conservators have already prohibited mooring.

5. Conclusions and recommendations

The occurrence of incidents during times of peak congestion, such as during an organised event, suggests that moorings may be a navigational issue along the Riverside retaining wall. However, the percentage of incidents in relation to the total number of vessels passing along Riverside in this study was small (5.3%). In addition, the majority of incidents were minor, including harmless instances of vessels safely overtaking and slowing down to allow others to pass.

There is not enough evidence from this study to conclude that moorings are unduly restricting the free passage of vessels along Riverside. This conclusion is also confirmed by the number of incidents at Eights Marina where there are no moorings but rowers still manage to clip the walls. At that point in the river, the sightline is fairly good, inferring that incidents are largely down to user error.

Although the observed rate of incidents is higher at Riverside as compared to Eights Marina, the difference between the two sites is marginal. For the majority of the time, moving vessels can pass each other without incident. There is insufficient evidence to support the hypothesis that the current mooring configuration at Riverside is restricting navigation with great significance.

The issue instead appears to arise largely from error by river users. The competency of some rowers appears to be contributing to the likelihood of an incident occurring. Rowers were observed taking a centre line and demonstrated a lack of awareness of their position in relation to other river users or the channel width. Steering a centre line could perhaps, be a behavioural response to perceived

channel narrowing. Taking the centre line forces other rowers into the bank or upon moored vessels. In addition, there were many cases where rowers clipped the bank or a moored vessel because they were simply not paying attention. Rowers need to be reminded to pay particular attention when navigating along Riverside, and to keep to the correct side of the channel to reduce the risk of a major incident in the future. It is also suggested that the rowing clubs ensure that their novices have achieved an acceptable level of ability before they are allowed out any distance from the boat houses.

The slightly enhanced incident occurrence at Riverside does suggest however, that although the moorings are not restricting the navigation width below the recommended minimum of 15 metres, the partial obstruction to around 16-18 metres channel width is sufficient to be having an impact upon traffic movements. It should be considered that the moorings along Riverside should be permitted for narrow-beamed vessels only (less than 2.15 metres beam), as has been suggested in the past. Eliminating wide-beamed vessels from the assemblage will ensure a smooth line of navigation and the navigation width will be reduced to slightly less than the ideal 20 metres.

In conclusion, the findings of this study are

- Most incidents observed involved rowing craft
- Rower competency/experience is a major factor in the likelihood of an incident occurring
- There is insufficient evidence to prohibit moorings at Riverside on navigational grounds
- There is some evidence to suggest that the risk of navigational incidents could be reduced by only allowing the mooring of narrow-beam vessels along the length of Riverside

Conservators are asked to consider the recommendations and conclusions.

Emily Hall
September 2011

Appendix

Key: Congestion refers to there being a large volume of traffic on the river at any one time, causing vessels to knock into each other or having to slow down to let another pass. User error refers to incompetence, vessels taking a centre line, or travelling on the wrong side of the channel. u/s, d/s refers to the direction of travel as either upstream or downstream, respectively.

Riverside

Date	Time	Number of vessels observed	Incidents	Reason
29 Aug	07:45 – 09:45	36	Double skull d/s had to move to avoid coxless four coming u/s	Congestion
			Coxless four d/s had to move to avoid coxless four coming u/s (same as above), then clipped narrowboat	Congestion
			Single going d/s had to take evasive action to avoid collision with moored wide-beam vessel. Not paying attention.	User error
			Eight held up and gave way to another Eight, both going d/s	Congestion
30 Aug	12:20 – 14:40	14	Double going u/s clipped blades against N bank vegetation whilst attempting to keep to rhs	User error
11 Sep	19:05 – 19:30	7	None observed	
13 Sep	11:00 – 11:30	5	None observed	
15 Sep	15:00 – 17:00	29	Coxed pair going u/s clipped oars against vegetation N bank, not paying attention	User error
			Double in centre of river going u/s had to move to rhs to avoid inflatable canoe going d/s	Congestion
16 Sep	07:00 – 08:30	3	None observed	
24 Sep	13:20 – 13:45	1	None observed	
28 Sep	07:25 – 07:55	0	None observed	
03 Oct	13:05 – 13:35	2	None observed	
09 Oct	10:00 – 10:30	2	None observed	
10 Oct	10:00 – 10:30	18	Double u/s clipped vegetation N bank with blades, own error	User error
15 Oct	09:15 – 09:45	1	None observed	
17 Oct	09:55 – 11:00	51	Eight u/s hit N Bank opposite Stanley Rd, own error, held up. Eight also going u/s	User error, Congestion
21 Oct	12:50 – 13:20	1	None observed	
27 Oct	13:50 – 14:20	8	None observed	
28 Oct	15:26 – 15:56	11	Single u/s, blade caught in willow fronds	User error
			Eight d/s gave way to coxed four and single u/s	Congestion
02 Nov	10:30 – 11:00	10	Single d/s, oar clipped two wide-beams, difficulty maintaining line. Also halted single coming d/s	User error, Congestion
05 Nov	13:33 – 14:05	11	Single u/s hit vegetation, N bank, own error	User error
10 Nov	14:10 – 14:40	1	None observed	

12 Nov	15:52 – 14:22	7	None observed	

16 Nov	13:43 – 14:13	1	None observed	
20 Nov	10:50 – 11:20	2	None observed	
25 Nov	12:10 – 12:40	8	Single d/s moved over to accommodate coxed pair u/s	Congestion
			Single u/s blown into N bank vegetation u/s bridge	Other
26 Nov	14:20 – 14:50	6	None observed	
04 Dec	11:40 – 12:10	16	None observed	
04 Dec	13:15 – 13:45	49	Eight Eights in congestion all going u/s	Congestion
07 Dec	14:40 – 15:10	3	None observed	
12 Dec	10:00 – 10:30	9	Single d/s gave way to eight d/s	Congestion
16 Dec	14:30 – 15:00	2	None observed	
17 Dec	10:15 – 10:45	1	None observed	
21 Dec	12:30 – 13:00	0	None observed	
23 Dec	09:55 – 10:25	0	None observed	
29 Dec	10:55 – 11:25	5	None observed	
31 Dec	09:15 – 09:45	0	None observed	
06 Jan	13:20 – 13:50	1	None observed	
08 Jan	13:50 – 14:20	5	None observed	
17 Jan	09:45 – 10:25	64	Single safely overtook double, both u/s	Congestion
			Eight d/s had to withdraw blades to avoid collision with skiff u/s	Congestion
17 Jan	12:50 – 13:50	100	Single u/s bumped into single d/s	Congestion
			Coxless four d/s had to pull in oars to avoid collision with wide-beam barge	Congestion
20 Jan	13:15 – 13:45	1	None observed	
23 Jan	10:10 – 10:40	20	Single d/s clashed blades with coxless four u/s	Congestion
25 Jan	12:50 – 13:50	2	None observed	
28 Jan	12:15 – 12:45	0	None observed	
01 Feb	10:50 – 11:20	0	None observed	
05 Feb	14:05 – 14:35	25	None observed	
17 Feb	10:15 – 10:45	10	Single u/s pulled over to allow double d/s to pass	Congestion
19 Feb	14:03 – 14:33	32	Eight d/s knocked blades with eight u/s	Congestion

23 Feb	15:11 – 15:41	23	Boat u/s gently bumped wide-beam	Congestion

24 Feb	14:20 – 14:50	27	Eight came to halt, held up another eight, both u/s	Congestion
			Eight u/s, blades hit vegetation N bank, own error	User error
			Eight d/s, blades clipped wide-beamed vessel	User error
01 Mar	14:00 – 14:30	1	None observed	
07 Mar	12:30 – 13:00	31	None observed	
09 Mar	11:40 – 12:10	0	None observed	
11 Mar	10:55 – 11:25	3	Eight overtaking eight, both u/s, no other traffic	Congestion
16 Mar	13:35 – 14:05	4	Double u/s on lhs collided with narrowboat d/s	User error
			Eight d/s managed to avoid double	Congestion
21 Mar	18:19 – 18:49	1	None observed	
25 Mar	09:30 – 10:00	3	None observed	
27 Mar	10:00 – 10:30	13	Eight u/s had to pull in oars to accommodate eight d/s who had centre line	Congestion
29 Mar	07:05 – 07:35	1	None observed	
31 Mar	07:05 – 07:35	3	Double d/s scraped oars along moored narrowboat	User error
			Double d/s had to pull in oars to avoid moored wide-beamed vessel	User error
06 Apr	15:15 – 15:45	2	None observed	
09 Apr	10:25 – 10:55	6	None observed	
14 Apr	13:10 – 13:40	4	None observed	
16 Apr	18:25 – 18:55	17	Eight u/s, oars hit vegetation N bank	User error
			Single u/s hit fishing platform, own error	User error
			Coxless four u/s, near miss wall S bank	User error
			Eight d/s clashed blades with eight u/s	Congestion
19 Apr	16:06 – 16:36	0	None observed	
22 Apr	18:01 – 18:31	13	None observed	
25 Apr	10:16 – 10:46	5	None observed	
01 May	09:15 – 09:45	14	None observed	
08 May	11:16 – 11:46	46	Eight u/s had to pull in oars to avoid clash with eight d/s	Congestion
			Eight u/s clashed oars with eight d/s	Congestion
			Eight u/s, oars hit vegetation N bank, own error. Impeded progress of two other Eights, one d/s one u/s	User error, Congestion
			Eight d/s clipped moored narrowboat	User error, Congestion
			Congestion between two eights, one u/s one d/s, coxless four d/s and coxed four u/s	Congestion
09 May	15:31 – 14:01	0	None observed	

12 May	13:02 – 13:32	5	None observed	

14 May	11:40 – 12:10	1	None observed	
17 May	11:05 – 11:35	9	Single u/s hit vegetation N bank	User error
27 May	15:46 – 16:16	14	None observed	
Total		**826**	**44**	

Eights Marina

Date	Time	Number of vessels observed	Incidents	Reason
11 Sep	18:44 - 19:03	4	None observed	
13 Sep	11:35 - 12:05	4	None observed	
20 Sep	08:45 - 11:00	51	Cruiser held up by single, both going u/s	Congestion
			Single going d/s collided with retaining wall opposite Eights Marina, own error	User error
			Single going d/s clipped oars on retaining wall opposite Eights Marina, own error	User error
			Eight u/s held up be narrowboat d/s, then safely overtook	Congestion
			Double going d/s clipped oars against moored narrowboat	User error
24 Sep	13:50 - 14:20	8	Eight going u/s obstructed two singles d/s	User error
28 Sep	08:00 - 08:30	2	None observed	
03 Oct	13:35 – 14:05	2	None observed	
09 Oct	11:00 – 11:30	2	None observed	
10 Oct	10:35 – 11:05	20	Double u/s hit N bank under Elizabeth bridge, own error	User error
15 Oct	09:50 – 10:20	1	None observed	
17 Oct	11:05 – 11:35	10	None observed	
21 Oct	13:30 – 14:00	1	None observed	
27 Oct	14:45 – 15:15	7	None observed	
28 Oct	14:50 – 15:20	6	None observed	
02 Nov	11:05 – 11:35	5	None observed	
05 Nov	12:45 – 13:15	4	Single d/s hit wall upstream Elizabeth bridge, S bank, own error	User error
10 Nov	14:45 – 15:15	2	None observed	
12 Nov	15:10 – 15:40	7	Eight u/s, centre line taken forcing single d/s into narrowboat	User error, Congestion

16 Nov	14:15 – 14:45	2	None observed	

20 Nov	11:25 – 11:55	0	None observed	
25 Nov	13:15 – 13:45	8	None observed	
26 Nov	14:50 – 15:20	8	Coxless four d/s came to abrupt halt u/s bridge to avoid hitting wall N bank	User error
04 Dec	10:55 – 11:25	37	None observed	
04 Dec	12:40 – 13:10	2	None observed	
07 Dec	14:10 – 14:40	5	None observed	
12 Dec	10:35 – 11:05	8	Single d/s clipped oars against wall u/s of bridge	User error
16 Dec	14:00 – 14:30	1	Eight u/s hit wall d/s wide-beam, limited ability	User error
17 Dec	10:50 – 11:20	2	None observed	
21 Dec	13:10 – 13:40	1	None observed	
23 Dec	10:50 – 11:20	2	None observed	
29 Dec	09:50 – 10:20	6	None observed	
31 Dec	09:45 – 10:15	6	None observed	
06 Jan	12:50 – 13:20	1	None observed	
08 Jan	12:25 – 12:55	8	None observed	
17 Jan	11:10 – 11:40	36	None observed	
17 Jan	12:00 – 12:30	0	None observed	
20 Jan	14:35 – 15:05	1	None observed	
23 Jan	10:40 – 11:15	33	None observed	
25 Jan	13:55 – 14:25	3	None observed	
28 Jan	13:00 – 13:30	8	Coxed four stopped and held up eight, which overtook, both d/s	Congestion
01 Feb	11:30 – 12:00	2	None observed	
05 Feb	13:30 – 14:00	4	None observed	
17 Feb	10:55 – 11:25	9	Single almost ran into another single, both u/s	User error, Congestion
19 Feb	13:25 – 13:55	2	None observed	
23 Feb	14:36 – 15:06	27	Three eights in pile-up, two d/s one u/s	Congestion
24 Feb	12:00 – 12:30	0	None observed	
01 Mar	13:30 – 14:00	2	None observed	

07 Mar	12:00 – 12:30	6	Eight u/s veered to lhs u/s of Elizabeth bridge, managed to avoid wall	User error

09 Mar	06:55 – 07:25	21	None observed	
11 Mar	09:55 – 10:25	4	None observed	
16 Mar	14:05 – 14:35	1	None observed	
21 Mar	17:43 – 18:13	5	None observed	
25 Mar	10:30 - 11:00	1	None observed	
27 Mar	10:35 – 11:05	7	None observed	
29 Mar	07:36 – 08:06	3	None observed	
31 Mar	07:36 – 08:06	4	None observed	
06 Apr	14:45 – 15:15	3	None observed	
09 Apr	09:50 – 10:20	5	None observed	
14 Apr	12:25 – 13:05	10	Single u/s hit wall u/s bridge, own error	User error
16 Apr	17:55 – 18:25	17	Eight u/s, oars shaved wall N bank u-s Elizabeth bridge	User error
19 Apr	15:35 – 16:05	4	None observed	
22 Apr	17:30 – 18:00	15	None observed	
25 Apr	09:45 – 10:15	19	Eight d/s hit wall S bank u-s bridge, own error	User error
01 May	09:50 – 10:25	47	None observed	
08 May	10:45 – 11:15	1	None observed	
09 May	15:00 – 15:30	25	None observed	
12 May	12:30 – 13:00	4	None observed	
14 May	11:05 – 11:35	2	None observed	
17 May	10:24 – 10:54	11	Single d/s, blades hit wall N bank opposite Eights Marina	User error
27 May	15:12 – 15:42	4	None observed	
	Total	**579**	**20**	