ACCIDENT REPORT

Report on the investigation of the collision between

the high-speed passenger catamaran

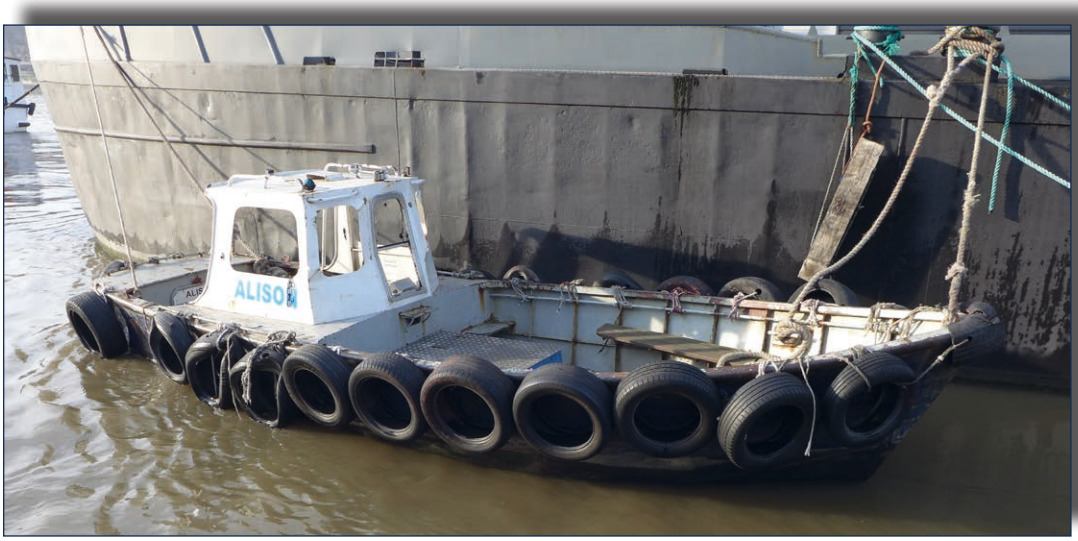
Typhoon Clipper

and the workboat

Alison

adjacent to Tower Millennium Pier, River Thames, London

on 5 December 2016



MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 24/2017 NOVEMBER 2017

Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2012 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

Front cover photograph of *Typhoon Clipper* courtesy of Thames Clippers

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

BML	-	Boatmasters' Licence
CCTV	-	Closed-circuit television
COLREGs	-	International Regulations for Preventing Collisions at Sea, 1972, as amended
CRC	-	Crown River Cruises Limited
dB	-	Decibels
DCSA	-	Deck/Customer Services Assistant
DSM Code	-	Merchant Shipping (Domestic Passenger Ships) (Safety Management Code) Regulations, 2001, as amended
HSC Code	-	International Code of Safety for High-Speed Craft, 2000, as amended
IMO	-	International Maritime Organization
ISM Code	-	International Management Code for the Safe Operation of Ships and for Pollution Prevention, 1993
LKE	-	Local Knowledge Endorsement
LOA	-	Length Overall
LRS	-	London River Services
m	-	metres
MCA	-	Maritime and Coastguard Agency
MSN	-	Merchant Shipping Notice
NWA	-	National Workboat Association
PFD	-	Personal Flotation Device
PLA	-	Port of London Authority
RNLI	-	Royal National Lifeboat Institution
SMS	-	Safety Management System
TfL	-	Transport for London
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency Radio
VTS	-	Vessel Traffic Services

TIMES: all times used in this report are UTC unless otherwise stated

SYNOPSIS

At 1108 on 5 December 2016 the high-speed passenger catamaran *Typhoon Clipper* and the workboat *Alison* collided adjacent to Tower Millennium Pier, River Thames, London. *Alison* capsized and sank immediately; the two crewmen on board were subsequently rescued by *Typhoon Clipper*'s crew. *Alison*'s crewmen were treated at the scene for the symptoms of cold shock, then admitted to hospital for checks before being released later the same day. *Alison* was recovered off the riverbed the following day by the Port of London Authority; there was no pollution.

Alison's crew had unberthed their vessel from Tower Millennium Pier and headed out into the river without properly assessing the shipping situation or making their intentions clear to other vessels. When the crew of *Alison* became aware of the risk of collision with *Typhoon Clipper*, it was too late to take effective avoiding action.

Neither *Typhoon Clipper*'s master nor mate saw *Alison* before the collision. This happened because *Alison* was initially obscured by the pier and then moved into *Typhoon Clipper*'s visual blind sector ahead. *Typhoon Clipper*'s forward-looking closed-circuit television camera captured *Alison*'s movements; however, this image was not being displayed in the wheelhouse.

Neither of *Alison*'s crewmen was wearing a personal flotation device; this placed their lives in immediate danger when immersed in cold water. *Alison*'s owner/operator, Crown River Cruises Limited, had not conducted a risk assessment or developed procedures for the safe operation of its workboats. The investigation also identified ambiguities with the Port of London Authority's regulations regarding the keeping of a lookout on vessels with limited visibility and the use of sound signals when departing from piers.

This report makes a safety recommendation to the Port of London Authority intended to clarify the requirement for keeping lookout on vessels with limited visibility and the use of sound signals when entering the Thames fairway. A safety recommendation has also been made to Crown River Cruises Limited to improve safety through the introduction of workboat operating procedures.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *TYPHOON CLIPPER*, *ALISON* AND ACCIDENT

SHIPS PARTICULARS		
Vessel's name	*Typhoon Clipper*	*Alison*
Flag	United Kingdom	United Kingdom
Classification society	Not applicable	Not applicable
IMO number	9451771	Not applicable
Type	High-speed passenger ferry	Workboat
Registered owner	Collins River Enterprises Limited	Crown River Cruises Limited
Manager(s)	MBNA Thames Clippers Limited	Crown River Cruises Limited
Construction	Aluminium	Steel
Year of build	2007	Unknown
Length overall	38.04m	Not applicable
Registered length	35.32m	7.25m
Gross tonnage	169 tonnes	Not applicable
Minimum safe manning	4	1
Maximum number of passengers	220	Not applicable
VOYAGE PARTICULARS		
Port of departure	Tower Millennium Pier	Tower Millennium Pier
Port of arrival	Canary Wharf	Westminster Moorings
Type of voyage	Passenger ferry service	Stores transfer
Passengers	48	None
Crew	4	2
MARINE CASUALTY INFORMATION		
Date and time	5 December 2016, 1108	
Type of marine casualty or incident	Very Serious Marine Casualty	
Location of incident	51°30.42'N - 000°04.69'W	
Place on board	Port hull stem	Hull
Injuries/fatalities	None	One crewman suffered skin burns from contact with red oxide paint
Damage/environmental impact	Indentation to port bow	Vessel foundered

MARINE CASUALTY INFORMATION (continued)		
Ship operation	Inland waterway passenger service	On passage
Voyage segment	Departure	Departure
External & internal environment	Wind: south-westerly, 10 knots. Visibility: good Tidal stream: slack water (Thames barrier closed) Water temperature: 11ºC	
Persons on board	52	2

Image courtesy of Thames Clippers

Typhoon Clipper

Alison

1.2 NARRATIVE

1.2.1 Events prior to the collision

At 0730 on 5 December 2016, *Typhoon Clipper* departed from Woolwich Pier to commence its daily ferry service, initially heading upriver to Westminster **(Figure 1)**. After completing one round-trip up and down the river, *Typhoon Clipper* berthed back at Woolwich Pier for a short crew break. During that morning, the crew of the workboat *Alison* took their vessel downriver from St Thomas' moorings and berthed on the north side of Tower Millennium Pier **(Figures 1** and **2)** to collect 10 tins of paint from the offices of Crown River Cruises Limited (CRC).

After the crew rest period, *Typhoon Clipper* commenced its second round-trip service, berthing at Tower Millennium Pier at 1102 **(Figure 2)**. At about the same time, the passenger vessel *Silver Bonito* was passing underneath Tower Bridge heading upriver **(Figure 2)**.

Once passengers had embarked, the crew of *Typhoon Clipper* unberthed the vessel and the master decided to wait for *Silver Bonito* to pass clear before proceeding ahead. *Typhoon Clipper* was stationary with the bow away from the pier and the port quarter close to, or touching, the pier **(Figure 3)**. At the same time, *Alison* was unberthed by its crew and driven close by the end of the pier **(Figure 4)** then headed into the river with the intention of passing ahead of *Typhoon Clipper* before turning to starboard behind *Silver Bonito*.

1.2.2 The collision

At 1107:57 and with *Silver Bonito* passing clear to starboard, *Typhoon Clipper*'s master applied ahead power and starboard rudder to head back downriver. Both of *Alison*'s crewmen were alerted to *Typhoon Clipper*'s acceleration by the sound of its engines increasing power. *Alison*'s helmsman immediately applied full astern in an attempt to back out of the way as *Typhoon Clipper* moved rapidly closer **(Figures 5** and **6)**.

At 1108:08, *Typhoon Clipper*'s port bow struck *Alison*'s starboard side abeam the workboat's wheelhouse. *Alison* immediately capsized to port and sank; the crewman on the foredeck was washed overboard and the helmsman was briefly trapped in the wheelhouse before escaping free and swimming back to the surface.

1.2.3 Post-collision events

The master of *Silver Bonito* witnessed the collision and made a "Mayday" report to the Port of London Authority's (PLA) vessel traffic services (VTS) using very high frequency (VHF) radio. PLA VTS responded to the "Mayday" by alerting the Thames RNLI[1] station, local police and ambulance services.

On hearing the impact, *Typhoon Clipper*'s master stopped the vessel immediately by selecting full astern. *Typhoon Clipper*'s deck/customer services assistant (DCSA) also heard the impact and went to the foredeck to investigate. Hearing shouting and then seeing men in the water, the DCSA reported a man overboard situation to the master using the internal communications system, then threw a lifebuoy **(Figure 7)** that *Alison*'s crewmen were able to grab.

[1] Royal National Lifeboat Institution

Reproduced from Admiralty Chart BA 3319 and BA 3337 by permission of the Controller of HMSO and the UK Hydrographic Office

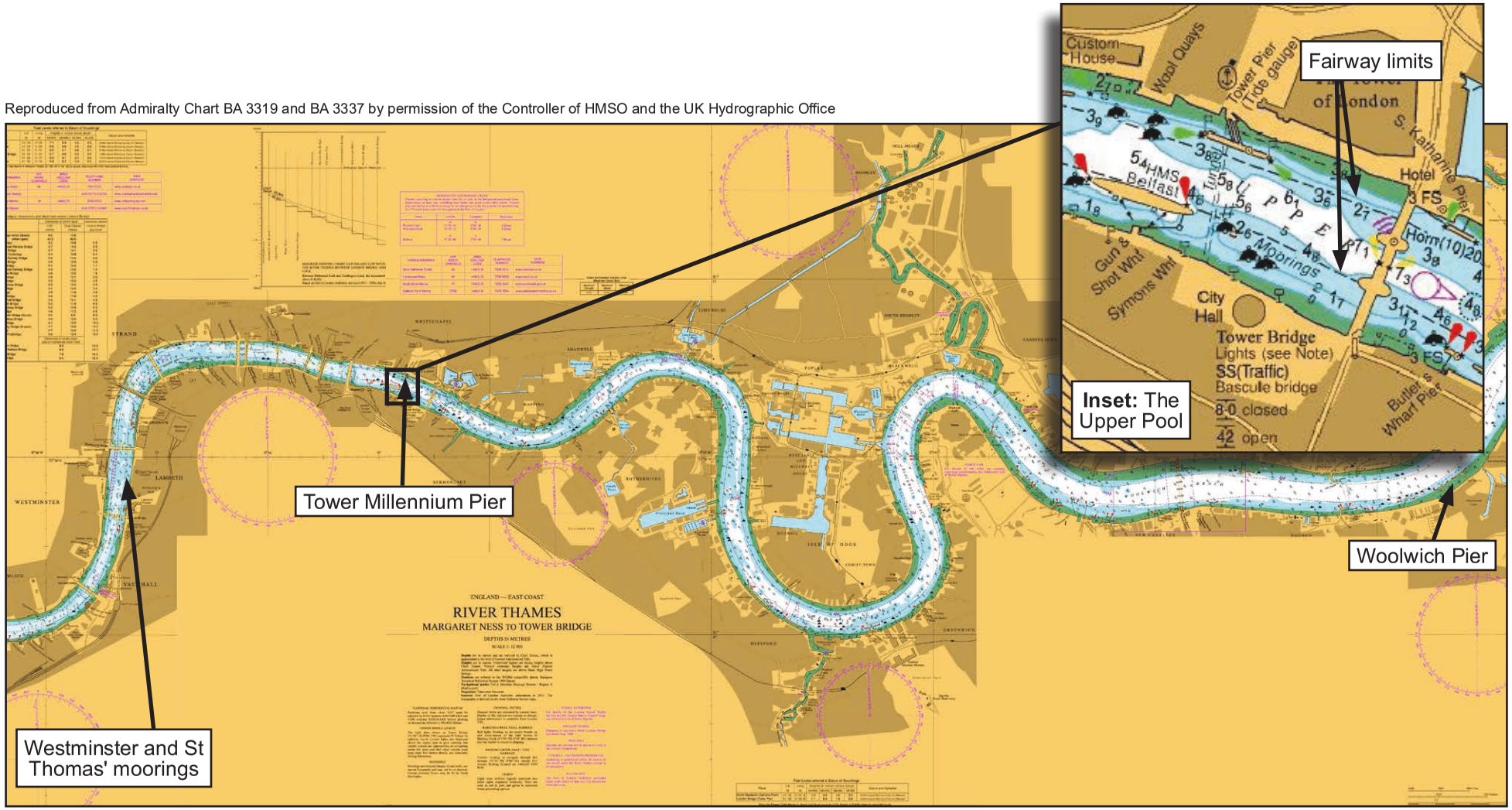

Figure 1: The River Thames with detail inset of the Upper Pool

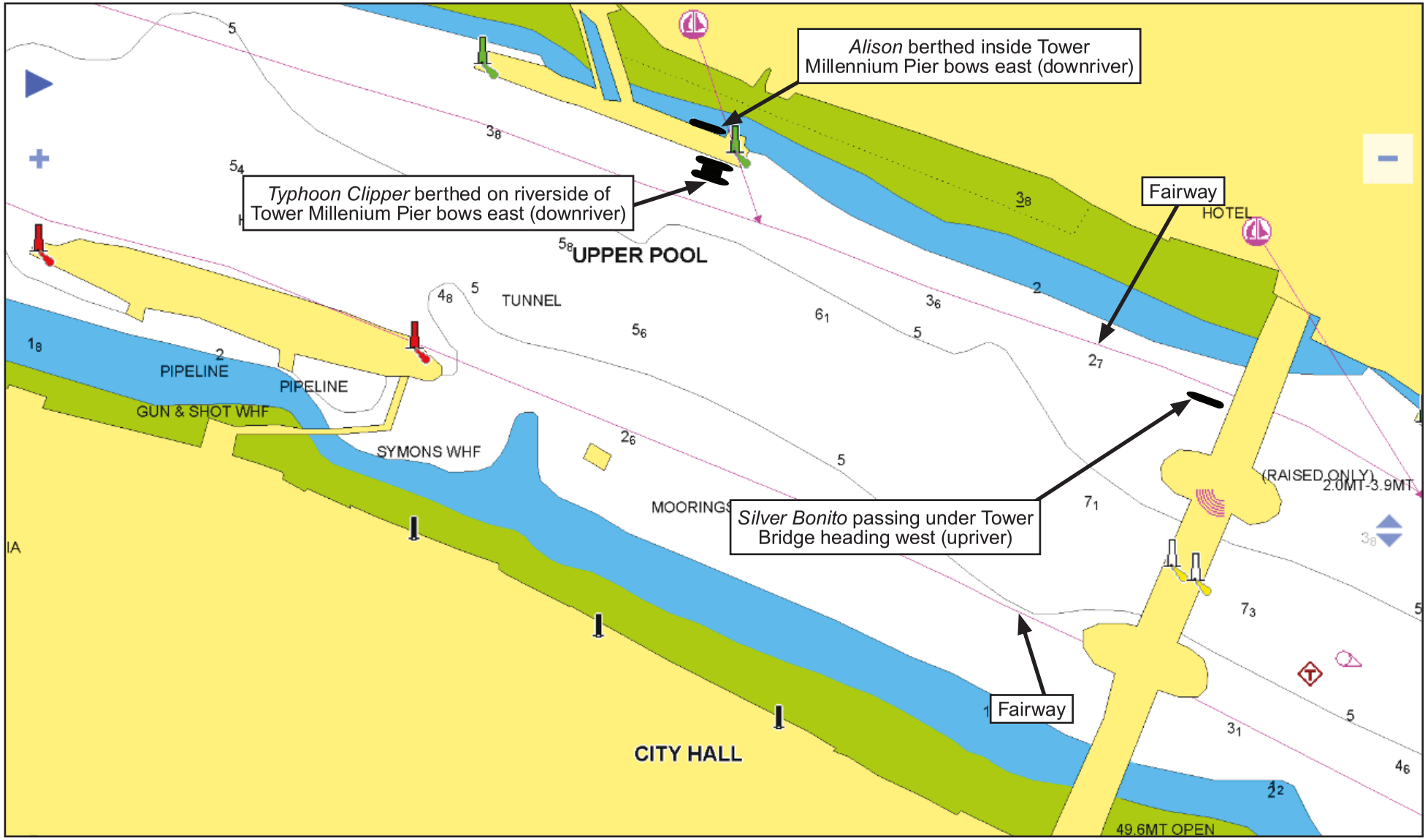

Figure 2: Locations of *Typhoon Clipper*, *Silver Bonito* and *Alison* prior to the accident

Image courtesy of London River Services

Figure 3: *Typhoon Clipper* adjacent to the pier waiting for *Silver Bonito* to pass

Image courtesy of London River Services

Figure 4: Tower Millennium Pier CCTV showing *Alison* emerging into the river close by the end of the pier

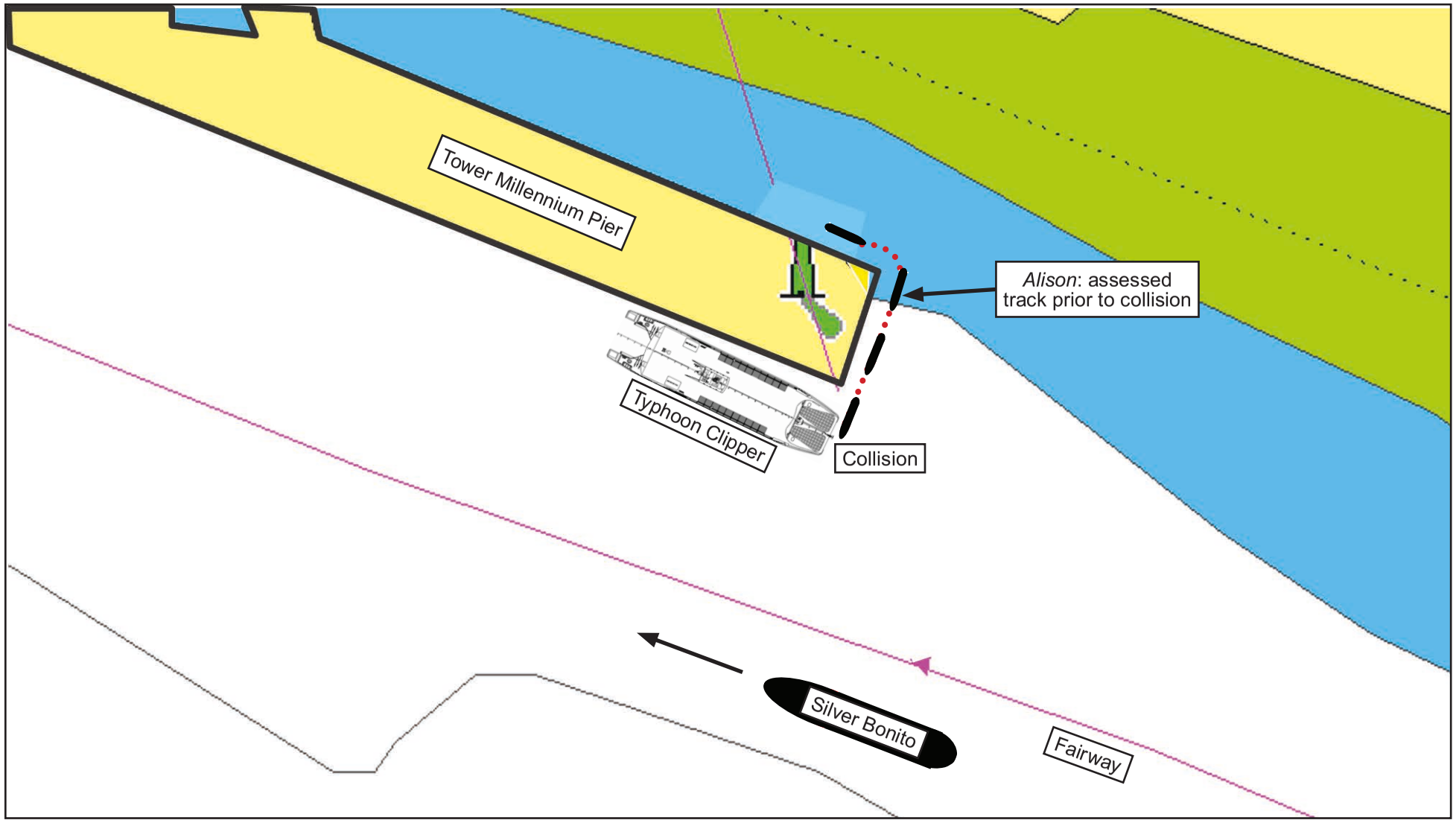

Figure 5: Chart showing the movement of *Typhoon Clipper*, *Silver Bonito* and *Alison*

Image courtesy of Thames Clippers

Figure 6: *Typhoon Clipper*'s bow CCTV camera image immediately prior to collision

Image courtesy of Thames Clippers

Figure 7: *Typhoon Clipper*'s DCSA throwing a lifebuoy to *Alison*'s crewmen

When the mate heard the DCSA's man overboard report, he went to the port side forward embarkation area, where he used a hand-held radio to inform the master of the situation. Meanwhile, the DCSA threw a second lifebuoy, then rigged the port side scrambling net and fetched the boat hook in preparation for rescuing *Alison*'s crew **(Figure 8)**.

Image courtesy of Thames Clippers

Figure 8: *Typhoon Clipper*'s port forward embarkation area just prior to the rescue with *Alison*'s crewmen in the water

Typhoon Clipper's master manoeuvred the vessel close to *Alison*'s crewmen, who were able to cling onto the scrambling net but were unable to climb out of the water unaided. With the assistance of a passenger and another member of Thames Clippers' staff[2], the mate and DCSA hauled *Alison*'s crewmen out of the water, one at a time. The second crewman from *Alison* was lifted out of the water 3 minutes and 30 seconds after the collision **(Figure 9)**.

Typhoon Clipper's master then berthed the vessel back at Tower Millennium Pier, by which time the RNLI, police and ambulance services were in attendance. *Alison*'s crewmen were treated for the symptoms of cold shock then taken to hospital; one of *Alison*'s crew was also covered in paint that had spilt during the accident. After medical checks in hospital, both of *Alison*'s crewmen were discharged later the same day.

[2] At the time of the accident, there was an off-duty DCSA on board *Typhoon Clipper* who assisted with the rescue of *Alison*'s crew from the water, but was not formally allocated crew duties.

Image courtesy of Thames Clippers

Figure 9: *Alison*'s second crewman being rescued out of the water by *Typhoon Clipper*'s mate, the DCSA, an off-duty DCSA and a passenger

Typhoon Clipper's master was breathalysed by the police after the accident, with a negative result. Due to their evident distress, the crew of *Alison* were not breathalysed, but police records noted that there were no signs that either of them had consumed alcohol.

1.3 ENVIRONMENTAL CONDITIONS

The collision occurred in the sheltered waters of the River Thames during daylight hours with good visibility. The wind was south-westerly and the tidal stream was negligible as the Thames Barrier was closed; the water temperature was 11ºC.

1.4 DAMAGE

The stem of *Typhoon Clipper*'s port hull was dented where it had struck *Alison* **(Figure 10)**. Port of London Marine Services Limited lifted *Alison* off the riverbed the day after the collision **(Figure 11)**. *Alison*'s wheelhouse superstructure was distorted and the glass from the forward-looking window was missing **(Figure 11 inset)**.

Image courtesy of Thames Clippers

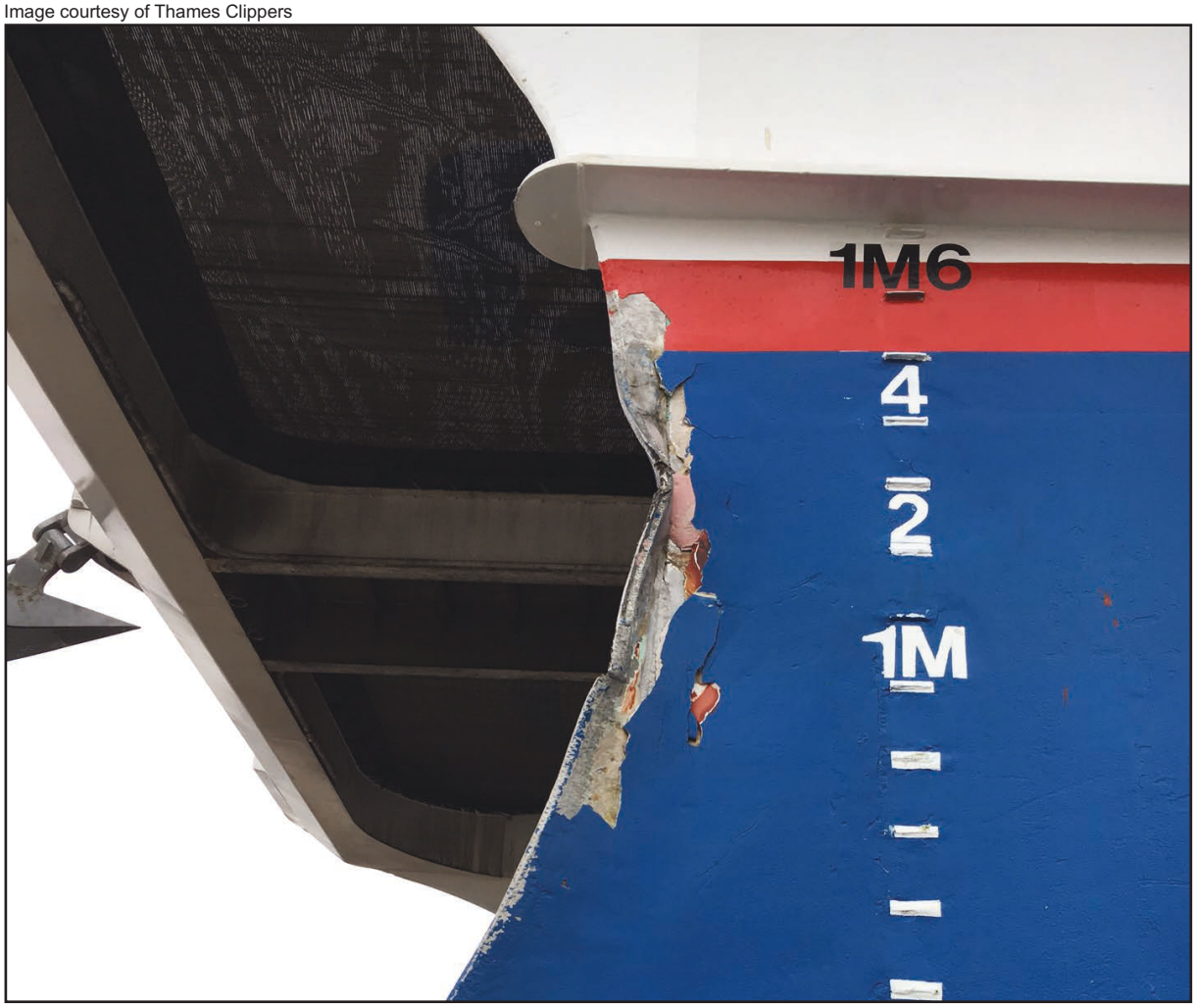

Figure 10: Damage to *Typhoon Clipper*'s port stem

Figure 11: Recovery of *Alison* off the riverbed with inset detail of its superstructure damage

1.5 *TYPHOON CLIPPER*

1.5.1 General

Typhoon Clipper was a River Runner 200 Mark II, low-wash, high-speed catamaran passenger ferry built in Australia by Brisbane Ship Construction Limited in 2007. The vessel was 38.4m length overall (LOA) and had a top speed of 27 knots. *Typhoon Clipper* was owned and operated by Collins River Enterprises Limited, trading as MBNA Thames Clippers Limited (Thames Clippers).

1.5.2 Applied regulations

Typhoon Clipper was designed and built to comply with the UK regulations for a Class V[3] passenger vessel. Once in service, the Maritime and Coastguard Agency (MCA) required Thames Clippers to recategorise the vessel (and its sister ships) to the International Maritime Organization's (IMO) Code of Safety for High-Speed Craft, 2000, as amended[4] (the HSC Code). Where design features of the vessel met the UK inshore regulations but did not meet the HSC Code, there was a requirement for the company to demonstrate an equivalent arrangement to the satisfaction of the MCA.

Typhoon Clipper was subject to both PLA and MCA regulations but was only inspected by the MCA. It was certified by the MCA as compliant with the HSC Code and the vessel's High-Speed Craft Safety Certificate **(Annex A)** listed the HSC Code requirements that were not met but where MCA exemptions or equivalent arrangements were in place. The MCA also issued a Permit to Operate High-Speed Craft Certificate to Thames Clippers for *Typhoon Clipper*. This defined *Typhoon Clipper* as an HSC Code Category A[5] passenger craft, permitting a maximum of 220 passengers and limiting its operations to the River Thames from Putney to Category D[6] waters.

1.5.3 Crew

Typhoon Clipper's crew met the MCA's minimum manning requirement and consisted of a master, mate, DCSA and barista.

The master was 25 years old and had been employed by Thames Clippers for 4 years, working his way from deckhand to master; he had been working as a master for just over a year prior to the accident. The master held an MCA Tier 1 Level 2 boatmaster's licence (BML) endorsed for high-speed craft and passenger operations. The master also held a Port of London Authority (PLA) local knowledge endorsement (LKE) for the Thames, and a Thames Clippers' MCA approved type-rating qualification for high-speed craft. This latter scheme required masters to demonstrate knowledge and understanding of the company's guidance specific to high-speed craft.

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[3] Class V passenger vessels are restricted to voyages in inshore waters.

[4] The HSC Code is applicable to vessels on international voyages. Its application to UK vessels on domestic voyages is contained in Statutory Instrument 2004 No 302, The Merchant Shipping (High Speed Craft) Regulations, 2004.

[5] Category A defined as a passenger vessel operating on a route where it had been demonstrated that there is a high probability that, in the event of evacuation, all passengers and crew could be rescued safely before persons in survival craft suffered exposure, or 4 hours; and carrying not more than 450 passengers.

[6] Tidal rivers and estuaries where the significant wave height could not be expected to exceed 2.0 metres at any time.

The mate was 42 years old and had been employed by Thames Clippers for 3.5 years, initially as a DCSA, then qualifying as a mate in August 2016. The DCSA was 22 years old and had been employed by Thames Clippers for 2 years; the barista had 2.5 years' experience on board Thames Clipper vessels.

1.5.4 Wheelhouse visibility

From a normal seated position in the wheelhouse, the master of *Typhoon Clipper* had sight of the sea surface 51.6m ahead of the vessel **(Figure 12)**. Given that this was less than two ship lengths it complied with the UK Merchant Shipping (Bridge Visibility) (Small Passenger Ship) Regulations, 2005, minimum ahead visibility requirements applicable when the vessel was designed and built.

Para 15.3.5 of the HSC Code required that sight of the sea surface *shall not be obscured by more than one craft length forward of the bow. Typhoon Clipper* did not comply with this requirement and the MCA had not granted an equivalent arrangement exemption from the HSC Code.

To improve visibility astern during berthing and unberthing, *Typhoon Clipper* had been fitted with rear-view mirrors either side of the wheelhouse **(Figure 13)**.

1.5.5 Closed-circuit television

Typhoon Clipper was fitted with a closed-circuit television (CCTV) system. There were seven external cameras providing a view of each of the four gangway positions, a bow camera looking ahead and a camera mounted outboard on either side also looking ahead **(Figure 14)**. The internal cameras viewed the wheelhouse, passenger cabin and both engine rooms; there was also an audio recorder in the wheelhouse. All the CCTV camera imagery and wheelhouse audio data was continuously recorded.

The primary purpose of the system was to improve the master's situational awareness and in particular to aid positioning of the vessel when berthing. As a secondary purpose, the external cameras could be used as an aid to keeping a lookout. This capability was most effective in daylight with good visibility and was degraded at night or in restricted visibility.

Imagery from the CCTV cameras was viewed on a display in the wheelhouse. Display features included split-screen viewing options where multiple camera outputs could be seen simultaneously. The system also had two pre-set, 4-way split screen options for use when the vessel was berthing either port or starboard side to; neither of these options showed the view from the bow camera. At the time of the accident, the port side to berthing option was selected. The camera outputs being displayed were **(Figure 15)**:

- Port side forward embarkation area
- Port side aft embarkation area
- Port and starboard outboard forward-looking.

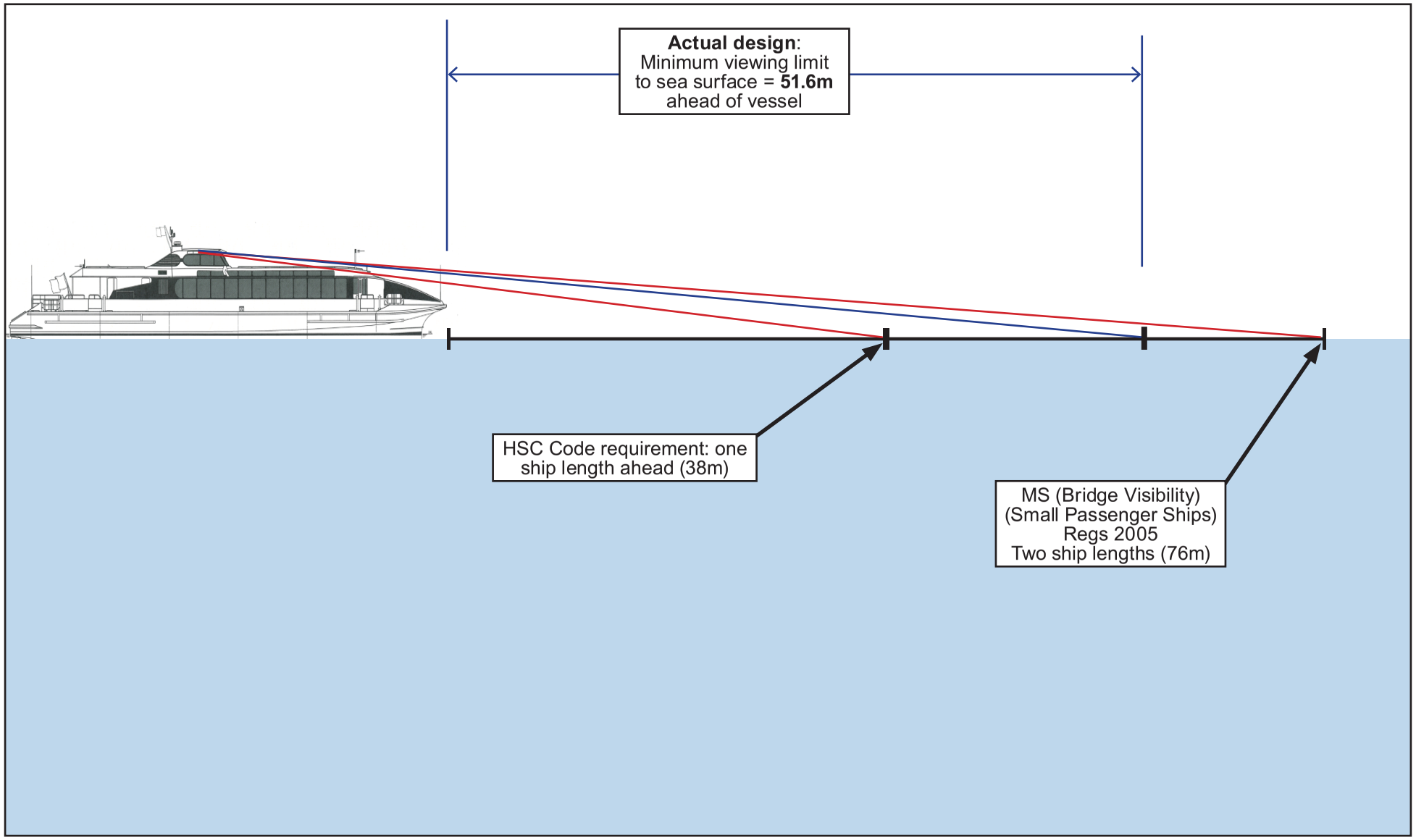

Figure 12: Diagram showing regulation and designed sight lines ahead of *Typhoon Clipper*

Figure 13: *Typhoon Clipper*'s rear-view mirrors

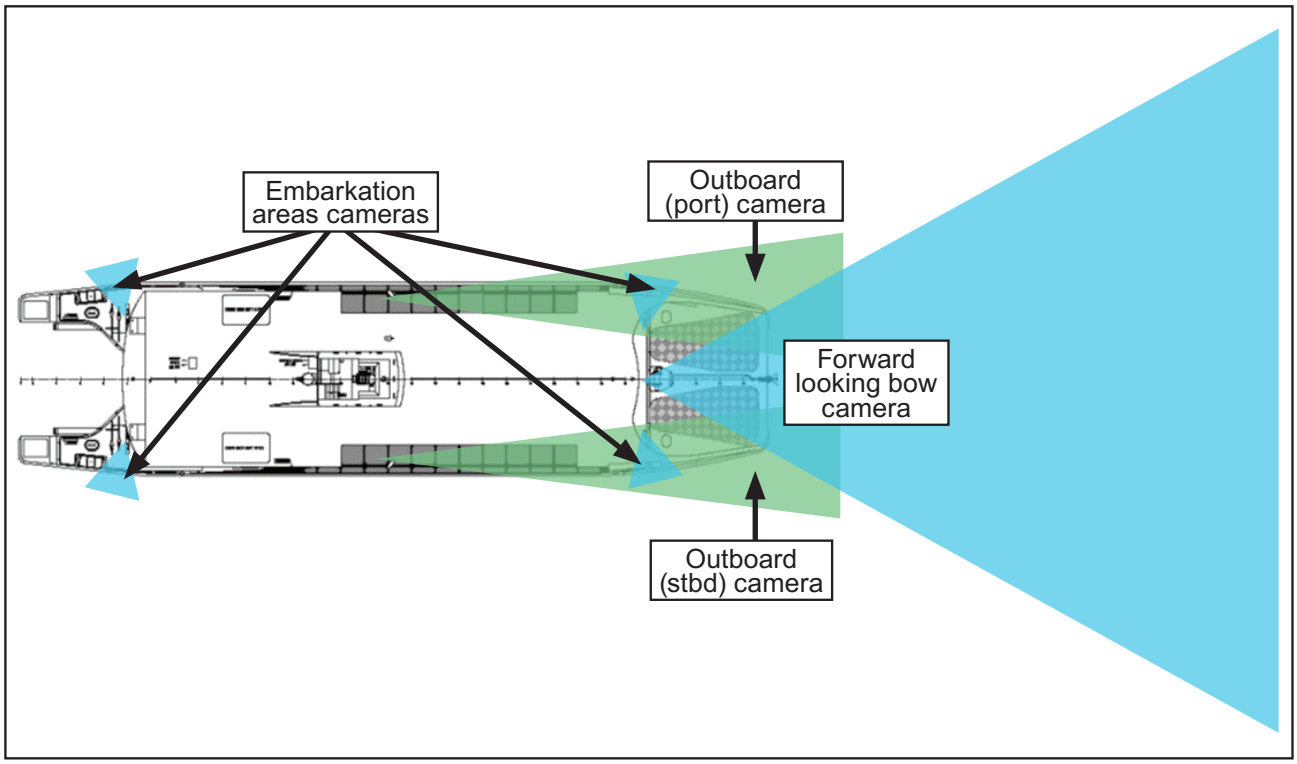

Figure 14: Diagram showing approximate arcs of coverage of *Typhoon Clipper*'s external CCTV cameras

Figure 15: *Typhoon Clipper*'s wheelhouse CCTV display (during the reconstruction) showing the display settings at the time of the accident

This display configuration was in accordance with Thames Clippers' direction to its masters, which followed a safety recommendation made by the PLA in 2009 after the collision between *Hurricane Clipper* and the cutter *George Williams.* The PLA's report into this accident recommended adoption of a 4-way split screen to improve visibility on the 'off' side when departing a pier (see Section 1.14.3).

1.5.6 Man overboard equipment

Typhoon Clipper's manoverboard equipment included: a boat hook on the starboard side forward, two lifebuoys with 30 metres (m) of buoyant line[7] and two scrambling nets, each located near the port and starboard forward embarkation areas.

1.6 THAMES CLIPPERS

1.6.1 The company

Thames Clippers was founded in 1999 and operated a fleet of high-speed craft providing commuter ferry services on the River Thames. In addition to scheduled services, the company's vessels were available for private charter and were also used to provide transport to events, particularly at the O2 Arena.

[7] The first lifebuoy thrown by the DCSA was not attached to the vessel; the second lifebuoy thrown was attached using a buoyant line (Section 1.2.3).

1.6.2 Safety management

Thames Clippers' safety management system (SMS) was certified by the MCA as compliant with the requirements of the International Management Code for the Safe Operation of Ships and for Pollution Prevention (the ISM Code). Instructions for vessel crews were contained in a Safety Management Manual and Route Operating Manual.

Key crew responsibilities were stated in the Route Operating Manual:

- The master had overall charge of the vessel including its safe operation, compliance with all instructions, regular crew training exercises and reporting defects or incidents.

- The mate was responsible for making fast and letting go mooring ropes, safe passenger embarkation and disembarkation as well as supervising the DCSA and the barista. When the vessel was underway, the mate was required to assist the master by providing a lookout, changing CCTV cameras, managing VHF communications and monitoring engine management systems.

- The DCSA's main roles were to check and report passenger numbers and assist the mate with mooring ropes. The barista managed the onboard catering and assisted with passenger safety.

When underway, the SMS required that the wheelhouse was manned by the master and the mate who were both required to keep a lookout. The mate was required to be stationed *remotely from radar and other distractions and briefed to report his sightings and sounds to the Master*.

1.6.3 Crew training and emergency procedures

Section 6 of the Safety Management Manual required Thames Clippers' crews to carry out regular safety training and exercises, including drills in procedures for fire, evacuation, man overboard, first-aid, machinery failure and pollution control. A log of drills and exercises was kept on board and each drill had a record sheet with feedback points for the company and other crews. The emergency procedure for a man overboard is at **Annex B**.

Typhoon Clipper's onboard Emergency Drills and Exercises History Log recorded 21 training exercises in the month prior to the collision, 5 of which were manoverboard drills.

1.6.4 Passage plans

Passage plans and wake/wash risk assessments were included in the Route Operating Manual. For eastbound commuter services, the passage planning guidance stated:

> *When abreast of the HMS Belfast and no inward bound traffic, cross the fairway[8] and berth alongside Tower Pier. Departing Tower Pier remain at a maximum of 12 knots until clear of Hermitage and Downing's Roads.*

[8] The 'fairway' in the River Thames was defined in the PLA Thames Byelaws as *a regular course or track of shipping, comprising all marked and/or charted navigable channels within the Thames*. The Thames fairway was marked on the Admiralty Chart by a black pecked line - see the inset of **Figure 1**.

The guidance also stated that vessels should *move directly off piers into the authorised channel*.

1.7 *ALISON*

1.7.1 General

Alison was a 7.25m workboat with an air draught of 1.7m; the year of build was unknown. It had a steel hull, protective cuddy-style wheelhouse aft and was propelled by a single engine/propeller controlled by a dual function morse controller[9]. When *Alison* was recovered off the riverbed, it was identified that the morse controller was in the full astern position **(Figure 16)**.

Alison was owned, managed and operated by CRC[10] from its office at Tower Millennium Pier. CRC operated a fleet of four Class V passenger vessels providing sightseeing trips and hospitality events on the River Thames. *Alison* was one of three workboats operated by CRC; these were used to ferry the company's crews to and from moored passenger vessels, and other general tasks such as collection and delivery of stores.

Alison's safety equipment included: a hand-held VHF radio, fire extinguisher, lifebuoy and first-aid kit; personal flotation devices (PFD) were also provided for the crew. *Alison* was fitted with a Vetus 12 volt single-trumpet horn that generated a 390 hertz signal at 112 decibels (dB) **(Figure 16)**.

1.7.2 Crew

There were two crewmen on board *Alison*; one was 33 years old and the other 34, and both had been working on the river since their teenage years. Both of *Alison*'s crewmen were employed to work on CRC's passenger vessels and workboats and held MCA Tier 1 Level 2 BMLs with PLA Thames LKEs.

Neither of *Alison*'s crewmen was designated as the skipper and they operated the boat together, taking turns to helm or crew. At the time of the accident, neither crewman was wearing a PFD.

1.7.3 Safety management

CRC maintained an SMS for use on its Class V passenger vessels that had been certified by the MCA as compliant with the Merchant Shipping (Domestic Passenger Ships) (Safety Management Code) Regulations, 2001, as amended (DSM Code).

Although not applicable to the operation of the company's workboats, CRC's SMS contained a health and safety policy statement that committed the company to providing adequate controls over risks to safety arising from work activities. It also required company employees to take reasonable care of their own health and safety.

CRC's procedures did not include risk assessments for workboat operations or checklists for use by workboat crews.

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[9] The morse controller operated both the gearbox and throttle in a single movement, ahead or astern.

[10] Crown River Cruises Limited also traded under the company names Circular Cruise Westminster and Westminster Party Boats. Given that Crown River Cruises Limited was shown as the vessel owner on *Alison*'s certification, this name is used throughout this report when referring to *Alison*'s ownership or management.

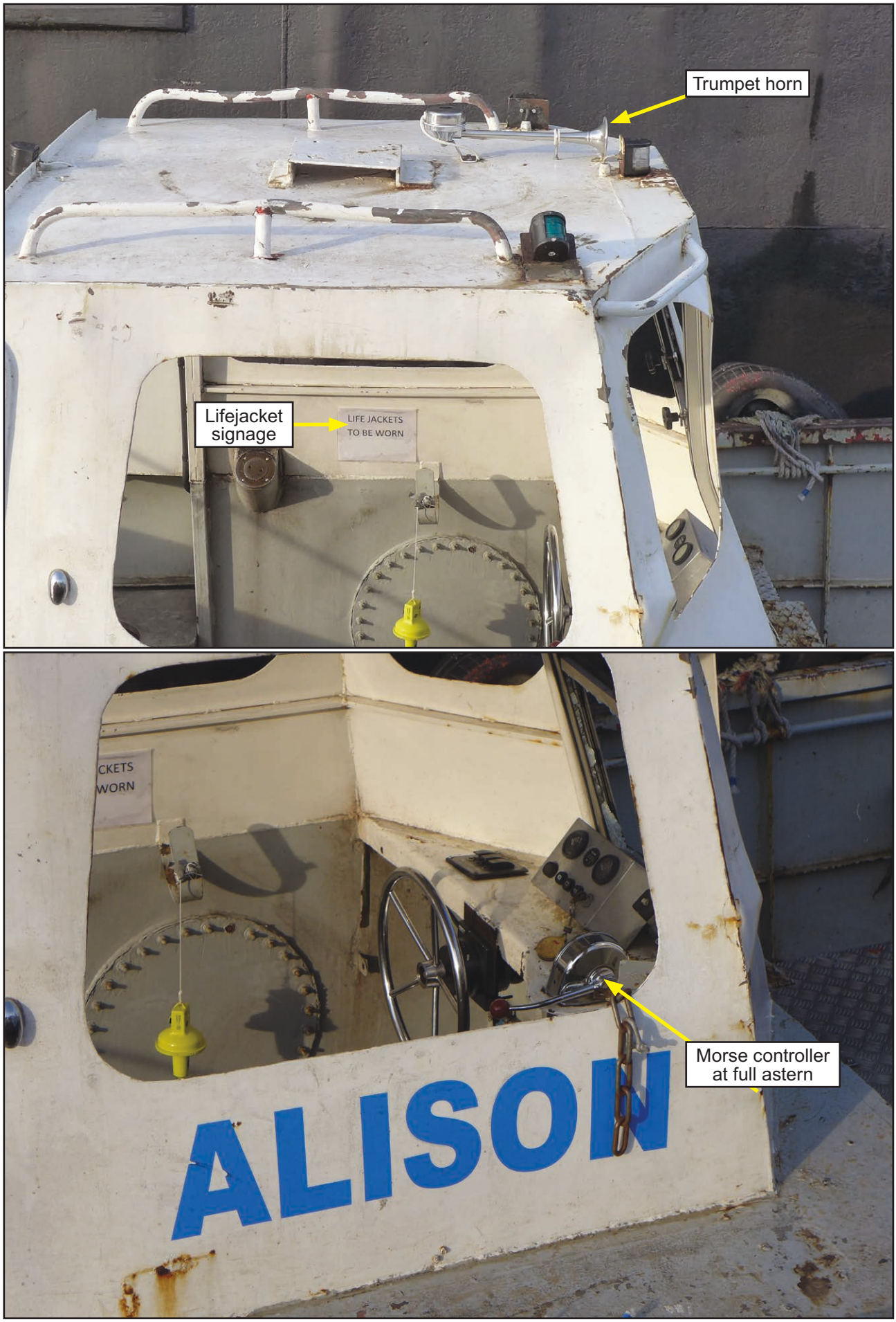

Figure 16: *Alison* - detail of trumpet horn, morse controller position and lifejacket signage

1.7.4 Certification

As a commercial workboat operating solely on the River Thames, *Alison* was required to comply with the PLA's Thames Freight Standard[11]. *Alison* was inspected by the PLA on 13 September 2016; the survey report raised five deficiencies and stated that remedial work was required to be completed before the vessel was put back in service on the Thames. These deficiencies included a requirement to post signage mandating the wearing of lifejackets. Such a sign had been provided **(Figure 16)** and, on 26 September 2016, CRC wrote to the PLA stating that all the deficiencies identified in the PLA survey report had been addressed.

1.7.5 Industry best practice

The MCA Workboat Code[12] offers guidance on industry best practice for the safe operation of workboats[13]. Chapter 30 of the Workboat Code recommended the implementation of an SMS commensurate with the size and complexity of the vessel. Appendix 7 of the Workboat Code offered guidance on the structure of an SMS for a workboat, and stated:

> *The company should draw up simple procedures to ensure that safe working practices are carried out in the operation of the vessel. These may be in the form of checklists which can be followed by all personnel.*

1.8 TOWER MILLENNIUM PIER

Tower Millennium Pier **(Figure 17)** was situated on the north bank of the River Thames close to the Tower of London; it was owned and operated by London River Services Limited (LRS).

On its south side, the pier had four berths for use by passenger vessels; the berth at the eastern extremity was reserved for use by Thames Clippers. On its north side, the pier had berths suitable for use by smaller vessels including workboats and rigid-hulled inflatable boats. Prior to the accident, *Typhoon Clipper* had berthed at the Thames Clippers' berth on the south side and *Alison* had berthed on the north side; both vessels were pointing downriver **(Figure 2)**.

LRS staff were on duty at the pier during the working day but were not responsible for vessel movements. Thames Clippers maintained a member of staff on the pier at all times when its ferry services were running, primarily for the safety of its passengers.

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[11] PLA Technical Standards for Commercial Vessels on the Tidal Thames, First Edition, June 2013, as amended (see Section 1.9.4).

[12] National Workboat Association/Maritime and Coastguard Agency's Industry Working Group Technical Standard for the Safety of Small Workboats and Pilot Boats, June 2014, as amended.

[13] *Alison* was not required to comply with the Workboat Code of Practice as, in accordance with PLA Regulations, the Thames Freight Standard and Commercial Vessel Code of Practice applied.

Figure 17: Tower Millenium Pier

1.9 THE PORT OF LONDON AUTHORITY

1.9.1 Background

The PLA was established in 1909 by the Port of London Act and was the statutory harbour authority for the 95-mile tidal stretch of the River Thames from its outer estuary to Teddington Lock. The River Thames was the UK's busiest inland waterway handling over 5 million tonnes of commercial goods each year. There were over 40 operators of passenger vessels providing transport or tourist services for nearly 10 million people annually. In 2016, there were 132 PLA registered workboats being operated by 83 different companies.

1.9.2 Vessel traffic capacity study

In 2015, Marico Marine Consultants conducted a study of vessel traffic levels and potential future capacity on the River Thames. The study was jointly commissioned by the PLA and Transport for London (TfL). The study defined vessel capacity in two categories: level of service and level of safety. The level of service described the system's ability to sustain free-flowing traffic on the river; the level of safety was a measure of navigational risk, specifically collision.

One of the key deductions from the study was that the area of greatest navigational risk was adjacent to Tower Millennium Pier where vessels berthing and unberthing encountered other vessels transiting the river **(Figure 18)**. The study also demonstrated that the presence of HMS *Belfast* constricted traffic flow in the Upper Pool increasing the risk of collision.

Tower Millennium Pier was identified as one of the busiest piers on the river in terms of passenger numbers and passenger vessel movements.

1.9.3 Thames Byelaws and General Directions

The PLA's Thames Byelaws and General Directions placed specific requirements on owners, masters and watchkeepers operating on the Thames. These requirements were in addition to any national or international requirements and were intended to maintain and enhance safety of navigation. They were contained in the PLA's Thames Byelaws, 2012, and its General Directions for Navigation, 2016, and included:

- That *a vessel must not cross or enter a fairway so as to obstruct another vessel proceeding along the fairway*. Thames Byelaw 24(a).

- That a *power-driven vessel about to enter a fairway from a creek, dock, basin, lock, wharf, jetty, tier or anchorage must sound one prolonged blast*. Thames Byelaw 43.

- That *all commercial vessels normally operating only on the Thames must prepare and maintain a generic Port Passage Plan, appropriate for use during the vessel's routine passage and operations in the Thames*. PLA General Direction for Navigation 8(3).

- That *all vessels navigating above the Thames Barrier, including …vessels subject to the requirements of the High-Speed Craft Code, which, by virtue of their construction or trim, have limited visibility from the wheelhouse, must have a lookout stationed in an appropriate position, maintaining an effective lookout, so as to cover the area of limited visibility; or have made suitable technical arrangements so that an effective lookout can be maintained in the area of limited visibility*. PLA General Direction for Navigation 28.

1.9.4 Thames Freight Standard

The PLA's Thames Freight Standard, 2013, set out requirements for commercial vessel construction, machinery, navigation, life-saving appliances, fire prevention, fire-fighting and protection of crew. It applied to all non-passenger commercial vessels navigating, working or mooring on the river.

Section 22 of this standard provided direction on the safety of personnel, including the requirement for a risk assessment in accordance with Health and Safety at Work Regulations[14]. It stated that *a health and safety risk assessment shall be used to satisfy the obligation of providing information to crew members of the measures taken for their own protection*.

[14] Regulation 7 of the Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations, 1997, as amended.

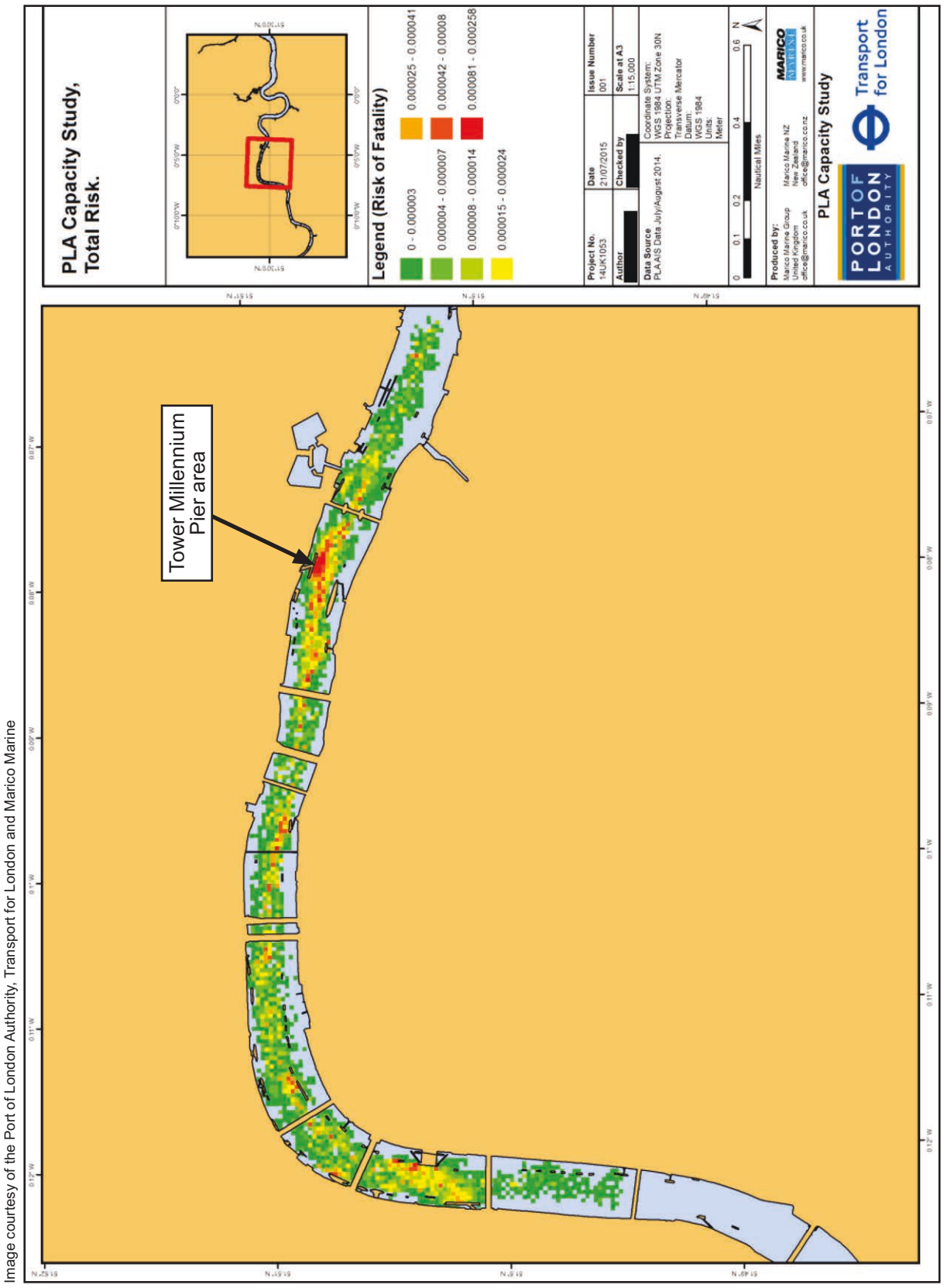

Figure 18: Figure from the Marico Marine study showing in red the area of greatest risk in the Upper Pool

1.9.5 Commercial Vessel Code of Practice

The PLA's Commercial Vessel Code of Practice[15] applied to all commercial vessels on the tidal Thames and provided guidance on the management of safety. Paragraph 1.1.1 stated that *vessels subject to this Code of Practice shall maintain an operational Safety Management System (SMS).*

[15] Code of Practice for the Management and Operation of Commercial Vessels on the Thames, 2013, as amended.

Paragraph 1.3 set out the requirements for the safety management of Type 1 vessels, which included workboats. This stated that *whilst strongly recommended, there is no formal requirement for owners of Type I vessels to establish and maintain a structured, operational SMS. However, if they do, they should utilise and develop an SMS, which reflects their specific vessel operations*. Owners were required to establish onboard procedures, including checklists, for the safety of their vessels.

Where an SMS was provided for workboats, the guidance stated that it should include health and safety requirements for the crew and guidance on navigation and passage planning. Owners were also required to ensure that crews had *an adequate understanding of relevant rules, regulations, codes and guidelines, and apply them as required*.

1.9.6 Passenger Vessel Code of Practice

Guidance for operators and masters of passenger vessels was provided by the PLA in its Passenger Vessel Code of Practice[16]. This Code covered local regulations, vessel types, passage planning, safety on the river and emergency management. It stated that the International Regulations for Preventing Collisions at Sea (COLREGs) *are the primary, and most important regulations and the master of any vessel must have a thorough knowledge and instinctive understanding of them*.

This Code included guidance for use of workboats in support of passenger vessel operations. This stated that *workboat crew should always wear a lifejacket. This is compulsory when bulwarks are less than 1m[17] from the deck. The workboat must be maintained in accordance with the Thames Freight Standard or IWSPBC[18], whichever is appropriate*.

The Code also required all commercial vessels to conduct operations in accordance with a passage plan that *should take into account all obstructions on the route*. The passage planning section of the Code included a diagram **(Figure 19)** showing waiting and no-waiting areas for passenger vessels operating near Tower Millennium Pier.

1.10 MARITIME AND COASTGUARD AGENCY BOATMASTERS' LICENCE

1.10.1 Competency

The competency requirements for MCA BML holders were set out in the Merchant Shipping (Boatmasters' Qualifications, Crew and Hours of Work) Regulations, 2015. Guidance on the structure and requirements of the BML system and the syllabi for training and examination was provided by the MCA in its Merchant Shipping Notice (MSN) 1853(M)[19].

Generic bridge watchkeeping and navigation competencies included the ability to *recognise the speed at which dangerous situations may develop and demonstrate a knowledge of the content and application of the International and National Regulations for Preventing Collisions at Sea*.

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[16] Passenger Vessel Operations – A Code of Practice for the Tidal Thames, 2016 edition.

[17] *Alison*'s bulwark height was less than 1m.

[18] Inland Waterways Small Passenger Boat Code.

[19] MSN 1853(M) - The Merchant Shipping (Boatmasters' Qualifications, Crew and Hours of Work) Regulations 2015, Structure and Requirements.

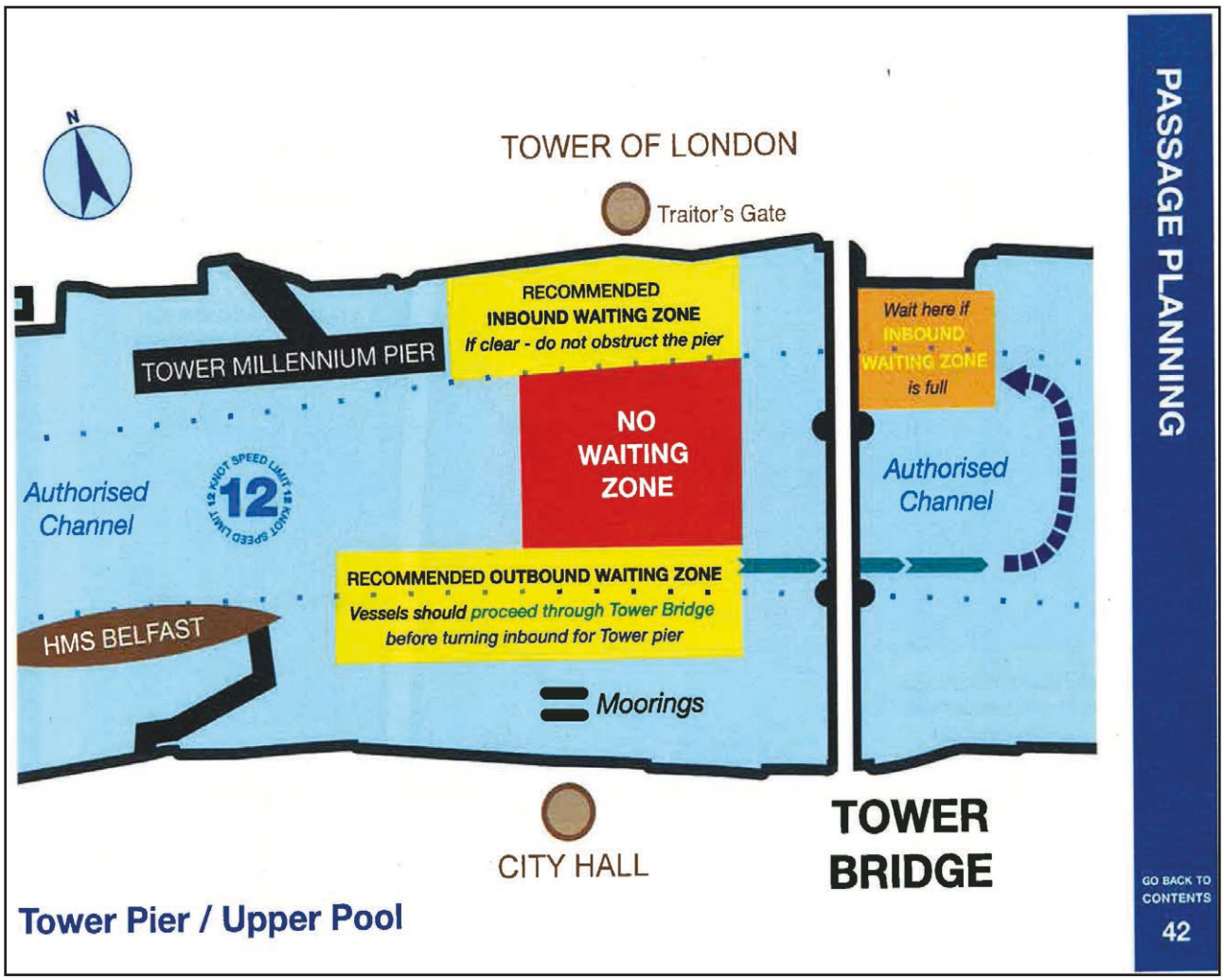

Figure 19: PLA Passenger Vessel Code of Practice - passage planning in the Upper Pool

1.10.2 Local knowledge endorsements

In geographical areas with specific hazards to navigation requiring skills beyond the generic syllabus, BML holders were required to complete a local knowledge endorsement examination; this included the Port of London.

Annex 12 to MSN 1853(M) promulgated the syllabus for local knowledge endorsements, which required candidates to demonstrate an understanding of local traffic patterns, including density and types of vessel to be encountered.

Further detail on the competency requirement for local knowledge endorsements specific to the Port of London was contained in Annex 14 to MSN 1853(M). This included a requirement for candidates to have a working knowledge of PLA Byelaws and an *awareness of traffic pinch points, types and timing of traffic expected in the area*.

1.11 COLD WATER IMMERSION

Sudden immersion in cold water has an immediate effect on the human body through a shock response and cold incapacitation[20]. The cold shock response, caused by immediate lowering of the skin temperature, leads to a rapid rise in heart

[20] Golden, F and Tipton, M (2002), Essentials of Sea Survival. Human Kinetics: Leeds, UK.

rate and a gasp reflex followed by uncontrollable rapid breathing. The onset of the cold shock response peaks within 30 seconds of immersion and lasts for 2 to 3 minutes. If the head is submerged during this time, it can lead to water entering the lungs and potential for death through drowning.

Cold incapacitation usually occurs within 2 to 15 minutes of entering cold water. The blood vessels are constricted as the body tries to preserve heat and protect vital organs. This results in restricted blood flow to the body's extremities, leading to loss of muscle and nerve functions. Useful movement of arms and legs is lost and, unless a lifejacket or PFD is worn, death by drowning can occur due to impaired swimming.

1.12 INTERNATIONAL REGULATIONS FOR PREVENTING COLLISIONS AT SEA

Rule 5 of the COLREGs required every vessel at all times to maintain a proper and effective lookout by sight, hearing and all means available in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision. Furthermore, Rule 7 required every vessel to use all available means appropriate to the prevailing circumstances and conditions to determine if a risk of collision exists.

1.13 ACCIDENT RECONSTRUCTION

On 13 January 2017, with the assistance of Thames Clippers, CRC, LRS and the PLA, the MAIB carried out a reconstruction of the circumstances of the accident using *Typhoon Clipper* and the workboat *Joanna B*. The aims of the reconstruction were to:

- identify if *Alison*'s horn could have been heard by *Typhoon Clipper* master and/or recorded on the wheelhouse audio recorder, and;

- to enable MAIB staff to determine where and when *Alison* could have been seen from *Typhoon Clipper*'s wheelhouse.

Alison was fitted with a single trumpet horn delivering an acoustic power output of 112dB. The specification of the horn on board *Joanna B* could not be identified, but a hand-held horn with an output of 120dB was carried on board *Joanna B* by a member of MAIB staff.

Prior to the reconstruction, it was established that no horn signal was audible on the recording of *Typhoon Clipper'*s wheelhouse audio for the period between *Alison*'s departure from the pier and the collision.

During the reconstruction, *Typhoon Clipper* was positioned adjacent to Tower Millennium Pier and *Joanna B* followed a similar track to *Alison*'s prior to the accident **(Figure 20)**. Both *Joanna B*'s fixed horn and the hand-held device were sounded as the workboat departed the pier and again when ahead of *Typhoon Clipper.*

At each stage of the trial, both *Joanna B*'s fixed horn and the hand-held horn were clearly audible in *Typhoon Clipper*'s wheelhouse and, following the reconstruction, could also be heard on the playback of the recording of *Typhoon Clipper'*s wheelhouse audio.

The accident reconstruction demonstrated that, had *Alison*'s horn been sounded at any point between departure from the pier and the collision, it would have been audible on the recording of *Typhoon Clipper*'s wheelhouse audio.

Figure 20: Accident reconstruction - *Typhoon Clipper* bow camera view showing the workboat *Joanna B*

1.14 PREVIOUS OR SIMILAR ACCIDENTS

1.14.1 Collision between *Bowbelle* and *Marchioness*: MAIB Report dated 5 June 1990

On 20 August 1989, the dredger *Bowbelle* and the passenger vessel *Marchioness* collided close to Cannon Street Railway Bridge, River Thames; 51 of the passengers on board *Marchioness* did not survive. The main cause of the collision was that neither vessel was keeping an effective lookout, so neither was aware of the other vessel in time to take avoiding action. The first of the 27 recommendations made in the MAIB report was that, *in all vessels of over 40m in length with a wheelhouse aft navigating in the River Thames above the Thames Barrier, a lookout should be stationed forward at all times*.

1.14.2 Collision between *Brenda Prior* and *Beatrice*: MAIB Report 16/2005

On 17 December 2004, the aggregate carrier *Brenda Prior* and the London Duck Tours amphibious vessel *Beatrice* collided adjacent to Lambeth Bridge, River Thames. Although the lookout, stationed in *Brenda Prior*'s wheelhouse, had reported sighting *Beatrice* prior to the collision, the master had not seen it and took no action to avoid collision.

The MAIB report concluded that *Brenda Prior*'s crew were not keeping an effective lookout. Prior to the accident, the PLA General Direction regarding lookout only applied to vessels over 40m, thus a safety recommendation was made to the PLA to extend this requirement to all vessels with limited visibility.

1.14.3 Collision between *Hurricane Clipper* and *George Williams*

On 20 September 2009, the high-speed passenger ferry *Hurricane Clipper* collided with the traditional Thames cutter *George Williams*. *Hurricane Clipper* had just unberthed from Waterloo Pier when the stem of its port bow struck *George Williams*, breaking the cutter in two. All seven of the cutter's crew went overboard into the river but were rescued by the emergency services. The PLA report into the accident concluded that the accident occurred *because the Master of the HURRICANE CLIPPER did not see the GEORGE WILLIAMS in time to prevent the collision. The combination of the wheelhouse location and the proximity of the cutter to the Clipper made a visual sighting physically impossible.* The report also stated that *Hurricane Clipper* had not made a sound signal in accordance with PLA regulations.

The actions table in the PLA report included the following recommendations:

- *Thames Clippers to change CCTV 4-way split screen display so that port and starboard side are each shown on 2 of the 4-way split screens*
- *Thames Clippers include procedure to ensure that 'off' side is visually checked clear before departing berth*
- *That more small craft be encouraged take steps to make their craft more visible to other users and give a wider berth to larger vessels*.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 FATIGUE OR ALCOHOL

There is no evidence that the master of *Typhoon Clipper* or either crewman on board *Alison* was suffering from the effects of fatigue or alcohol and, therefore, they are not considered to have been contributing factors to this accident.

2.3 THE COLLISION

Both vessels had an obligation under the COLREGs to assess the risk of collision by keeping a good lookout and evaluating the shipping situation.

Alison's crew did not effectively assess the shipping situation after departing from Tower Millennium Pier and before starting their passage upriver. Although aware of *Typhoon Clipper*'s presence, they had not noticed that it had unberthed and was, therefore, likely to accelerate ahead. Thus, the risk of collision with *Typhoon Clipper* went unnoticed by *Alison*'s crew until it was too late to take effective avoiding action.

On board *Typhoon Clipper*, neither the master nor the mate saw *Alison* prior to the collision. Initially the pier obstructed their view, and when *Alison* cleared the end of the pier it moved into *Typhoon Clipper*'s blind sector ahead. *Typhoon Clipper*'s forward-looking CCTV camera did capture *Alison*'s movements, but this image was not being displayed in the wheelhouse. Neither vessel made a sound signal to alert others to their intentions.

2.4 *ALISON* – LOOKOUT AND RISK OF COLLISION

2.4.1 Crew competence

Both *Alison*'s crewmen had a great deal of experience working on the river, including on board passenger vessels, where they had developed an innate understanding of blind spots and the associated risk of small vessels not being seen. Both were also qualified as MCA boatmasters with Thames LKEs. Therefore, their decision to take the risk of passing ahead of *Typhoon Clipper* was not a result of insufficient experience or training.

2.4.2 Risk of collision

Having loaded paint, *Alison*'s crew unberthed the vessel and proceeded close around the end of the pier, heading for the fairway.

One of *Alison*'s crewmen was on the helm and the other was working on the forward deck **(Figure 6)**; in this situation, they could easily communicate with one another so were, in effect, both keeping a lookout. Their heads were above the level of the pier **(Figure 21)** and, while their view was slightly obstructed by the pier's railings, they had both seen *Typhoon Clipper*. However, neither had noticed that *Typhoon Clipper*

Figure 21: View of the pier from *Typhoon Clipper*'s wheelhouse (during reconstruction) and inset analysis of height of *Alison* when close by the pier

had unberthed and was likely to accelerate at any moment. They had assumed that *Typhoon Clipper* was still alongside and that it would be safe for them to pass close ahead into the fairway.

As *Alison* continued past the end of the pier, the helmsman was focused on watching *Silver Bonito* pass ahead so that he could time his turn to starboard and head upriver. This distraction, coupled with the assumption that *Typhoon Clipper* was still berthed, led to the risk of collision not being identified on board *Alison*. Therefore, when *Alison*'s helmsman was alerted to the risk, by the roar of *Typhoon Clipper*'s engines, it was too late to take effective avoiding action.

2.4.3 Normalisation of risk

The environment on the River Thames is one where vessels are persistently operating close to each other, particularly smaller craft such as workboats. Thus it becomes routine or normalised for vessels to be frequently managing close quarters situations where risk of collision exists.

To *Alison*'s crew it seemed perfectly normal to be operating very close to two larger vessels, and there was no sense that more time should be taken to assess the situation. This unsafe operating condition was underpinned by an assumption that *Typhoon Clipper* would be able to see *Alison* and would keep clear.

Had *Alison*'s crew stopped to assess the situation before entering the fairway, it would have been clear that trying to pass close ahead of *Typhoon Clipper* was unsafe. There was a hand-held VHF radio on board that could have been used to inform the other vessels of the workboat's plan. It would also have been possible for *Alison* to have stopped before proceeding into the river and, having gained the attention of *Typhoon Clipper*'s master, made a visual signal giving warning of the plan to pass ahead.

2.5 *TYPHOON CLIPPER* – LOOKOUT AND RISK OF COLLISION

2.5.1 Situation

The location of the accident, where vessels berthing and unberthing at Tower Millennium Pier encountered passing traffic, had been identified in the PLA/ TfL study (Section 1.9.2) as the area of greatest navigational risk on the Thames **(Figure 18)**. Given this environment, the ability to see all vessels in close proximity is fundamental for collision avoidance; an issue highlighted by previous accidents where the absence of an effective lookout has been repeatedly identified as the main cause.

Having completed passenger embarkation, *Typhoon Clipper*'s master unberthed the vessel from Tower Millennium Pier. Seeing *Silver Bonito* proceeding upriver, he decided to hold position close to the pier until the intended route was clear. This decision complied with the PLA byelaw requiring vessels entering the fairway to keep clear of others proceeding along the fairway.

2.5.2 Line of sight detection

When *Typhoon Clipper* was waiting for *Silver Bonito* to pass, both the master and mate were in the wheelhouse. As *Alison* unberthed and proceeded around the pier, it would only have been possible for them to have seen the top of its wheelhouse, as the pier itself was obstructing their view **(Figure 21)**. However, the master and mate were focused on their intended route, looking ahead and to starboard. Therefore, they were extremely unlikely to catch sight of *Alison* as it passed around the end of the pier.

When *Typhoon Clipper* started accelerating, *Alison* is assessed to have been no more than 15m ahead. With an air draught of 1.7m, no part of *Alison* would have been visible when it was any closer than 21m ahead of *Typhoon Clipper*. To have had a realistic prospect of being seen from *Typhoon Clipper*'s wheelhouse, *Alison* would have needed to be about 50m ahead **(Figure 22)**. Therefore, once *Alison* had passed the end of the pier, it entered *Typhoon Clipper*'s visual blind sector ahead and all possibility of a line of sight detection from *Typhoon Clipper*'s wheelhouse was lost.

2.5.3 Use of CCTV system

The primary purpose of *Typhoon Clipper*'s CCTV system was to provide the master with situational awareness of the vessel, specifically to aid ship handling when berthing. When the system was installed, it was not intended as a means of lookout and its value as such was limited at night or in poor visibility.

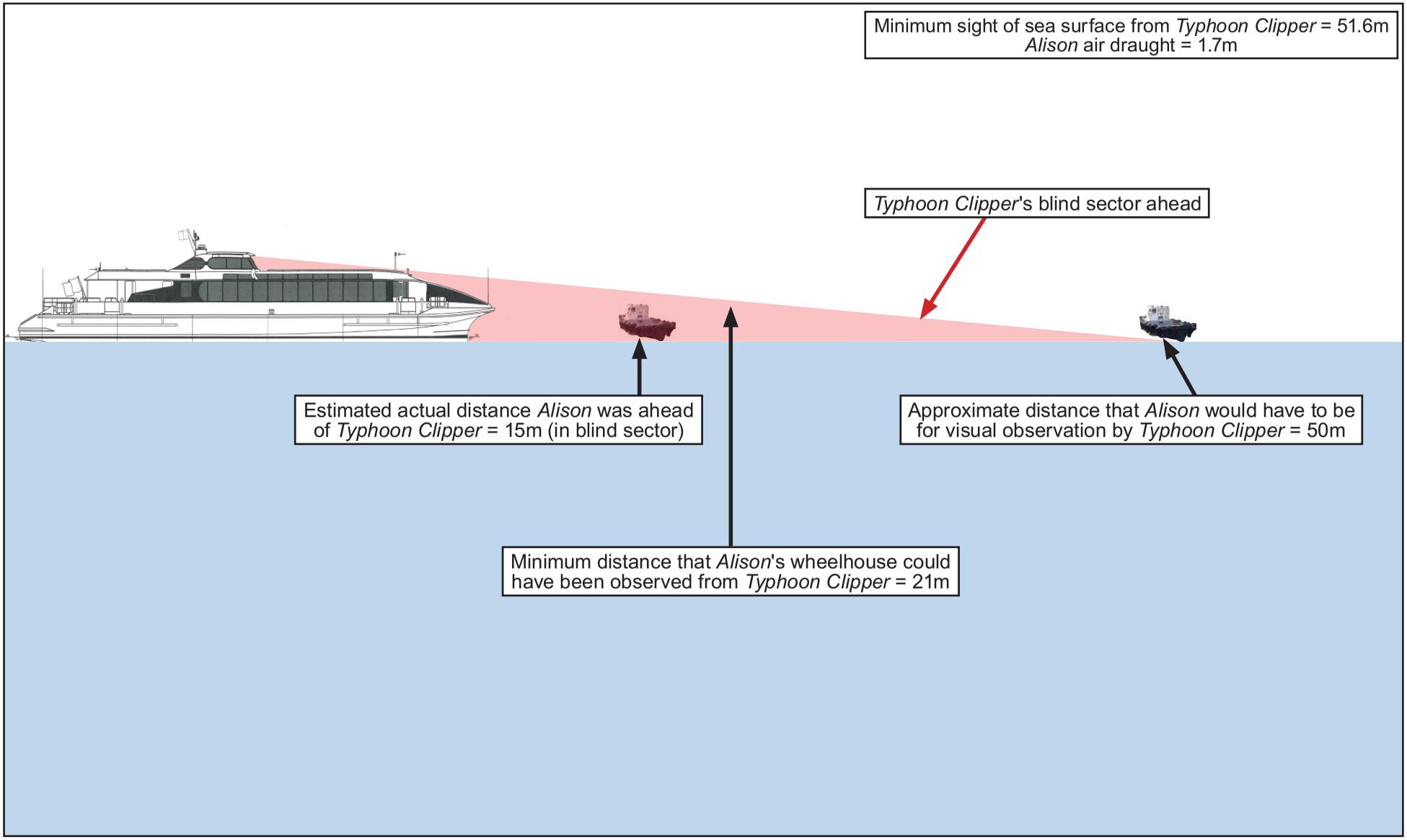

Figure 22: Analysis diagram showing *Typhoon Clipper*'s blind sector and *Alison*'s assessed relative position

Use of the CCTV system as an aid to keeping lookout became company policy as a result of the PLA's recommendation, following the *George Williams* accident in 2009, that the *port and starboard side are each shown on 2 of the 4-way split screens* (Section 1.14.3).

As *Alison* passed the end of the pier, it was fleetingly visible on the port side outboard CCTV camera **(Figure 23)**, and this was displayed on one of the split-screen quadrants in *Typhoon Clipper*'s wheelhouse. However, to have seen this, either the master or mate would have had to be focused on the CCTV display at the exact moment when *Alison* passed through the camera's coverage. This would not have been appropriate action given the priority for keeping a visual lookout.

Post-accident analysis of CCTV recordings showed that the bow camera captured *Alison* directly ahead of *Typhoon Clipper* **(Figure 6)**. However, the image from this camera, which provided good coverage of the forward blind spot, was not included in the split screen configuration adopted following the PLA's recommendation.

The COLREGs require use of *all available means* to maintain a good lookout and this, along with the PLA's General Direction 28 reference to *suitable technical arrangements*, could be considered to include the CCTV system. However, the CCTV system had not been designed as an aid to keeping lookout.

Image courtesy of Thames Clippers

Figure 23: *Typhoon Clipper* CCTV port side outboard forward-looking camera's brief detection of *Alison* immediately prior to collision

2.6 *TYPHOON CLIPPER* WHEELHOUSE VISIBILITY

In congested waters, maintaining a good lookout by all means available is critical to navigational safety.

Typhoon Clipper was constructed to meet the requirements of UK Class V inshore passenger vessel regulations. Post-build (and as required by the MCA), Thames Clippers recoded its River Runner 200 vessels to comply with the HSC Code. This Code had different and more stringent wheelhouse visibility requirements, which the vessels did not meet **(Figure 12)**. This particular area of non-compliance with the HSC Code was not identified at the time of the recoding. Had it been so, Thames Clippers would have been required to apply to the MCA for an exemption from the HSC Code's visibility requirements. Such an application would have needed to demonstrate to the MCA that satisfactory equivalent wheelhouse visibility arrangements were in place.

The PLA's General Direction 28 (Section 1.9.3) required vessels operating on the Thames with *limited visibility,* including high-speed craft, to have a lookout posted forward or *suitable technical arrangements* to cover the area of limited visibility. This General Direction was ambiguous as it did not define what *limited visibility* or *suitable technical arrangements* meant. Additionally, the PLA did not inspect *Typhoon Clipper* and accepted the vessel's MCA's certification under the HSC Code. However, the bridge visibility did not comply with the HSC Code and the PLA did not require any additional improvements or technical capabilities.

2.7 USE OF SOUND SIGNALS

The reconstruction (Section 1.13) demonstrated that, in similar circumstances to the accident, a workboat horn was audible in *Typhoon Clipper*'s wheelhouse and, in post-accident analysis, could also be heard on the wheelhouse audio recorder. No such sound was evident on *Typhoon Clipper*'s audio recordings from the accident, therefore neither *Alison* nor *Typhoon Clipper* made a sound signal in the moments before the collision.

Had *Typhoon Clipper* sounded a long blast after unberthing and before making way, it is possible that this would have alerted the crew of *Alison* to the fact that it was about to accelerate. Equally, had *Alison*'s crew sounded a long blast on passing the end of the pier, it is also possible that this would have gained the attention of *Typhoon Clipper*'s master or mate, leading them to investigate the situation.

Thames Byelaw 43 *Vessels Entering the Fairway* (Section 1.9.3) stated that vessels should sound one prolonged blast when *about to enter a fairway from a creek, dock, basin, lock, wharf, jetty, tier or anchorage.* This byelaw was aimed at all vessels entering the fairway. However, it was not enforced and the exclusion of the word 'pier' had led to ambiguity and inconsistent use of sound signals by vessels departing Tower Millennium Pier.

The use of sound signals as described in the Thames Byelaw 43 was a factor in safe navigation on the river. Given the increasing traffic density on the river and concerns regarding noise pollution, a review of this byelaw may be useful to ensure that it is still fit for purpose. However, as the only currently defined means available to masters to indicate their intention to join a fairway, the application of Byelaw 43 should be applied consistently and enforced to be of value.

2.8 SAFETY MANAGEMENT OF *ALISON*

2.8.1 Risk assessment and safety procedures

Irrespective of a vessel's size or purpose, management of safety depends on understanding hazards and mitigating the associated risks. CRC did not have a risk assessment or procedures within its SMS for the safe operation of its workboats.

CRC was not specifically required to have an SMS covering its workboat operations. However, the Commercial Vessel Code of Practice required that crews had *an adequate understanding of relevant rules, regulations codes and guidelines, and apply them as required*, and strongly recommended owners to *develop an SMS, which reflects their specific vessel operations*. Additionally, the Thames Freight Standard required a health and safety risk assessment for the protection of personnel on non-passenger commercial vessels navigating, working or mooring on the Thames. The MCA Workboat Code was not applied to vessels on the Thames, but offered useful guidance on developing simple procedures commensurate with the nature of the vessel's operation.

The purpose of a risk assessment is the identification of potential hazards, enabling the provision of procedures within an SMS, to assist in mitigating those hazards. Such procedures can help educate crews to the dangers they need to consider and provide useful guidance, including crew and vessel safety instructions, basic passage planning and actions to take in an emergency.

The absence of a risk assessment for CRC's workboats or onboard procedures for *Alison* meant that the crew were not made aware of the hazards associated with their work or advised on how these could be minimised. The fact that they had ignored the sign instructing them to wear lifejackets is indicative that CRC needs to invest more effort in this area if a more effective safety culture is to be developed within its workboat fleet.

2.8.2 Designating a vessel skipper

Both crewmen on board *Alison* were experienced operators of passenger vessels and workboats and when operating the boat together their normal practice was to take turns as the helmsman; there was no designated skipper in overall charge of the vessel.

Had CRC formally assigned the duties of skipper to one of *Alison*'s crewmen, this would have ensured accountability for the safety of the vessel. Moreover, it is likely that an assigned skipper would feel a sense of responsibility for the safety of the crew, ensuring compliance with relevant guidance such as the obligation to wear PFDs.

2.9 EMERGENCY RESPONSE

On hearing the noise of the impact but unaware of what had happened, *Typhoon Clipper*'s master immediately stopped the vessel. At the same time, the DCSA, who was also aware that something had happened, instinctively investigated the forward area of the vessel and soon realised there were people in the water. Having deployed the first lifebuoy, the DCSA raised the alarm by calling the master.

The subsequent actions of *Typhoon Clipper*'s crew followed the manoverboard procedure and resulted in both of *Alison*'s crew being rescued from the water 3 minutes and 30 seconds after the collision.

Regular crew training and drills can seem time consuming; however, they are an important process to prepare vessel crews for dealing with real emergencies. The reactions of *Typhoon Clipper*'s crew to this emergency were instinctive, swift and effective because the crew had been conducting regular drills and were properly prepared for an emergency.

2.10 SURVIVABILITY IN COLD WATER

When immersed and clinging to *Typhoon Clipper*'s scrambling net, neither of *Alison*'s crewmen could climb out of the water unaided even though both had been in the water for only a short time.

Suddenly entering cold water has immediate debilitating effects on the human body and, as this accident demonstrated, casualties can become incapable of helping themselves within a very few minutes. Although cold shock and cold incapacitation will still occur when a PFD is worn, the likelihood of the wearer surviving immersion is greatly improved. This is because a PFD will keep the casualty's head above water as they regain control of their breathing, preventing immediate drowning. Wearing a PFD also means that the casualty does not have to expend vital energy on swimming or treading water, reducing the load on their heart.

Neither of *Alison*'s crewmen was wearing a PFD. This meant that, as soon as they entered the water after the collision, their lives were in immediate danger. The debilitating effects of the cold water also meant that it took the efforts of four people to haul them out of the river despite *Typhoon Clipper*'s relatively low freeboard and the use of a scrambling net. Irrespective of the causes of the accident itself, the survival of *Alison*'s crew was reliant on them being rescued quickly.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. The crew of *Alison* had not effectively assessed the shipping situation and were unaware of the risk of collision with *Typhoon Clipper* until it was too late to take effective avoiding action. [2.4.2, 2.4.3]

2. The helmsman of *Alison* was distracted because he was focusing on *Silver Bonito* passing by. [2.4.2]

3. *Alison*'s crew made no attempt to indicate their intentions to other vessels nearby in a busy part of the waterway. [2.4.3]

4. Neither the master nor mate of *Typhoon Clipper* saw *Alison* because it was initially obscured by the pier, then moved into the visual blind sector ahead and the CCTV settings excluded use of the bow camera. [2.5.2, 2.5.3]

5. Neither vessel made a sound signal to warn others of their intentions to enter the fairway. [2.7]

3.2 SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. PLA direction on keeping lookout was ambiguous as it did not define *limited visibility* or *suitable technical arrangements*. [2.6]

2. PLA regulation regarding use of sound signals when entering the fairway lacked clarity as to whether it applied to vessels departing a pier, or not. [2.7]

3. CRC did not have a risk assessment or onboard procedures for safe operation of its workboats, including *Alison*. [2.8.1]

4. The absence of a designated skipper meant that there was a lack of accountability for the safe operation of *Alison*. [2.8.2]

5. *Alison*'s crew were not wearing personal flotation devices, an action which significantly reduced their chance of survival when immersed in cold water. [2.10]

3.3 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT

1. Although *Typhoon Clipper* had been certified by the MCA as compliant with the HSC Code, the visibility from the vessel's wheelhouse did not meet the Code's requirement. [2.6]

2. The emergency response by *Typhoon Clipper*'s crew was swift and effective, ensuring that the crew of *Alison* were rescued quickly. [2.9]

SECTION 4 - ACTIONS TAKEN

The **Port of London Authority** has:

- Issued a safety bulletin **(Annex C)** alerting mariners to the hazards associated with navigating in close proximity to piers, jetties and other river structures.

- Investigated the accident and prepared a report, which concluded that the primary causes of the accident were:

    - the failure of the master of *Alison* to follow COLREGs for vessels operating in a narrow channel and crossing vessels (Rules 9 and 15), and;

    - the failure of the master of *Typhoon Clipper* to keep a good lookout (COLREG Rule 5).

- Secondary causal factors in the PLA report included: poor safety culture on board *Alison*, a failure by *Alison* to communicate effectively, and poor wheelhouse visibility at slow speeds in Thames Clippers' vessels.

- The PLA report made recommendations, inter alia, to:

    - Crown River Cruises: to develop crew familiarisation with COLREGs and local regulations, improve company safety culture and share the lessons from the accident with all staff.

    - Thames Clippers: to revise its operating procedures to include a visual check before departing piers, consider the visibility requirements of its vessels and to share the findings of the incident.

    - The MCA: to consider the visibility requirements of all Class V vessels to ensure that good all round visibility is achieved.

Crown River Cruises has:

- Introduced the mandatory wearing of lifejackets by all staff when operating company workboats.

The **Maritime and Coastguard Agency** has:

- In collaboration with the managers of the River Runner 200 class passenger vessels, MBNA Thames Clippers Limited, commenced a review of the vessels' forward visibility arrangements, aimed at resolving the issue of compliance with the High Speed Craft Code identified in this report.

SECTION 5 - RECOMMENDATIONS

The **Port of London Authority** is recommended to:

2017/147 Review and, as necessary, clarify the application of:

- General Direction 28 requiring posting of a lookout or a suitable technical means of maintaining an effective lookout in any vessel with limited visibility.
- Byelaw 43 requiring the use of sound signals for vessels intending to enter the fairway; this should include consideration of vessels departing from a pier.

Crown River Cruises Limited is recommended to:

2017/148 Update its safety management system to include risk assessments and procedures for the safe operation of workboats.

Safety recommendations shall in no case create a presumption of blame or liability

Marine Accident Report

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