Office of the Chief Investigator
Transport Safety

Marine Safety Investigation
Report No 2012/02

Sinking

FV Lady Cheryl

Point Nepean

24 March 2012

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THE CHIEF INVESTIGATOR

The Chief Investigator, Transport Safety is a statutory position under Part 7 of the *Transport Integration Act 2010*. The objective of the position is to seek to improve transport safety by providing for the independent no-blame investigation of transport safety matters consistent with the vision statement and the transport system objectives.

The primary focus of an investigation is to determine what factors caused the incident, rather than apportion blame for the incident, and to identify issues that may require review, monitoring or further consideration.

The Chief Investigator is required to report the results of an investigation to the Minister for Public Transport or the Minister for Ports. However, before submitting the results of an investigation to the Minister, the Chief Investigator must consult in accordance with section 85A of the *Transport (Compliance and Miscellaneous) Act 1983*.

The Chief Investigator is not subject to the direction or control of the Minister in performing or exercising his or her functions or powers, but the Minister may direct the Chief Investigator to investigate a transport safety matter.

EXECUTIVE SUMMARY

On the evening of 23 March 2012, the commercial fishing vessel FV Lady Cheryl departed Williamstown for a 10 day deep sea fishing voyage. It was intended that the vessel transit Port Phillip Bay, depart through Port Phillip Heads and then set a course for the fishing grounds to the west of Tasmania. However, in the early hours of the following morning when abeam Shortland Bluff (Queenscliff) and still within the bay, the vessel altered course towards Point Nepean. The master did not notice the error and Lady Cheryl ran aground on the outlying reef at Point Nepean. The vessel was holed below its waterline and sank a short time later. All six vessel crew safely transferred into a pilot launch that came to their assistance.

The investigation concluded that the master mistook Shortland Bluff for Point Lonsdale and believing that the vessel was clear of Port Phillip Heads, altered course to head to the fishing grounds. Instead, the course alteration directed the vessel towards Point Nepean.

It was found that the master was fatigued and had consumed a significant amount of alcohol, both factors contributing to his loss of situational awareness. The investigation also found that the master had not made effective use of navigation aids within the port and navigational equipment aboard his vessel.

The investigation makes recommendations to the vessel owner in the management of alcohol consumption and fatigue, and the use of vessel navigational equipment. The investigation also makes a recommendation to the waterway manager to consider opportunities for expanding vessel traffic services to smaller vessels.

1. CIRCUMSTANCES

1.1 The incident

At about 2100 on 23 March 2012 the deep sea fishing vessel FV Lady Cheryl departed from Seaworks Dock, Williamstown bound for sea. The vessel was manned with a master, an engineer and four general purpose hands. The master was navigating the vessel.

At about 2114 the vessel passed Breakwater Pier, Williamstown and set a course to the West Channel, situated to the east of the Bellarine Peninsula. The intended passage plan after passing through and clearing the West Channel was to steer a course towards the Outer Western Channel at Port Phillip Heads, passing close to Shortland Bluff, and once clear of Point Lonsdale, to steer a course approximately south-southwest to the fishing grounds (see Figure 1).

The vessel cleared the West Channel at about 0022 on 24 March 2012 and at 0024 altered course to starboard to pass close to Shortland Bluff. At about 0031 Lady Cheryl reported to Point Lonsdale Vessel Traffic Service (Lonsdale VTS) that it was half an hour from the Heads and at 0042 the vessel reported 'Heads out' [1]. At that time the VTS officer at Lonsdale looked out the window and saw that Lady Cheryl was actually in the vicinity of Shortland Bluff. Shortly after that call Lady Cheryl altered course to an approximately south-southwest direction and headed directly towards the outlying reef at Point Nepean.

1.2 Consequences

Lady Cheryl ran aground on the reef off Point Nepean at 0057. The master was able to manoeuvre the vessel off the reef and attempted to head back to Williamstown. However, the vessel was holed below the waterline and commenced sinking rapidly, forcing the crew to abandon ship into the pilot launch that had arrived at the scene.

The vessel sank in six to eight metres depth of water, about 500 metres north-northeast of Point Nepean. All crew members were rescued and only one suffered minor cuts and bruises.

It was reported that about 30,000 litres of diesel oil and an unspecified amount of lubricating oil escaped from the vessel, which dispersed and evaporated. Other vessel debris was retrieved under the supervision of the Port of Melbourne Corporation but the vessel could not be salvaged.

[1] Colloquially, a vessel has cleared the Heads or is 'outside the Heads' when it passes to seaward of the imaginary line between Point Lonsdale and Point Nepean.

1.3 Environment

At the time of the incident the wind direction at the Heads was west-southwesterly at about 25 knots, gusting to about 35 knots with high seas, and a south-southwesterly swell of two to three metres in height.

The tide was flooding. The direction of the tidal stream at the entrance north of Point Nepean was approximately easterly at a rate of about four knots. The height of tide above chart datum was about 1.4 metres at Nepean Bank.

There was no moon at the time and the sky was overcast. The visibility of lights was good but physical features were not clearly visible.

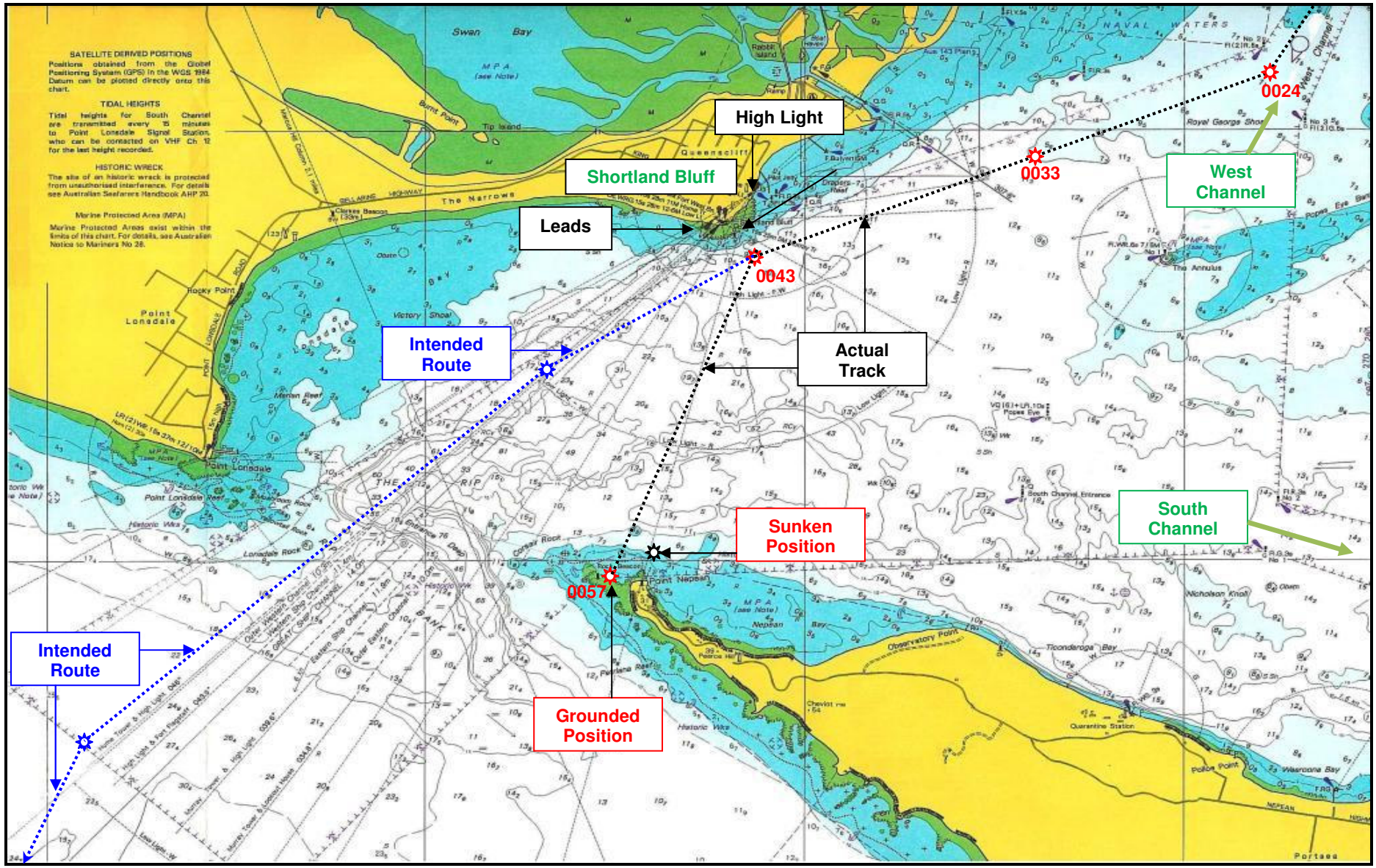

Figure 1: Lady Cheryl's track approaching Port Phillip Heads. Times shown are for the changes in vessel course, as recorded by VTS radar

2. FACTUAL INFORMATION

2.1 Port Phillip Heads

2.1.1 The Heads

Port Phillip Heads (the Heads) marks the entrance into Port Phillip from Bass Strait. There are five channels which lead larger vessels through the Heads into Port Phillip:

- the Great Ship Channel with a maintained depth of 17.0 metres lies midway between Point Lonsdale and Point Nepean. It is also referred to as the main shipping channel or main leads;
- to the east of the Great Ship Channel lies the Eastern Ship Channel of depth 11.9 metres and the Outer Eastern Channel of depth 10.0 metres;
- to the west of the Great Ship Channel lies the Western Ship Channel of depth 11.4 metres and the Outer Western Channel of depth 10.3 metres.

The width of navigable water between Point Lonsdale and Point Nepean within the channels is approximately 1065 metres.

Due to the relatively narrow entrance, the tidal stream at the Heads can reach speeds of up to eight knots, depending on the weather conditions and the difference in sea level between the ocean and the bay. In a typical flood tide, the in-going stream arrives from the south and east, increasing in strength as it nears the Heads. It sets right into the entrance, across and through the reefs then swirls around Lonsdale Bay towards Shortland Bluff to the northeast and South Channel Entrance to the east. On an outgoing tide, the directions are reversed.

2.1.2 Channel leads

The channel leads are located at Queenscliff and Shortland Bluff to assist vessels transiting the several channels at the entrance. The leads consist of the High Light located at Queenscliff and four light towers[2] lower in height, located on Shortland Bluff. When navigating through the Heads, the alignment of each beacon with the High Light provides a 'leading line' for the transit of each channel by day; and by night, their distinctive lights should be aligned.

For example, the channel leads for the Outer Western Channel is the High Light (a white light, fixed and occulting every 15 seconds) and the Hume Tower light (a red light, occulting every 15 seconds). To safely navigate in the 'small ship channel' (the waters west of the Outer West Channel), the Queenscliff High Light should be lined up with the white sector light (directional isophase 2 seconds) of Fort West Beacon. Vessels exiting the Heads would therefore be referring to the lights in alignment astern of them as they transit the appropriate channel.

At night, when close to the entrance, the edge of land at Point Lonsdale is generally visible due to the 'overspill' of light from the lighthouse. However, at the other side of the entrance there are no light beacons at Point Nepean to indicate the edge of land or outlying reefs.

[2] From east to west: Murray Tower, Low Light, Hume Tower and Fort West Beacon.

2.2 Navigating the Heads

The Port of Melbourne is situated at the northern head of Port Phillip Bay. Larger vessels transiting outbound from the port to the Heads sail via Port Melbourne Channel to Fawkner Beacon, then south to Hovel Pile and via the South Channel to the Heads.

Smaller vessels of less than 35 metres in length with a draught of less than four metres usually navigate from the port to the Heads via the West Channel, which has a charted depth of between four and eight metres. In order to stay well clear of larger vessels transiting via the South Channel, outbound vessels will set a course from the West Channel to pass close to Shortland Bluff and thence transit the Heads via the 'small ship channel' in fair weather and at other times via the Outer Western Channel, provided that inbound shipping is not affected.

Small outbound vessels approaching the Heads from the east typically pass just west of Corsair Rock, keeping close to the edge of the fixed white sector of the Low Light whilst remaining in the occulting white sector of the High Light.

2.3 FV Lady Cheryl

2.3.1 The vessel

Lady Cheryl was a purpose built deep sea commercial fishing vessel of 157 gross registered tonnes built in 1987. It was owned and operated by Corporate Alliance Enterprises Pty Ltd, Melbourne. The vessel had been operating out of the Port of Melbourne for the last six years. Fishing voyages were usually of between seven and ten days duration all year round. At the time of the incident the vessel was under survey with Transport Safety Victoria (TSV) (See section 2.6.1).

Lady Cheryl was of steel construction, with a forward wheelhouse and fitted for stern trawling. It had an overall length of 27.4 metres, an extreme breadth of 7.92 metres and at the time of the incident had a maximum draught of about 3.6 metres.

Propulsion power was supplied by a 440 kW Cummins diesel engine driving a right-handed single screw propeller, giving it a service speed of about 10 knots[3].

The vessel's navigational equipment and crewing complied with the requirements of the *Uniform Shipping Laws* (USL) *Code*[4]. Equipment included two electronic chart plotters; a differential GPS (DGPS) system and a back-up GPS; and an X-band radar with automatic radar plotting aid (ARPA).

The steering equipment comprised a satellite compass with automatic pilot and a magnetic compass. All equipment was interfaced with the electronic chart plotter. The vessel was not required to be fitted with an Automatic Identification System[5] (AIS), and was not fitted with such. The vessel was fitted with a Satcom-C automatic polling device as required by the Australian Fisheries Management Authority.

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[3] 1 knot = 1 nautical mile per hour or 1.852 km/h.

[4] The *USL Code* provides standards for the design, construction and operation of domestic commercial vessels including the minimum manning requirements and qualifications of vessel operators. The Code was first published in 1979 in response to the need for a common national safety standard for commercial vessels. Some parts of the *USL Code* have been superseded by the *National Standard for Commercial Vessels* (NSCV).

[5] AIS is a short range coastal tracking system operating on the VHF radio bandwidth, used for identifying and locating vessels by electronically exchanging data with other nearby ships and VTS stations.

2.3.2 Certificate of survey

The Certificate of Survey issued by TSV required the vessel, when engaged in fishing operations up to 100 nautical miles off the coast, to be crewed by:

- a master holding a certificate of competency as Skipper Grade 2;
- an engineer holding a certificate of competency as Marine Engine Driver Grade 2;
- two general purpose hands (GPH).

The vessel was permitted, in addition to the above, to carry up to two additional crew or special personnel.

A notation on the Certificate of Survey stated that 'in lieu of a chief mate a GPH may be carried if the duration of the voyage is less than 24 hours. However, the requisite qualification of the chief mate was not specified. The certificate also stated that 'every crew member must be permitted at least 10 hours rest in a 24 hour period'.

2.3.3 Operating procedures

Lady Cheryl had implemented a safety management system (SMS) in accordance with the *National Standards for Commercial Vessels* (NSCV) Part E 'Operational Practices' (see section 2.8). Although not mandatory at that time, the owner had developed an SMS manual which all persons joining the vessel were required to read and sign as part of their induction on joining the vessel. The manual was submitted to TSV in July 2011. The owner had also developed a DVD to supplement the vessel *Safe Operating Practices* manual, to address occupational health and safety requirements when engaged in fishing operations and other maintenance activities. In accordance with Part E, safety and emergency drills were carried out at least once a month and when there was a change of command. At that time a crew debriefing also took place, sometimes attended by the owner or his representative.

Relevant to this incident, the SMS manual stated that the master had a duty of care to provide a drug free working environment and ensure workers maintained a 0.00 blood alcohol limit. It also stated that the master had the right to refuse a worker from boarding or travelling on the vessel if in their opinion the worker was affected by alcohol or drugs.

The owner advised the investigation that the company had a fatigue policy based on the guidelines developed for New Zealand trawlers by Maritime New Zealand. Although the policy was not documented in the SMS manual, it was disseminated verbally. With regard to work and rest periods, the owner advised that it was the intention of the company that all crew have at least 10 hours rest in a 24 hour period. However, the manual did not stipulate maximum watch periods nor minimum rest periods for the vessel master or other crew, in order to manage fatigue.

The owner stated that on a typical day the vessel would conduct about three 'shots', each involving shooting the nets, waiting for a catch, then hauling in the nets. The duration of each 'shot' was between four and eight hours and the crew were free to rest in the time between shooting the nets and hauling them, which could range from two to six hours each time. The crew were also free to rest when transiting from one fishing ground to the next, save for each person's 3-hour watchkeeping rotation.

The SMS manual did not provide the master with guidance on the conduct of the navigational watch during arrival and departure port. The owner stated that the master's induction was usually carried out by the owner himself and included verbal advice regarding the navigation of the vessel during its arrival into and departure from port and only after satisfactory completion of this induction was the master given command of a company vessel.

2.4 The voyage

2.4.1 Arrival Melbourne

Lady Cheryl arrived at Port Phillip Heads on the morning of 23 March 2012 at about 0830, passed the West Channel at about 0900 and berthed at Seaworks Dock, Williamstown at about 1130. After unloading the catch, the crew went ashore with the outgoing master to purchase personal items.

On their return, the crew prepared the vessel for a ten day voyage to the west coast of Tasmania. There was a change of master and a trainee general purpose hand also joined the vessel for the next trip. The engineer and three general purpose hands from the previous voyage were to stay on board for the next voyage.

2.4.2 Departure Melbourne

On the outbound voyage, Lady Cheryl departed its berth at about 2100. The following provides a summary of key events based on Vessel Traffic Service (VTS) recordings of VHF radio communications and the VTS radar display.

On passing Breakwater Pier, the vessel advised Melbourne VTS that its estimated time of arrival at West Channel Pile was at 2345 and at the Heads (Port Phillip Heads) at 0045 (on 24 March).

Lady Cheryl cleared the West Channel at about 0022 on 24 March 2012 and at about 0024 altered its course to head to the Outer Western Channel. At about 0031 when the vessel reported that they were 'half hour from the Heads area outbound', the vessel was still about midway between the West Channel and Shortland Bluff. The VTS advised the vessel to steer clear of inbound shipping and at 0033 Lady Cheryl altered course further to starboard and headed closer towards Shortland Bluff.

At about 0042 Lady Cheryl was in the vicinity of Shortland Bluff when the master reported to the VTS 'Heads out' and at about 0043 the vessel changed its course to port to head directly towards Point Nepean. The radar plot did not record any further deviation of course and the vessel ran aground just east of Rock Beacon, at 0057.

2.5 Personnel

2.5.1 Master

The master of Lady Cheryl had about 22 years experience at sea. He obtained his certificate of competency as Skipper Grade 2 in July 1994 from the Marine Board of Victoria[6] and since 1999 has been in command of vessels similar to the Lady Cheryl. For the previous six years he had been the master of Lady Cheryl, working out of the port of Melbourne. At the time of the incident his certificate of competency was current and appropriate for command of the Lady Cheryl. The master underwent a medical examination and eyesight test on 6 March 2012 as a prerequisite to applying for a Marine Engine Driver Grade 2 certificate of competency and was found to be fit for duty as an engine driver but was required to wear spectacles for long distance vision.

At interview, the master stated that on the afternoon of the departure he arrived at the vessel at about 1630 and proceeded to take over from the outgoing master. This was to be the master's first trip after three weeks rostered leave. Between 1730 and 1920 he went ashore to purchase provisions and at 1930 took over formal command of the vessel. The master stated that he went ashore again to post vessel documents and while ashore he consumed two 'beers', arriving back at a little before 2100.

The vessel departed the wharf in Williamstown at about 2100. The master stated that all the navigational equipment was switched 'on' and was operating normally. As was normal practice, the master was the sole person navigating the vessel and the crew were engaged in securing the vessel for the sea passage. After leaving Williamstown and turning south, steering was put to automatic pilot. The master stated that the visibility of lights was good but there was no moon so the horizon was black and the landscape and other shapes were not readily visible. He said that he monitored the vessel's progress on the chart plotter and believed that he was sailing on an outgoing tide.

The master stated that somewhere between Williamstown and the West Channel in the southern part of the bay, three crew members came into the wheelhouse and offered him a can of beer which he accepted. His recollection was that they were all consuming alcohol and were engaged in general conversation. He stated that he was not aware how the alcohol came to be on board.

On entering the West Channel off St Leonards, the master adjusted the radar to the 1.5 nautical mile range but the sea had 'picked up' and was causing sea clutter on the radar screen. However, the master could visually identify the channel pile lights and stated that he had not been worried. After clearing the West Channel, the master set a course to pass through the Outer Western Channel at the Heads. He stated that he was occasionally checking the vessel's track on the chart plotter and could see that the vessel was drifting to the east but he believed they were still on the western side of the Heads.

When he thought he was clear of the Heads, the master reported this to Lonsdale VTS by VHF radio. The master stated that he could not recall anything from the time he spoke to Lonsdale VTS until he felt the vessel impact the reef.

[6] The marine regulatory agency responsible for crew certification at that time. Certification functions are now performed by Transport Safety Victoria.

The master stated that he was able to manoeuvre the vessel off the reef. By this time some of the crew had arrived in the wheelhouse. Subsequently the engineer reported that the engine room was holed to the port side of the centre line and was taking in water. The engine room bilge pumps were started and the master decided to take the vessel back to Williamstown, reporting this intention to Lonsdale VTS. However, the master soon realised that the vessel was in danger of sinking and a distress call was sent.

The master stated that the pilot launch arrived alongside the Lady Cheryl and four crew members transferred to the launch. He then attempted to run Lady Cheryl onto the beach near Point Nepean but when sinking was imminent, the master shut down the engines and he and the engineer also abandoned into the pilot launch. Lady Cheryl sank soon after.

When asked about his daily routine, the master reported having disrupted sleep during the previous week and that on the night before joining the vessel he did not sleep well, waking several times. On the day of departure, he awoke at about 0700 and travelled about four hours by train to Melbourne.

When asked about the company's operating procedures, the master stated that he was aware of the company's *Safety Management System* manual and its *Safe Working Practices* manual. He was also aware that the company prohibited drugs and alcohol to be brought on board or to be consumed before boarding the vessel.

Following the incident a breath alcohol test was conducted on the master where he recorded a reading in excess of 0.05[7]. He was not tested for the consumption of drugs.

2.5.2 Crew

The engineer of Lady Cheryl held a certificate of competency as Marine Engine Driver Grade 2 issued by Marine and Safety, Tasmania, in October 2011. At the time of the incident the certificate of competency was current and appropriate to act as engineer of the Lady Cheryl.

There were also four general purpose hands on board, one of whom was a trainee. All of them had completed their pre-sea training and in addition one crew member held a certificate of competency as Master Class 5 and another crew member held a certificate of competency as Coxswain.

Following the incident a preliminary breath test was conducted on each of the crew. Four crew returned readings in excess of 0.05 and the trainee returned a zero reading.

The crew members that had stayed on from the previous voyage stated that they were awake from the night of 22 March 2012 until they arrived back to Melbourne. After unloading the catch they went ashore with the outgoing master. On their return they commenced preparing the vessel for the next fishing trip and assisted the incoming master. Two of them stated that they had been awake for more than 24 hours at the time of the incident and one stated that he had been awake for at least 30 hours.

The crew stated that on the outbound voyage they all consumed alcohol, except the trainee. All confirmed that they were aware of the company's drug and alcohol policy.

[7] Grams of alcohol in 210 litres of breath.

The crew members' evidence corroborated the master's recollection of the bay passage, including crew members visiting the wheelhouse and offering the master alcohol. They also confirmed the sequence of events and actions following the grounding.

2.5.3 Fleet engineer

In accordance with company procedure, the fleet engineer, representing the owner, attended the vessel on 23 March, arriving at about 1315. He stated that when he arrived the outgoing master and the crew had gone ashore. When they returned to the vessel none of them appeared to be under the influence of alcohol. He also did not notice any alcohol being brought on board. He stated that a number of notices displaying company policy were posted around the vessel and he was satisfied that every crew member was aware that this was a 'dry ship'. The fleet manager also stated that he did not observe any sign of fatigue with the skipper nor did the skipper advise him of any problems in that regard.

2.5.4 VTS officer

The VTS officer at Point Lonsdale commenced his shift at 1800 on 23 March 2012. His first contact with Lady Cheryl was at about 2114 when the vessel called Melbourne VTS by VHF radio when passing Breakwater Pier at Williamstown. He acknowledged the call and when the vessel appeared on his radar display he commenced tracking it. He stated that he did not actively monitor Lady Cheryl's progress but checked its position on his radar screen each time it reported in.

At 0031 Lady Cheryl called to request clearance to proceed through the Heads. The VTS officer advised the vessel to stay clear of the main channels and Lady Cheryl acknowledged. Lady Cheryl called Lonsdale VTS again at 0042 and reported 'Heads out'. The VTS officer stated that he looked out the window and observed Lady Cheryl in the vicinity of Shortland Bluff but that the early call of 'Heads out' did not overly concern him as he was used to fishing vessels not knowing the boundaries of the Heads[8]. Besides, at that time it appeared from the alignment of Lady Cheryl's navigation lights that the vessel was headed towards Point Lonsdale. He also commented that it was not mandatory for fishing vessels to report their positions.

The VTS officer then turned his attention to the transfer of a pilot between an outbound and an inbound vessel. The next contact with Lady Cheryl was at 0117 when the vessel called Lonsdale VTS to report that they were returning to Williamstown. The VTS officer requested Lady Cheryl confirm their position and was told that the vessel was experiencing electrical trouble and could not confirm their position. A short while later Lady Cheryl informed Lonsdale VTS that they had 'hit the reef' and soon thereafter stated that they had a mayday situation. The VTS officer then activated the appropriate response and provided communications liaison between several parties involved in the search and rescue.

2.5.5 Master, pilot launch

The master of the pilot launch stated that just prior to the incident, the pilot launch was returning from the pilot transfer at sea and he could see Lady Cheryl to the east of the entrance and pitching heavily. The launch had returned to the pilot despatch station at Queenscliff when the master heard Lady Cheryl's mayday call and immediately went to their assistance, arriving at the site about 10 minutes later.

[8] The Port of Melbourne Corporation advised that in addition, it is not unusual for position reports to be made by a vessel when it is still some distance from the reporting position indicated on the chart.

2.6 Regulation

2.6.1 Transport Safety Victoria

Transport Safety Victoria (TSV) is the State regulatory authority under the direction of the Director, Transport Safety, responsible for the efficient and safe operation of vessels on State waters by ensuring that operators are appropriately qualified, vessels are appropriately crewed and standards are set and maintained for navigational aids. TSV also verifies that the design, construction and equipment of new and existing commercial vessels meet the requirements of the *USL Code* and the *NSCV*. At the time of the incident the *Marine Act 1988* (the *Act*) and *Marine Regulations 2009* (the *Regulations*) were in force[9].

In accordance with the *Act*, the Director may determine and enforce standards and procedures for navigation and maritime safety on State waters. With regard to the safety of navigation within port waters, the Director published the *Marine (VTS Standards) Determination 2008* effective from 1 December 2008, setting out the relevant standards with which a VTS in a Victorian port must comply. Schedule 3 of the Determination provides for the Port of Melbourne Corporation to be the VTS Authority for the port waters of the port of Melbourne.

2.6.2 Regulations pertaining to alcohol consumption

At the time of the incident, the master was required to have an alcohol level of less than 0.05 grams in 210 litres of breath (or less than 0.05 grams in 100ml of blood). Subsequent to the incident the *Transport Legislation Amendment (Marine Drug and Alcohol Standards Modernisation and Other Matters) Act 2012* was passed by the Victorian Parliament on 7 November 2012 and came into force on 1 December 2012. Amongst other changes, the Act requires a zero alcohol limit for masters and operators[10] of commercial vessels.

2.7 Port of Melbourne Corporation

The Port of Melbourne Corporation is responsible for the management of port of Melbourne waters. In the southern parts of Port Phillip Bay, these waters include all designated channels through Port Phillip Heads, extending northeast to the waters between Queenscliff and Point Nepean, and then adjoining South Channel. Waters outside port of Melbourne waters, including West Channel, are managed by Parks Victoria. After sailing west-southwest from West Channel, the Lady Cheryl entered port of Melbourne waters to the northeast of Shortland Bluff.

The Port of Melbourne Corporation administers the VTS for the port waters of the port of Melbourne through Melbourne VTS, located in the Shipping Management Centre (harbour control) and Lonsdale VTS, located at Point Lonsdale. As Service Category 3 provider, the Port of Melbourne VTS Authority provides information and advice and issues warning to VTS users but the VTS does not issue instructions regarding the navigation of individual vessels.

[9] On 1 July 2012 the *Marine Safety Act 2010* superseded the *Marine Act 1988* and *Marine Regulations 2012* superseded *Marine Regulations 2009*.

[10] Any person who has navigational control of the vessel.

In accordance with the Harbour Master's Directions, all vessels 50 metres or more in length must report to the VTS when entering the port waters of the Port of Melbourne. Such vessels are fitted with AIS equipment and are automatically acquired when they enter within radar range of Melbourne VTS or Lonsdale VTS and their identification detail is superimposed on their radar target. This allows the VTS to keep a track of individual vessels. The VTS system is capable of providing visual and audible warning signals to the VTS officer should a vessel be running into danger – that is, close to another object or shallow water.

Small vessels (less than 50 metres in length) may also report their movements to the VTS and where possible the VTS will track their movements provided that the vessel is fitted with AIS. If the vessel is a vessel of interest but is not fitted with AIS, the VTS will track the vessel. It is left to the discretion of the VTS officer to decide which targets are tracked.

2.8 National Standard for Commercial Vessels

2.8.1 Part C

Section 7C of Part C of the *National Standard for Commercial Vessels* (NSCV) specifies the requirements for navigational systems on vessels including the provision of AIS. Part C was endorsed by the National Maritime Safety Committee on 7 November 2008 to apply to all commercial vessels entering into survey. It did not apply to existing vessels.

Under the provisions of Section 7C, fishing vessels under 35 metres in length when operating in Class B waters must be fitted with an operational AIS. However these vessels when operating in sheltered waters are not required to have an AIS. With regard to Lady Cheryl, the vessel was an existing vessel and therefore was not required to have an AIS. Furthermore, even if Lady Cheryl had been equipped with an AIS, under the current requirements it was not mandatory for the equipment to be operational when the vessel was inside the Heads.

2.8.2 Part E

Part E of the *National Standard for Commercial Vessels* (NSCV) specifies minimum requirements for the safe operation of domestic commercial vessels in Australia including operational requirements, emergency procedures and essential elements of a safety management system[11]. At the time of the incident, Chapter 2 *Operational Practices* and Chapter 3 *Emergency Planning and Preparedness* of Part E applied to Lady Cheryl.

Chapter 4 *Safety Management System* (SMS) of Part E was not mandated at the time of the incident, and became applicable to all Victorian trading and fishing vessels from 1 July 2012. It provides guidance on the form of a vessel's SMS manual 'so as to provide a ready reference to all persons charged with a duty for safety on the vessel and within the organisation'.

[11] A structured and documented system for managing risk.

Regarding fatigue management, Part E states that action should be taken to ensure that fatigue, and the risk from fatigue is minimised. It also references the International Maritime Organisation (IMO) Guidelines on Fatigue[12] as providing practical guidance on measures to avoid and minimise fatigue and that crew rosters should be designed so that they do not cause undue fatigue. The IMO guidelines under the STCW convention[13] specify at least 10 hours rest in a 24 hour period.

2.9 Human factors

The investigation commissioned an examination of human factors potentially pertinent to this incident. This section provides a summary of factors identified by an independent medical and human factors specialist.

Situational awareness is most commonly defined[14] as the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future. The development of an accurate sense of situational awareness requires ongoing cognitive input, accurate and timely information processing and integration of all features of the situation. Anything that affects cognitive function and information processing will therefore have an adverse effect on situational awareness. Fatigue and alcohol, individually and particularly in combination, can affect cognitive function and therefore interfere with the development and maintenance of situational awareness.

Fatigue is defined[15] as being synonymous with drowsiness, sleepiness and tiredness and invokes a diminished capacity for work and possible decrements in attention, perception, decision-making and skilled performance. It is well documented that cognitive skills are adversely impaired by fatigue. The relationship between cognitive skill impairment and fatigue is dose-dependent - that is, the more fatigued an individual, the greater the impairment of cognitive skills and functioning. A UK marine safety study[16] found fatigue and vigilance to be significant issues in marine accidents and incidents. A third of all the groundings examined involved a fatigued officer alone on the bridge at night.

In the road transport sector, the impairment effects of alcohol on the accuracy and safety of the driving task have been well documented. The impairment affects a multitude of cognitive functions, including attention, memory, psychomotor performance, pursuit tracking, response time, concentration, perception, judgement and risk assessment. As a result of these impairments, situational awareness, especially in a dynamic motion environment, is at risk of being severely degraded as a result of alcohol ingestion. In the marine sector, studies have likewise shown that even low-dose alcohol exposure reduces operational performance in a variety of settings.

[12] MSC Circular No 1014 "Guidance on fatigue mitigation and management" dated 12 June 2001.
[13] The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended.
[14] Endsley, MR. Design and evaluation for situation awareness enhancement, in Proceedings of the Human Factors Society 32nd Annual Meeting (pp 97-101). Santa Monica, CA.
[15] Akerstedt T. Consensus statement: "Fatigue and Accidents in Transport Operations. J Sleep Res 2000; 9:395.
[16] Marine Accident Investigation Branch. Bridge watchkeeping safety study 1/2004. Southampton, UK.

2.10 Fatigue analysis

A number of bio-mathematical models have been developed to evaluate the likelihood of fatigue associated with work place schedules. The models do not provide definitive evidence of the existence of fatigue in a particular individual but rather provide an indication of the potential for its presence.

FAID® (Fatigue Audit InterDyne) is fatigue management software used to assess the risk of fatigue associated with shift rostering systems. By analysing a set of work hours over a period of seven days, the software calculates a fatigue score. Studies undertaken by the Centre for Sleep Research in Adelaide have found that a FAID score of 40 to 80 is indicative of a moderate level of fatigue, a score between 80 and 100 is indicative of a high level of fatigue, and a score over 100 is indicative of a very high level of fatigue. The studies also concluded that a fatigue score between 80 and 100 is comparable to the impairment of an individual with a blood alcohol content of 0.05 per cent or greater. Analysis of the master's sleep history found that the fatigue score was above 100 during the 2 hours immediately preceding the incident.

FAST® (Fatigue Avoidance Scheduling Tool) predicts task effectiveness using calculations developed from empirical research findings of studies into the effects that wakefulness and circadian rhythms have on cognitive performance. For the master of the Lady Cheryl, the model indicated that at about 0042, when he broadcast 'Heads Out', the master had an overall task effectiveness score of 75 per cent and a mean cognitive score of 85 per cent, which indicates that he was operating below normal effectiveness and cognitive levels. The FAST modelling also indicated that this cognitive score suggested a blood alcohol equivalence of about 0.06 per cent.

3. ANALYSIS

3.1 The incident

At some time between clearing West Channel (0031) and altering course towards Point Nepean when abeam Shortland Bluff (0042), the master lost situational awareness. It is probable that when the vessel was passing Shortland Bluff, the master mistook the bluff to be Point Lonsdale. At this location there were no navigation lights visible to the south of his position, and the absence of moonlight or other celestial lighting meant the coast ahead would have been difficult to see. Not seeing any lights or landmarks ahead of him, he assumed that the vessel had reached open seas. He informed the VTS of such and then altered course to the heading towards the fishing grounds.

In the following 15 minutes prior to the collision with the reef at Point Nepean, the condition of the master is unknown. Lady Cheryl continued on this course until striking the reef.

Following the collision with the reef, the actions of the master and crew of Lady Cheryl and the pilot launch were well conducted, resulting in the vessel being safely abandoned.

3.2 Master's situational awareness

Navigating a ship at night requires a high level of cognitive function in order to develop and maintain situational awareness. The evidence indicates that two significant factors, alcohol and fatigue, were operating together to affect the physical and mental state of the master and that his ability to develop and maintain an adequate level of situational awareness was severely reduced.

At the time of the incident, the master had been awake for about 18 hours and at 0100 would have been close to the low point of his circadian rhythm. The results of the FAID and FAST analysis also indicate that the difficult sleep patterns he had experienced prior to returning to work had probably resulted in some degree of pre-existing fatigue.

3.3 Systems supporting navigation

3.3.1 Navigation aids

In the vicinity of Shortland Bluff, Point Lonsdale light is not yet visible and there are no other shore-based navigational lights marking the edges of Port Phillip Heads. Once south of Shortland Bluff, the leading lights at Queenscliff become visible and can be used to guide a vessel along any of the designated channels passing through the Heads. This requires the navigator of an outbound vessel to view the leading lights astern of the vessel. However, in this instance the master did not make use of them.

Additionally, about midway between Shortland Bluff and Point Nepean, the light from Point Lonsdale lighthouse would have come into view and might have alerted the master to his location, if observed.

3.3.2 Use of navigation equipment on board Lady Cheryl

Lady Cheryl was well equipped with navigation equipment. After passing Shortland Bluff, had the master checked his radar or chart plotter, he would have noticed the landmass of Point Nepean coming up fine on his port bow and that the vessel was heading towards a landmass and not into open sea. It is probable that the master's familiarity with the route created complacency that resulted in less frequent checks of the navigational equipment than good practice would dictate.

The GPS and electronic charting system installed on Lady Cheryl was also capable of being programmed with the vessel's voyage plan and within that plan, to set the cross-track errors with guard zones and safe water parameters. The radar display was similarly capable of being set with guard zones and the echo sounder activated to alert of water below a minimum depth. Had these facilities been utilised, an audible alarm would have sounded, probably alerting the master to the danger.

3.4 Alcohol consumption

The owner had provided the master and crew with clear instructions regarding the consumption of alcohol and all members indicated that they were aware of the instruction. Yet, all but one of the crew consumed alcohol.

The *Transport Legislation Amendment (Marine Drug and Alcohol Standards Modernisation and Other Matters) Act 2012* which came into force on 1 December 2012 together with appropriate enforcement strategies, will reduce the likelihood of an event similar to the loss of the Lady Cheryl.

3.5 Fatigue

The certificate of survey specified that every crew member must be permitted 10 hours rest in every 24 hour period and this was the undocumented policy of the owner. In the marine industry this is widely considered to be an effective means to combat fatigue, as long as one period of rest is not less than six hours. However, it is apparent from the statements of the master and the crew that this was not always achieved.

A safety management system (SMS) provides a systematic and documented approach to the identification of hazards and the control of risks. While addressing much of the required scope of an SMS for a commercial fishing vessel of this size, the manual prepared for Lady Cheryl could have been improved by providing specific procedures for managing the fatigue levels of the master and crew.

For the purpose of managing fatigue, an SMS should address the training requirements for crew to recognise the causes and symptoms of fatigue; establish and enforce rest periods and ensure that work duties are organised to facilitate the fatigue management strategies. Fatigue management guidance should also include means to confirm that a person has had sufficient rest before taking over the navigational watch. For the master, fatigue management includes being provided with strategies and resources for navigational watchkeeping.

3.6 Vessel crewing

At the time of the incident the Lady Cheryl was not required to carry a qualified mate on a ten day voyage. While this was not inconsistent with the minimum crewing requirement specified within regulatory codes, good seamanship practice suggests that a second crew member with suitable navigating qualifications should have been mandated for a voyage of this duration.

Since this incident, Transport Safety Victoria has reviewed its crewing policy and now requires all commercial vessels to carry a mate on sea voyages greater than 24 hours duration (see section 5.1.2).

3.7 Vessel Traffic Services

3.7.1 Vessel tracking

Lady Cheryl was not subject to the Harbour Master's directions for position reporting. Therefore, although the VTS officer provided the vessel with appropriate traffic information, he was not required to monitor the vessel on the radar and did not observe the vessel approaching danger. Notwithstanding, once Lady Cheryl had been acquired on the VTS radar, there was an opportunity for the VTS to monitor the vessel's transit through the Heads, and alert the vessel to the danger of collision with the reef.

3.7.2 Automatic Identification System (AIS)

In port of Melbourne waters, vessels of 50 metres or more in length are fitted with AIS and are therefore automatically tracked by the VTS and are readily identifiable. Similarly, smaller vessels if fitted with AIS can be readily identified and tracked, providing greater opportunity for them to receive warnings from the VTS in case of imminent danger. However there may be reluctance by some in the fishing industry to install equipment that could provide competitors with details of their whereabouts.

4. CONCLUSIONS

4.1 Findings

1. The master had consumed significant quantities of alcohol and was fatigued, reducing his cognitive performance.

2. When passing Shortland Bluff near Queenscliff, the master believed he was passing Point Lonsdale and altered course to port, placing the Lady Cheryl on a course towards Point Nepean.

3. Three of the four crew members that had been part of the previous voyage were awake for an extended period prior to the incident and all four had consumed significant quantities of alcohol after departing port.

4. Lady Cheryl did not have effective procedures to manage fatigue amongst its master and crew.

4.2 Contributing Factors

1. The master lost situational awareness as a result of the combined effects of alcohol and fatigue.

2. The master did not make effective use of available shore-based navigation aids and the navigation equipment aboard the Lady Cheryl.

5. SAFETY ACTIONS

5.1 Safety Actions taken since the event

5.1.1 Corporate Alliance Enterprises

Corporate Alliance Enterprises has updated the safety management manual for its fishing fleet to include:

- zero tolerance policy towards recreational drugs;
- fatigue management information;
- standard operating procedure checklists for departing and entering Port Phillip Bay.

5.1.2 Transport Safety Victoria

Transport Safety Victoria has reviewed its crewing policy and now mandates that fishing vessels carry a mate on voyages greater than 24 hours in duration.

Transport Safety Victoria has also initiated discussions with WorkSafe Victoria to develop strategies for employers to combat fatigue and the consumption of drugs and alcohol by vessel crew.

In relation to the recommended safety actions 2012027, 2012028 and 2012029 below, Transport Safety Victoria advised that they intend to audit the safety management plans of Corporate Alliance Enterprises and will also use these findings to inform the audit program for other commercial vessels.

5.2 Recommended Safety Actions

Issue 1

The master and four crew members of Lady Cheryl consumed alcohol knowingly in breach of company policy for its fishing fleet.

RSA 2012027

That Corporate Alliance Enterprises develops systems that better assure compliance with company policy on alcohol consumption.

Issue 2

At the time of the incident crew members had been awake for an extended period and the master demonstrated signs of fatigue. The company's vessel safety management system did not include specific guidance and procedures for the management of master and crew fatigue. Changes made to the company safety management manual since the incident do not provide these procedures; specifically in the management of work and rest schedules.

RSA 2012028

That Corporate Alliance Enterprises develops systems for its fishing fleet that manage and document hours of work and rest to reduce the likelihood of fatigue including systems to confirm watchkeepers are sufficiently rested before taking over the navigational watch.

Issue 3

The vessel's navigational equipment could have been programmed with the vessel's voyage plan and safety parameters set, such that audible and visual alarms would activate if the vessel deviated from its set plan or was in danger of collision. The vessel's safety management system manual did not provide any guidance to the master on this issue and in addition, did not provide any guidance on the composition of the navigational watch, nor its conduct, especially when navigating through areas of high risk in this case, Port Phillip Heads.

RSA 2012029

That Corporate Alliance Enterprises provides guidance and procedures to masters within its fishing fleet for the use of on board navigational equipment when navigating in areas of high risk.

Issue 4

The Port of Melbourne manages the designated channels of Port Phillip Heads and provides Vessel Traffic Services (VTS) to shipping. The services provided to smaller vessels are less well defined and there exists an opportunity to improve monitoring and warning services for these vessels.

RSA 2012030

That the Port of Melbourne Corporation considers the opportunities for expanding its vessel traffic services to smaller vessels, particularly for higher risk operations such as transiting Port Phillip Heads.