Office of the Chief Investigator
Transport Safety

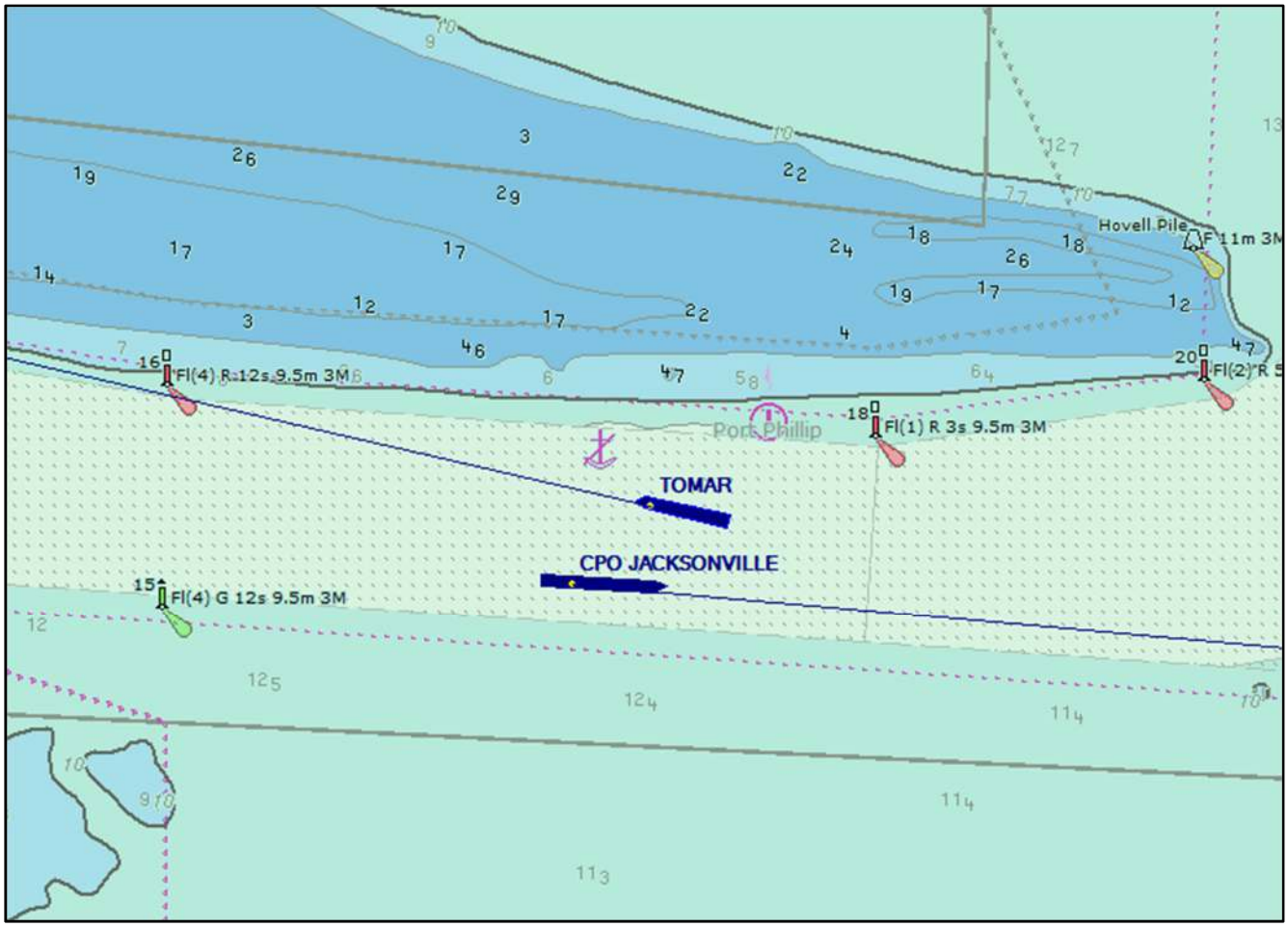
Marine Safety Investigation
Report No 2018/02

Navigational occurrence

MV Tomar and *MV CPO Jacksonville*

South Channel, Port Phillip

12 August 2018



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.

SAFETY SUMMARY

What happened

On 12 August 2018, car carrier *MV Tomar* was transiting Port Phillip, outbound from the Port of Melbourne. Shortly before 0310, it commenced its turn to starboard to round Hovell Pile and travel west along South Channel towards Port Phillip Heads. At the same time, the inbound container ship *MV CPO Jacksonville* was travelling east along South Channel, approaching the Hovell Pile turn.

Soon after 0313, *Tomar* was at the southern-most point of its turn, about 100 m from the edge of South Channel on its port side. At this point, *Tomar* was fine on the port bow of the approaching *CPO Jacksonville* that was at a distance of about 2,000 m. Concerned at the location of *Tomar*, the pilot of *CPO Jacksonville* delayed altering course to port and steered the ship to within 40 m of the southern edge of South Channel.

Tomar maintained its turn to starboard and moved back towards the north side of the channel as *CPO Jacksonville* maintained its course. At about 0315, the ships passed port-to-port about 130 m apart (shipside to shipside).

What the Chief Investigator found

It was found that the point at which *Tomar's* manoeuvre to round Hovell Pile was commenced, combined with the ship's turning radius, resulted in *Tomar* sailing south of the centreline of the narrowing section of South Channel. This led to an increased potential for conflict with the inbound *CPO Jacksonville*.

It was found that there was no documented plan agreed between pilot and master for the manoeuvre of *Tomar* around Hovell Pile. In addition, the pilotage provider, Australian Pilotage Group, had not provided its pilots with documented plans for the manoeuvre.

While not directly contributory to the occurrence, it was also concluded that:

- The Harbour Master's Directions for vessels converging at Hovell Pile lacked clarity, probably reducing the effectiveness of this risk control
- The marine regulatory framework was limited in its capacity to assure safe marine pilotage in Victoria.

What has been done as a result

Proactive safety actions taken include:

- The development and implementation of an Integrated Management System (IMS) by Australian Pilotage Group
- Crew training by *Tomar's* ship management, using this occurrence as a case study
- An update of Harbour Master's Directions for vessels converging at Hovell Pile
- Amendments to legislation to enhance the regulation of pilotage in Victoria.

Safety message

Agreeing and clearly defining intended ship manoeuvres is essential to allow pilots and ship's crew to monitor a ship's course and take corrective action as and when required.

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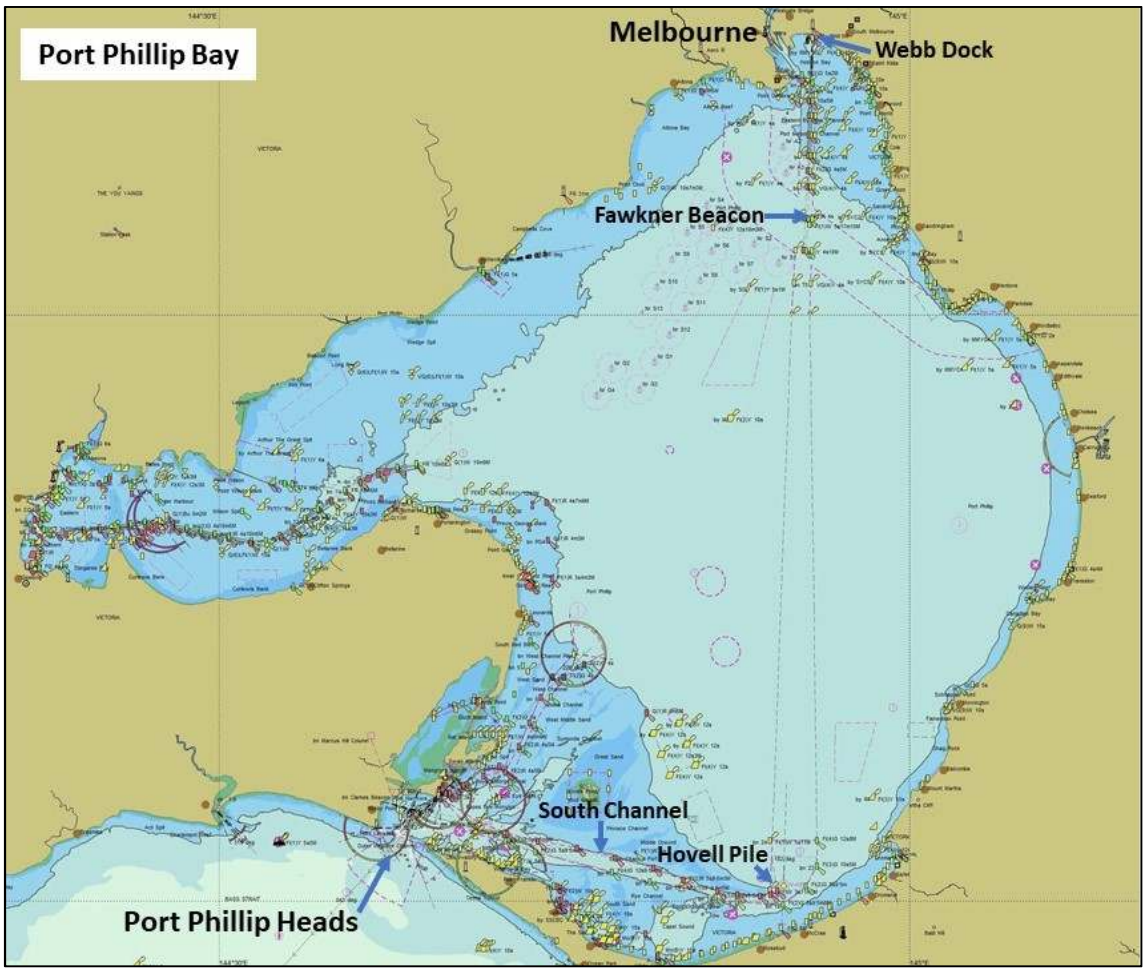
1. THE OCCURRENCE

At about 0057[1] on 12 August 2018, car carrier *MV Tomar* departed Webb Dock, Melbourne, bound for sea. A pilot had boarded at the berth, exchanged information with the master and the navigational conduct of the ship was transferred to the pilot. The detail of the passage was not discussed prior to departure, with the pilot preferring to discuss his navigational intentions with the bridge team as the voyage progressed.

The ship travelled south in Port Phillip (Figure 1) via the Port Melbourne Channel, and passed Fawkner Beacon at 0149.[2] Engine speed was increased to 90 RPM,[3] giving a ship speed of 17.3 knots[4] and an estimated time of arrival (ETA) of 0310 at Hovell Pile, and an ETA of 0355 at Point Lonsdale (at Port Phillip Heads).

Figure 1: Port Phillip (sometimes referred to as Port Phillip Bay)



Source: Australian Hydrographic Office with annotations by Chief Investigator Transport Safety

That same morning, container ships *MV Maersk Inverness* and *MV CPO Jacksonville* were due to arrive in Melbourne.

[1] All times referred to in this report are local time, Australian Eastern Standard Time (EST), Coordinated Universal Time (UTC) + 10 hours.
[2] All times, ship positions and communications are taken from Melbourne VTS (Vessel Traffic Services) radio and AIS (Automatic Identification System) recordings.
[3] At that engine RPM, the ship required about 15 minutes notice to reduce its engine revolutions to manoeuvring capability.
[4] 1 knot = 1 nautical mile per hour = 1.852 km per hour.

Maersk Inverness arrived at the pilot boarding ground (to seaward of Port Phillip Heads) at about 0200. A pilot boarded, and navigational conduct of the ship transferred to the pilot. The ship's ETA at Hovell Pile was 0305.

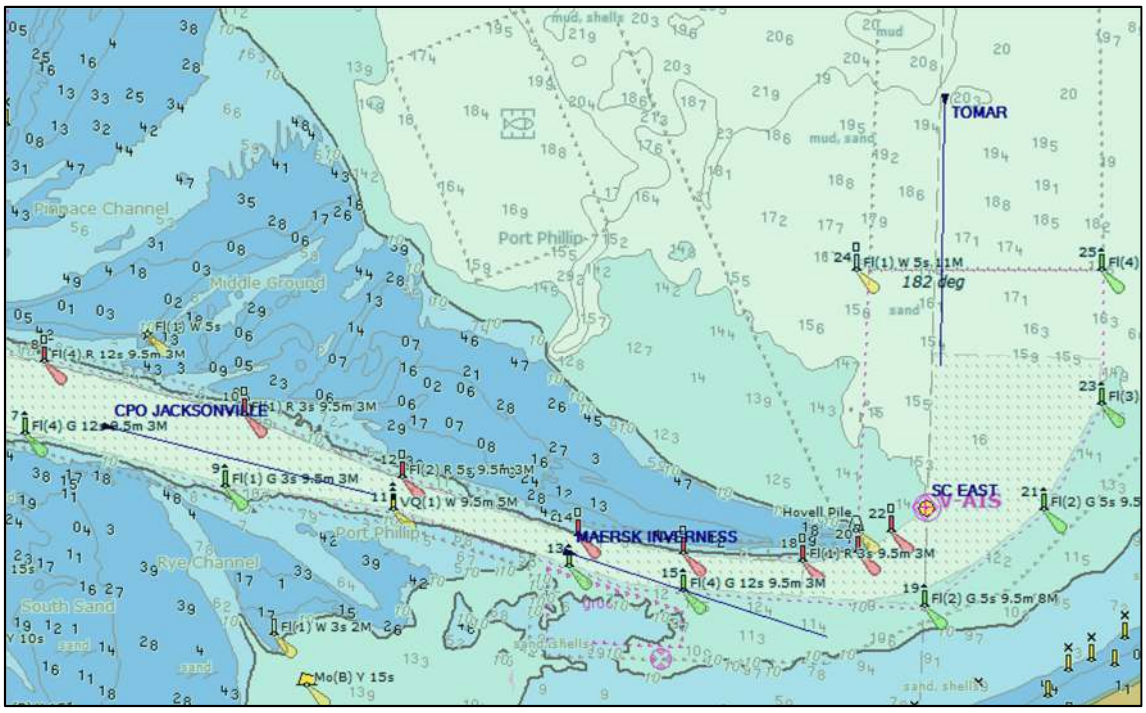
At about 0210, *CPO Jacksonville* arrived at the pilot boarding ground. On boarding the ship, the pilot provided the master with the pilotage passage plan. The passage plan was agreed between master and pilot, and navigational conduct of the ship transferred to the pilot. The ship passed through the Heads at about 0230, entered South Channel, and engine speed increased to about 85 RPM.[5] The ship's speed increased to about 18 knots. The ETA at Hovell Pile was 0315.

The three ships communicated their respective positions and ETAs to the port's Vessel Traffic Services (VTS)[6] and the VTS informed each ship of the other ships' ETA at Hovell Pile. Communications took place on the port's (VHF) working channel and were therefore open (broadcast) communications.

At about 0259, *Tomar* was about 3.4 nautical miles (nm) north of Hovell Pile. The pilot called VTS, seeking and receiving permission to enter South Channel, outbound. At that time, *Maersk Inverness* was about 2.5 nm from Hovell Pile and *CPO Jacksonville* was about 6.1 nm from Hovell Pile. At about 0301, *Tomar* was about 2.8 nm from Hovell Pile and *Maersk Inverness* was about 1.9 nm from Hovell Pile. The pilot of *Tomar* called *Maersk Inverness* and informed them of their intention to pass port-to-port. At this point, *CPO Jacksonville* was about 5.4 nm from Hovell Pile.

At 0304:40 the three ships were approaching Hovell Pile, with *Maersk Inverness* due to arrive at the turn first, followed by *Tomar* and then *CPO Jacksonville* (Figure 2).

Figure 2: *Tomar*, *Maersk Inverness* and *CPO Jacksonville* approaching Hovell Pile turn at 0304:40.



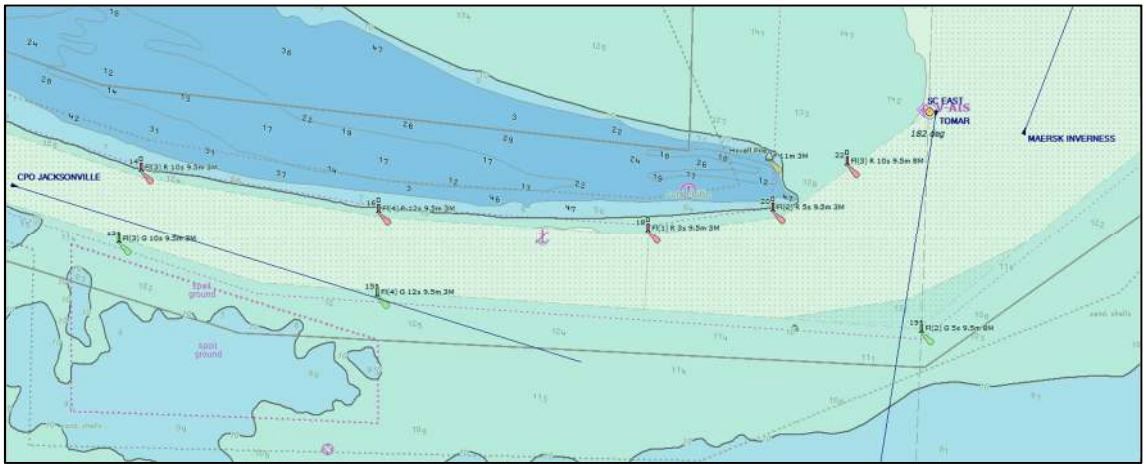
Source: Vessel Traffic Services

[5] At that engine RPM, the ship required about 25 minutes notice to reduce its engine revolutions to manoeuvring capability.
[6] The VTS has responsibilities to coordinate vessel traffic.

At 0309:22, *Tomar* was about 0.59 nm north-east of Hovell Pile and commenced turning to starboard, with a rate-of-turn of 20 - 25^0 per minute. *Maersk Inverness* was about 0.66 nm east of Hovell Pile and turning to port to head north towards Fawkner Beacon. *CPO Jacksonville* was still about 2.3 nm from Hovell Pile.

At about 0310, when they were approximately east north east of Hovell Pile, *Tomar* and *Maersk Inverness* passed at a separation of about 460 m, while *CPO Jacksonville* was still about 2.2 nm from a position due south of Hovell Pile (Figure 3).

Figure 3: *Tomar*, *Maersk Inverness* and *CPO Jacksonville* at about 0310

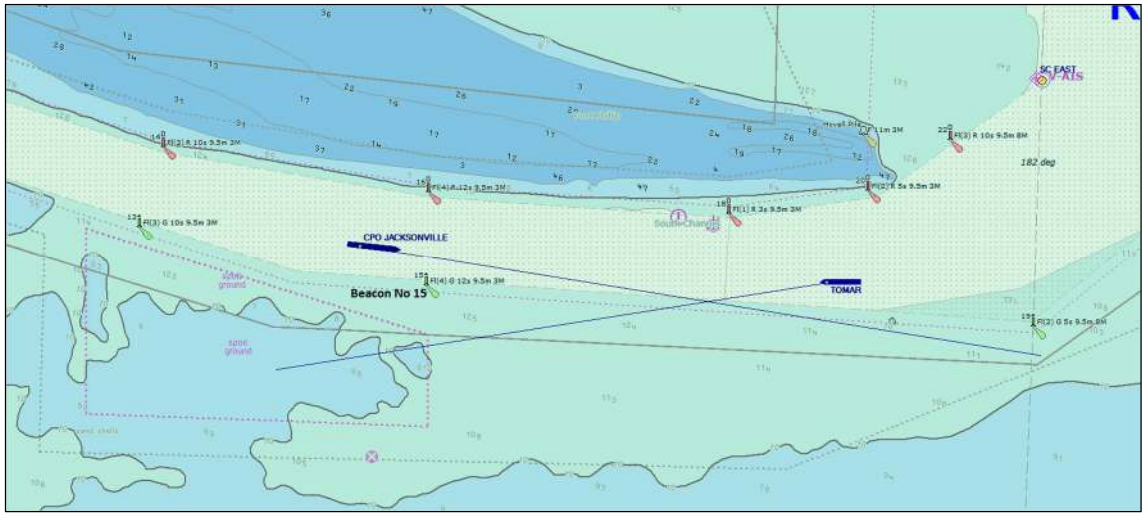


Source: Vessel Traffic Services

At 0312:45, *Tomar* was in a position approximately south of Hovell Pile. The pilot of *CPO Jacksonville* called VTS to enquire whether the pilot of *Tomar* was aware of the presence of *CPO Jacksonville* (in the channel). VTS replied that *Tomar* was aware and the pilot of *Tomar* also confirmed to VTS that they were aware of *CPO Jacksonville*. Around this time, Tomar's rate-of-turn increased slightly, to 28 - 30^0 per minute

At 0313:15, *Tomar* (now at a speed of 14.4 knots) was at the southern-most point of its turn and about 100 m from the edge of the channel on its port side (Figure 4). *Tomar* was fine on the port bow of *CPO Jacksonville* that was travelling at a speed of 17.8 knots. The distance between the two ships was about 1.1 nm (2,035 m).

Figure 4: The relative positions of *Tomar* and *CPO Jacksonville* at 0313:15

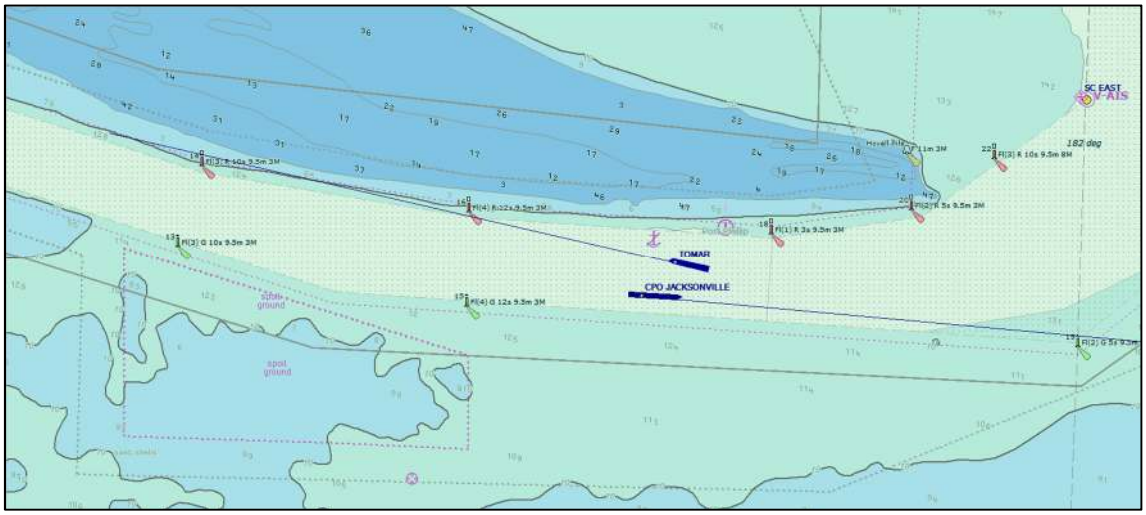


Source: Vessel Traffic Services with annotations by Chief Investigator Transport Safety

CPO Jacksonville was approaching Beacon 15 and at about this time the pilot would normally have altered the ship's course to port to sail parallel to and about 100 m from the edge of the channel on its starboard side. However, due to *Tomar* being fine on its port bow, *CPO Jacksonville* delayed altering its course to port and steered to within 40 m of the channel edge.

Tomar maintained its turn to starboard, moving back towards the north side of the channel. The ships passed about 130 m apart (Figure 5).

Figure 5: *Tomar* and *CPO Jacksonville* passing at 0315:20



Source: Vessel Traffic Services

2. CONTEXT

2.1 Location of occurrence

2.1.1 South Channel

South Channel is located in the southern part of Port Phillip. At its eastern end, it bends around Hovell Pile and extends north up to Beacons 24 and 25 (Figure 7). An imaginary line joining Rosebud Pier through Beacon 19 and the Virtual AIS mark divides this section of the channel into the main channel to the east and a secondary channel to its west (Figure 7 inset).

Regarded as the reference beacon for ships navigating the bend at the eastern end of South Channel, Hovell Pile is located west of Beacon 22 on the 10-metre depth contour (Figure 6).

Figure 6: Hovell Pile

Source: Port of Melbourne

The width of South Channel at its narrowest section is about 400 m. It has a maintained depth of 15.5 m, increasing to 16 m in the main channel that rounds Hovell Pile. The secondary channel has a maintained depth of 13.1 m.

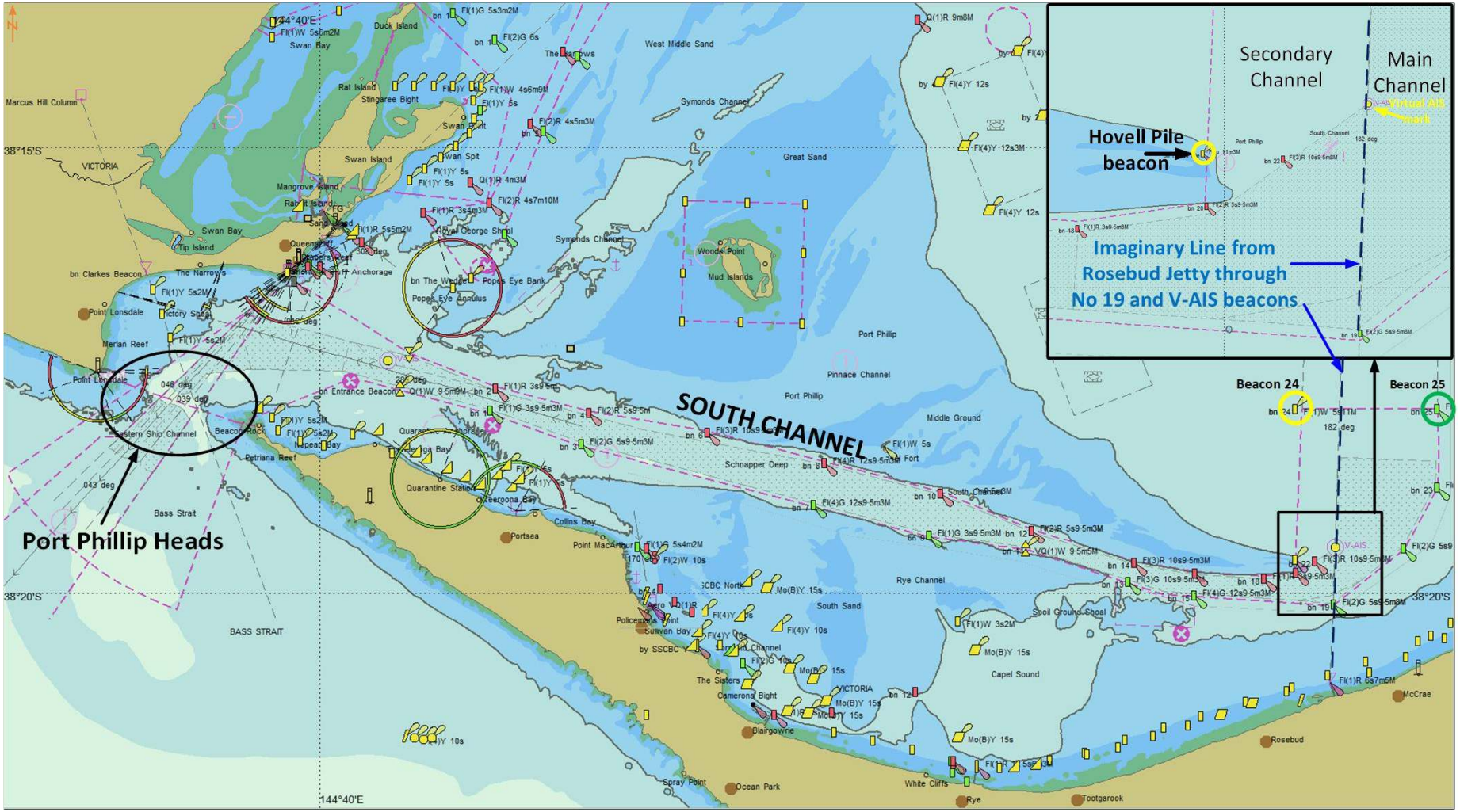
2.1.2 The north-south shipping fairway

The Port Phillip Shipping Fairway runs north-south, from the end of South Channel (Beacons 24 and 25) to Fawkner Beacon in the northern part of Port Phillip.

2.1.3 Environmental conditions at the location

At the time of the occurrence, visibility was greater than 10 nm, with no moon. The wind was 22 knots (gusting to 26 knots) from 280^0~285^0 (west by north) and the seas slight. The height of tide was 0.79 m above the charted datum and ebbing, with current at the location unlikely to have been significant.

Figure 7: South Channel and the location of Hovell Pile



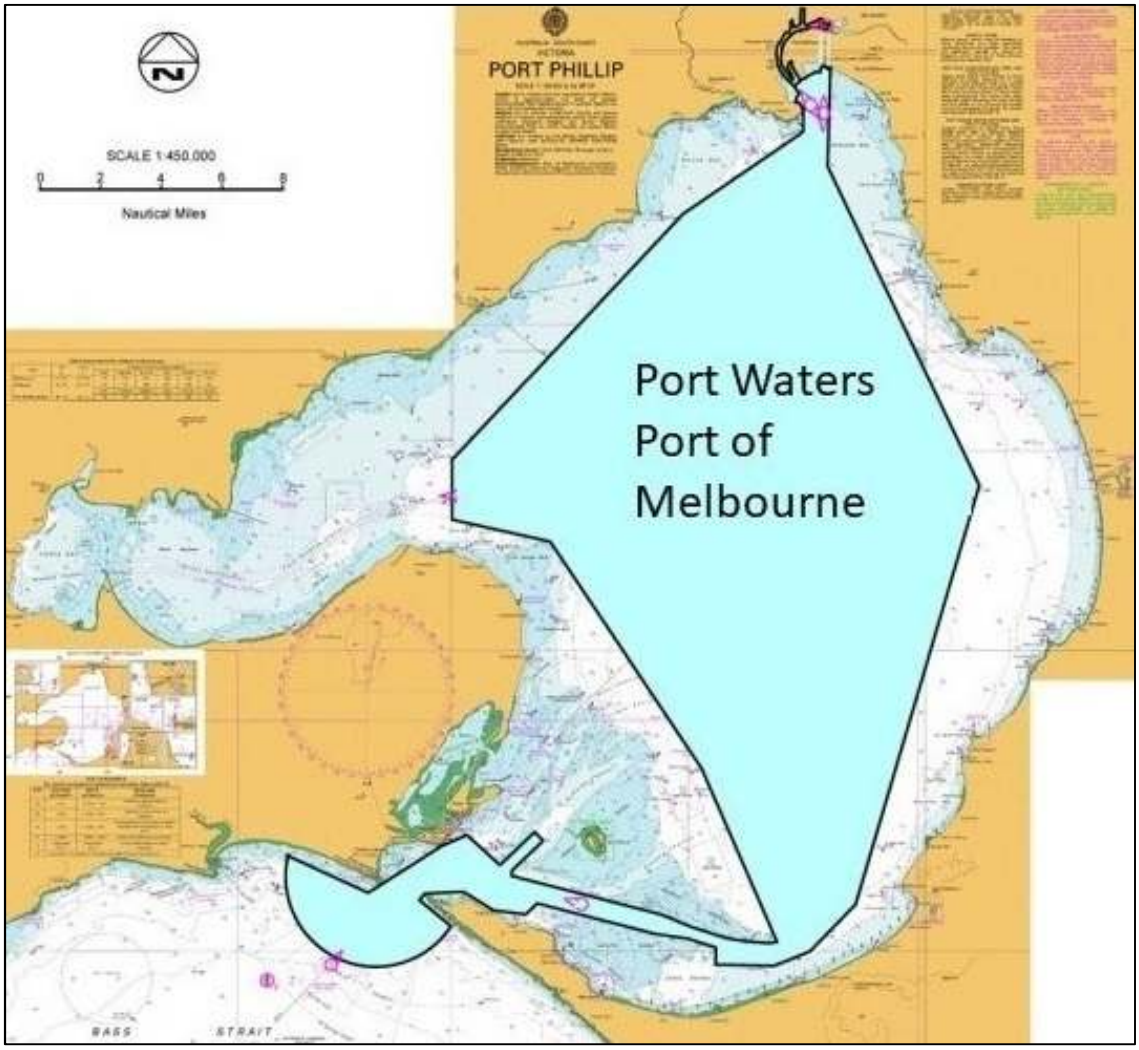
Source: Australian Hydrographic Office with annotations by Chief Investigator Transport Safety

2.2 Port of Melbourne

2.2.1 Victorian Ports Corporation (Melbourne)

The occurrence was in the port waters of the port of Melbourne. Victorian Ports Corporation (Melbourne) (VPCM) is the port manager of these waters. The port waters include shipping channels between sea and the port's berths, and a central portion of Port Phillip (Figure 8).

Figure 8: Port waters of the port of Melbourne



Source: Victorian Ports Corporation (Melbourne) with annotations by Chief Investigator Transport Safety

2.2.2 Vessel Traffic Services

VPCM was the authorised Vessel Traffic Services (VTS) Authority for the port waters of the port of Melbourne.[7] VPCM had responsibility to manage, operate and coordinate vessel traffic in these port waters. Objectives of the VTS included compliance with relevant laws and conventions, and improving the safety and efficiency of vessel navigation.

[7] In April 2014, the Australian Maritime Safety Authority issued a Vessel Traffic Services Instrument of Authority to VPCM under *Marine Order 64 (Vessel Traffic Services Authority) 2013*.

The services provided by the VTS included:

- the provision of essential and timely information to assist the on-board decision-making process
- traffic organisation services to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within port waters.

2.2.3 Harbour Master and Harbour Master's Directions

In accordance with the *Marine Safety Act 2010* (*MSA 2010*), VPCM was required to engage a licensed Harbour Master.[8] Pertaining to ship navigation within their port waters, the Harbour Master had a function to control and direct the navigation and other movement of vessels. Consistent with this function, the Harbour Master had powers to make written and/or oral directions with respect to ships entering or within port waters. Standing directions were published as Harbour Master's Directions (HMD).

Relevant to this occurrence, the HMD specified special requirements for vessels converging on Hovell Pile. The Directions required that a vessel with a similar time of arrival to another vessel at Hovell Pile must, no closer than 5 nm from Hovell Pile, communicate with the other vessel and VTS to agree on the arrangements for rounding Hovell Pile. Within this requirement, there was no definition of 'similar ETA'.

In this instance, the ETAs of *Maersk Inverness, Tomar* and *CPO Jacksonville* at Hovell Pile were 0305, 0310 and 0315 respectively. The only communication relevant to the HMD requirement for converging vessels was a call by *Tomar* to *Maersk Inverness* advising of a port-to-port pass. This communication was made at 0301, when *Tomar* was about 2.8 nm from Hovell Pile, and *Maersk Inverness* was about 1.9 nm from Hovell Pile. There was no relevant ship-to-ship communication initiated by *Maersk Inverness* or *CPO Jacksonville.*

2.3 Pilotage

2.3.1 Requirements

Vessels 35 m and over in length were required to engage the services of a licensed pilot when navigating the port waters of the port of Melbourne.[9] [10] Pilots were supplied by registered pilotage service providers.

2.3.2 Pilotage service providers

There were two pilotage service providers supplying pilots to ships operating in the port of Melbourne: Port Phillip Sea Pilots (PPSP) and Australian Pilotage Group (APG). The providers were registered by the Safety Director[11] in accordance with the requirements of MSA 2010.[12] Registration was an administrative process with no requirement to demonstrate competency or capacity to meet safety duties.

[8] Harbour Masters are licensed by the Safety Director in accordance with *MSA2010* Part 6.2.
[9] Specified by the Marine Safety Act 2010.
[10] A pilot is not required when the vessel is under the command of a pilot exempt master.
[11] Defined within MSA 2010 as the Director, Transport Safety within the meaning of section 3 of the *Transport Integration Act 2010*.
[12] Part 7.1 – Provision of pilotage services

MSA 2010 included safety duties that applied to pilotage providers.[13] It specified that pilotage service providers shall, so far as is reasonably practicable, ensure the safety of those services. A pilotage provider was required to ensure that a supplied pilot was not impaired by fatigue, alcohol or other drugs, was medically fit, and was qualified and competent. The pilot services provider was also required to provide such information, instruction, training or supervision to a pilot, as was necessary to enable the pilot to safely navigate, or facilitate the navigation of, a vessel.

Port Phillip Sea Pilots

In June 1839, Port Phillip Sea Pilots (PPSP) was registered by the Marine Board of Victoria[14] as a pilotage service provider for the ports of Melbourne, Geelong and Westernport. It had been operating as a pilotage provider since that time. PPSP had about 35 licensed pilots.

PPSP safety management system (SMS)[15] included detailed requirements for pilots to undertake prior to and after boarding a ship, including the master-pilot exchange of information. Guidance on the manoeuvre around Hovell Pile was also documented within its SMS. All pilots were issued with a Personal Pilotage Unit (PPU)[16] that were loaded with passage plans, and PPSP mandated the use of the PPU during pilotage. The PPSP SMS also included requirements for pilot medical checks, training and professional development.

Australian Pilotage Group

Australian Pilotage Group (APG) was first registered as a pilotage services provider in July 2015, under the name Melbourne Pilot Service Pty Ltd. Its name was changed to APG in February 2016 and it provided its first pilotage services in May 2018. At the time of the occurrence, APG had one licensed pilot and one trainee.

The APG SMS[17] contained detail on pilot responsibilities prior to and during pilotage of a ship. However, elements of the SMS were in development at the time of this occurrence. The APG SMS did not yet include detailed passage/course plans for pilotage within the port of Melbourne and the PPU issued to its pilot was not yet loaded with passage plans. Requirements for pilot medical checks, training and professional development were also not yet specified within the SMS.

2.3.3 Pilots and licensing

In accordance with MSA 2010, marine pilots were licensed by the Safety Director. The Director also had a function to develop standards for the training and licensing of marine pilots. Consistent with this function, the Safety Director issued The *Standard for Training and Licensing of Marine Pilots (Issue 2)* on 9 September 2013.[18] The standard specified qualifying training and examination requirements for pilotage applicants. Senior active pilots were used by the Safety Director to assist with the examination and on-board assessment of applicant pilots.

Pilot licences issued under MSA 2010 remained in effect unless suspended or cancelled. The licensing standard did not include requirements for maintaining a

[13] Part 2.3 – Safety duties of marine designers, manufacturers and suppliers and marine contractors
[14] The Victorian marine regulator at the time.
[15] PPSP Integrated System Manual dated 31 May 2018.
[16] The PPU issued to PPSP pilots is independent of the ship, and provides accurate position, COG, SOG, ROT and prediction information to the pilot.
[17] APG Safety Management Manual dated 17 July 2018.
[18] Superseding Issue 1, that was published on 29 June 2012.

licence such as ongoing demonstration of skills, nor did it specify medical requirements. The criteria for suspending or cancelling a licence were also not specified within the standard.

Pilot of MV Tomar

The pilot of *Tomar* was employed by APG. He had obtained his pilot licence in May 2003 when employed by PPSP.[19] This initial licence was valid for 10 years and was subsequently reissued by the Safety Director on 1 July 2012, [20] with no expiry date attached.

In February 2013, the pilot ceased employment with PPSP and worked as master on Australian coastal ships until about February 2018. In May 2018, he returned to piloting in the port of Melbourne. The Safety Director had required his competencies to be re-assessed prior to him resuming as a pilot in Victoria.

Pilot of MV CPO Jacksonville

The pilot of *CPO Jacksonville* was employed by PPSP. He obtained his pilot licence in June 2005. The initial licence was valid for 10 years and was subsequently reissued by the Safety Director on 1 July 2012 with no expiry date attached.

2.4 *MV Tomar*

2.4.1 Ship specifications

Tomar (Figure 9) was a 61,328 gross tonnage pure car/truck carrier (PCTC) owned by Wilhelmsen Lines Car Carriers Ltd, UK and operated by Wilhelmsen Ship Management Ltd, UK. It was registered in Southampton, United Kingdom and classed with DNV GL (Det Norske Veritas Germanischer Lloyd).

Tomar had a length of 199.99 m, breadth of 32.26 m and depth of 36.02 m. The summer draught was 11.025 m. The ship was fitted with a Mitsubishi UE 7UEC60LS II two-stroke seven-cylinder marine diesel engine of 13,240 kW, driving a single right-hand-screw propeller, giving it a speed of about 18.5 knots. The manoeuvring full-ahead speed was 14 knots, with a stopping distance at this speed of about one nautical mile. The rudder was a single, semi-balanced type with a maximum helm angle of 35^0.

Figure 9: MV *Tomar photographed on 03/09/2018*

Source: Wallenius Wilhelmsen

[19] In accordance with the provisions of the Marine Act 1988 (Vic) and the Code of Training and Licensing of Marine Pilots issued in September 1999 that were applicable at the time.
[20] All active marine pilot licences were reissued at the time of commencement of MSA 2010, on 1 July 2012

The ship's navigation and radio equipment complied with the requirements of Chapters IV and V of SOLAS[21] and was reported to be operating satisfactorily at the time of the occurrence. The equipment included an Electronic Chart Display and Information System (ECDIS) that interfaced with the ship's radars, AIS, gyro compass, speed log and Global Positioning System (GPS). The ship was fitted with a rate-of-turn indicator on the bridge.[22]

2.4.2 Departure condition

Tomar departed Melbourne for Port Kembla with 1403 vehicles on board, and a displacement of 30,142 t. Its draught was 8.70 m forward and 9.10 m aft. The ship's GM[23] was 1.77 m. The ship was upright at the berth however, on departing, the ship developed a port list of around one degree due to the effect of the wind on its starboard beam.

2.4.3 The bridge team

The bridge team for the outbound voyage consisted of the master (in command), the chief officer (watchkeeper), the helmsman and a look-out. They were assisted by a marine pilot supplied by APG. An APG trainee pilot was also on the bridge.

The master held a certificate of competency as master issued in accordance with REG.II/2 of the STCW convention, valid until November 2020. He had about seven years' command experience and had sailed as master of *Tomar* on several occasions. He had visited the Port of Melbourne several times as master and as a watchkeeper. The chief officer held a certificate of competency as master issued in accordance with REG.II/2 of the STCW convention, valid until April 2022. He had about five years' experience as chief officer. In the previous two years, the chief officer had been on a four-months-on – four-months-off roster on *Tomar* and had visited the Port of Melbourne several times during his career.

2.5 *M/V CPO Jacksonville*

2.5.1 Ship specifications

CPO Jacksonville was a fully cellular container vessel owned and operated by Borealis Maritime Limited, UK (Figure 10). It was registered in Monrovia, Liberia and classed with DNV GL.

The ship was 262.06 m long with a beam of 32.20 m and a summer draught of 12.52 m. The ship was fitted with a Hyundai-Wartsila 8RTA 82 two-stroke eight-cylinder marine diesel engine of 36,160 kW power, driving a single right-hand screw propeller, giving it a speed of about 23.7 knots at 102 rpm. It was also fitted with a 1,500 kW bow thruster, effective at speeds under 5 knots. Manoeuvring full-ahead speed was 16.2 knots. The stopping distance at this speed was about one nautical mile. The ship had a single semi-balanced stream line rudder with maximum helm angle of 35°.

[21] International Convention for the Safety of Life at Sea, 1974, as amended.
[22] There was no automated system. Some ships are fitted with a rate-of-turn controller which when set, automatically orders rudder movements to maintain a constant rate-of-turn.
[23] The metacentric height (GM) is a measurement of the initial static stability of a floating body. It is calculated as the distance between the centre of gravity of a ship and its metacentre.

Figure 10: MV *CPO Jacksonville*

Source: Borealis Maritime GmbH

The ship's navigational and radio equipment complied with the requirements of Chapters IV and V of SOLAS and was reported to be operating satisfactorily at the time of the occurrence. The equipment included an ECDIS that interfaced with the ship's radars, AIS, gyro compass, speed log and GPS.

2.5.2 Arrival condition

CPO Jacksonville arrived Melbourne from Sydney with about 30,122 t of general cargo loaded in containers, giving it a displacement of 54,807 t. Its draught was 10.10 m forward and 11.30 m aft.

2.5.3 The bridge team

The bridge team on the inbound voyage consisted of the master (in command), the second officer (watchkeeper), the helmsman and a look-out. They were assisted by a pilot supplied by PPSP.

The master held a certificate of competency as master, issued in accordance with REG.II/2 of the STCW convention, valid until June 2021. He had about 38 months' command experience. The master had visited the port of Melbourne on several occasions. The second officer held a certificate of competency as chief mate, issued in accordance with REG.II/2 of the STCW convention, valid until December 2021.

3. SAFETY ANALYSIS

3.1 Rounding Hovell Pile, outbound

3.1.1 Guiding rule

The navigation of ships in South Channel was governed by Rule 9(a), Narrow Channels, of the IMO's *International Regulations for the Preventing of Collisions at Sea, 1972*, as amended. This rule stated:

'A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.'

3.1.2 Conducting a turn around Hovell Pile, outbound

The approach

After passing Fawkner Beacon, outbound ships steer a course of approximately 182^0, parallel to an imaginary line extended from the Rosebud Jetty light through Beacon 19 and the Virtual AIS mark. The main channel is to the east of this imaginary line. Shallow draught ships will sometimes enter the secondary channel, steering a course on or just west of that imaginary line.

Constant-radius turn

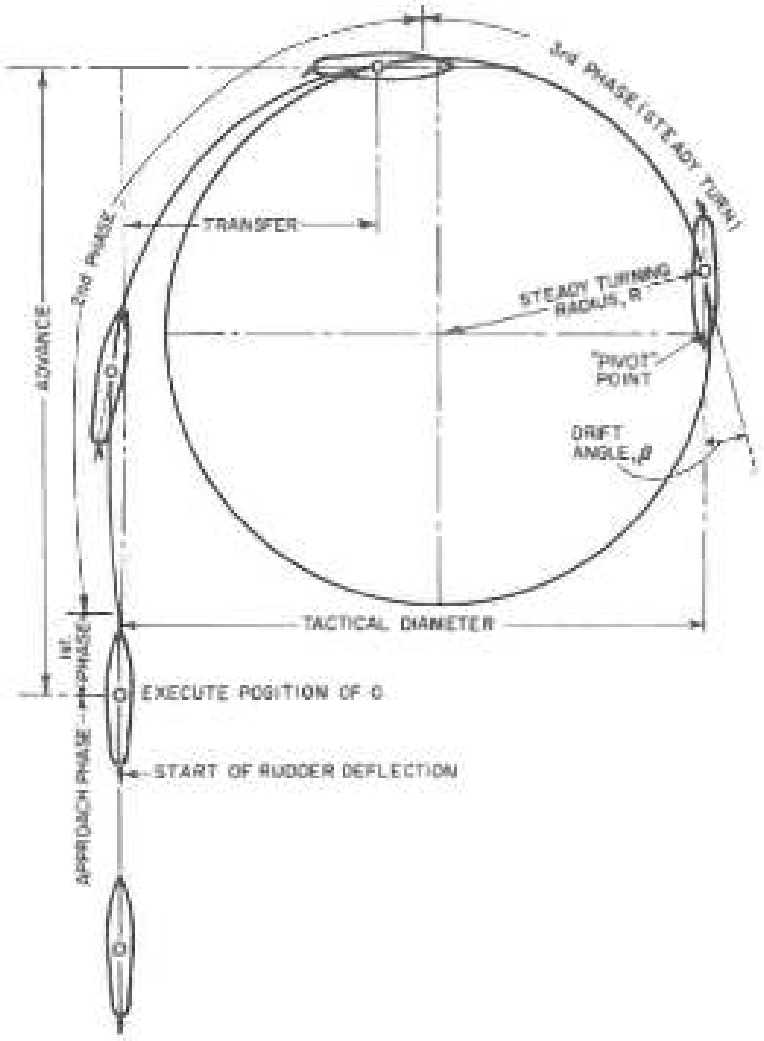
It is customary for ships to employ a constant-radius[24] turn when rounding Hovel Pile. A nominally constant-radius turn involves using a set rate-of-turn. The rate-of-turn is calculated based on the speed of the ship and the desired radius of the turn, using the following formula: [25]

$$\text{required rate of turn (degrees/minute)} = \frac{0.955 \times \text{speed of ship (knots)}}{\text{radius of turn (nm)}}$$

For a ship using this approach, the initial phase of the turn is not typically of constant radius. For a conventional ship with a single-screw fixed pitch propeller, the ship will typically travel about one ship's length from its 'wheel-over' position before it starts turning. For a starboard turning ship, there may be an initial small drift to port and a phase in which several dynamic forces interact before the ship settles into a constant-radius turn with forces in equilibrium (Figure 11).

[24] Sometimes referred to as a controlled-radius turn.
[25] For practical purposes 0.955 is sometimes rounded to 1.0

Figure 11: A diagrammatic representation of the turning circle of a ship



Source: Principles of Naval Architecture 1980, Section 6 The Turning Path of a Ship

In addition, the ship will slow in the turn, and for the given rate-of-turn (that was based on the ship's initial speed), the settled radius of the turn may subsequently be less than that originally sought. External forces such as wind and current also act on the ship, influencing speed, drift and turning radius.

There are a number of techniques available to assist the monitoring of the progress of the ship through the turn. These include monitoring the ship's cross-track drift[26] and comparing the ship's actual versus desired heading as it passes aligned beacons.

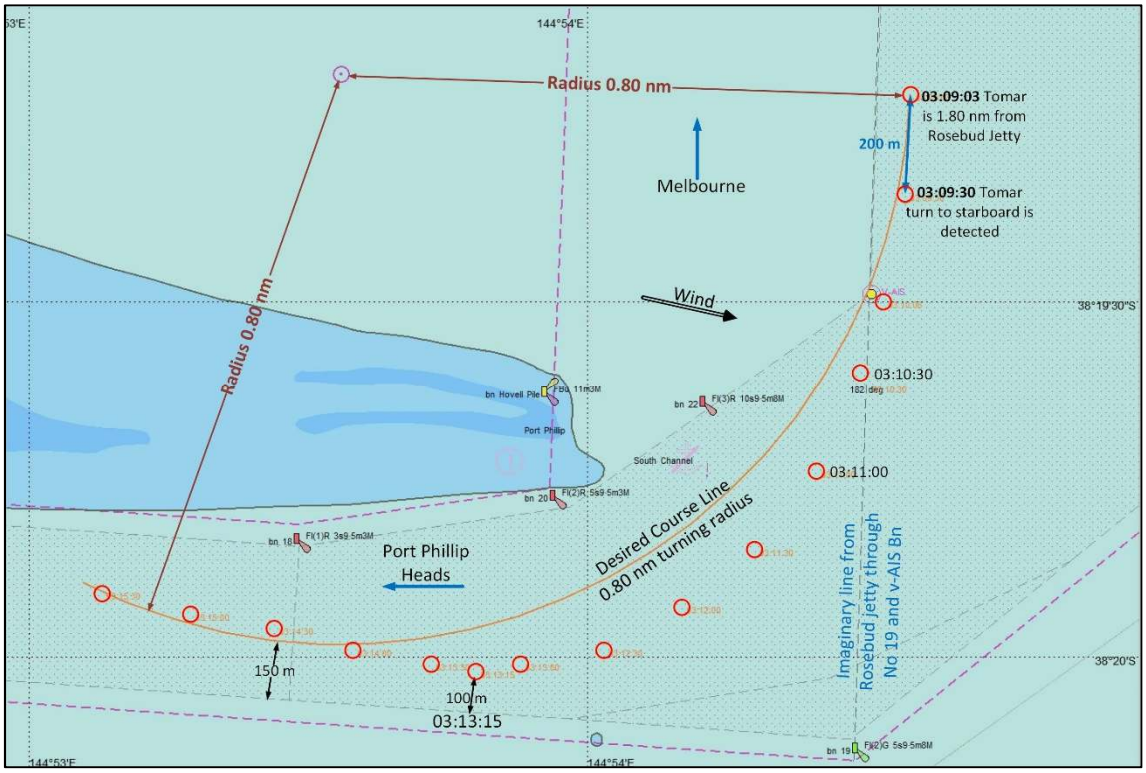
3.1.3 *Tomar*'s manoeuvre rounding Hovell Pile

To round Hovell Pile and enter South Channel, the pilot of Tomar was intending to conduct a 0.80 nm radius turn, commencing when the ship was 1.80 nm from Rosebud jetty. Using the constant-radius turn method and formula, and assuming a ship speed of 17 knots, the pilot determined a required rate-of-turn of just above 20^0 per minute. The actual rate-of-turn achieved for the majority of the turn was around 25^0 per minute.[27]

[26] The distance the ship drifts off its intended track.
[27] This would nominally equate to a turn radius of about 0.7 nm for a speed of 17 knots

The actual course of *Tomar* (using VTS data) was compared against a 0.80 nm constant-radius turn commencing at the ship's 0309:03 position when it was 1.80 nm from Rosebud Jetty (Figure 12). A point 0.80 nm off on the ship's starboard beam was selected as the centre of the constant-radius arc.

Figure 12: Track of *Tomar* plotted against the intended constant-radius turn



Source: Australian Hydrographic Office with annotations by Chief Investigator Transport Safety

The plot indicates that *Tomar* traced a path wider than the 0.8 nm arc, coming to within about 100 m of the edge of the channel on its port side. The 0.8 nm arc comes to within about 150 m of the edge of the channel when approximately abeam No 18 beacon.[28]

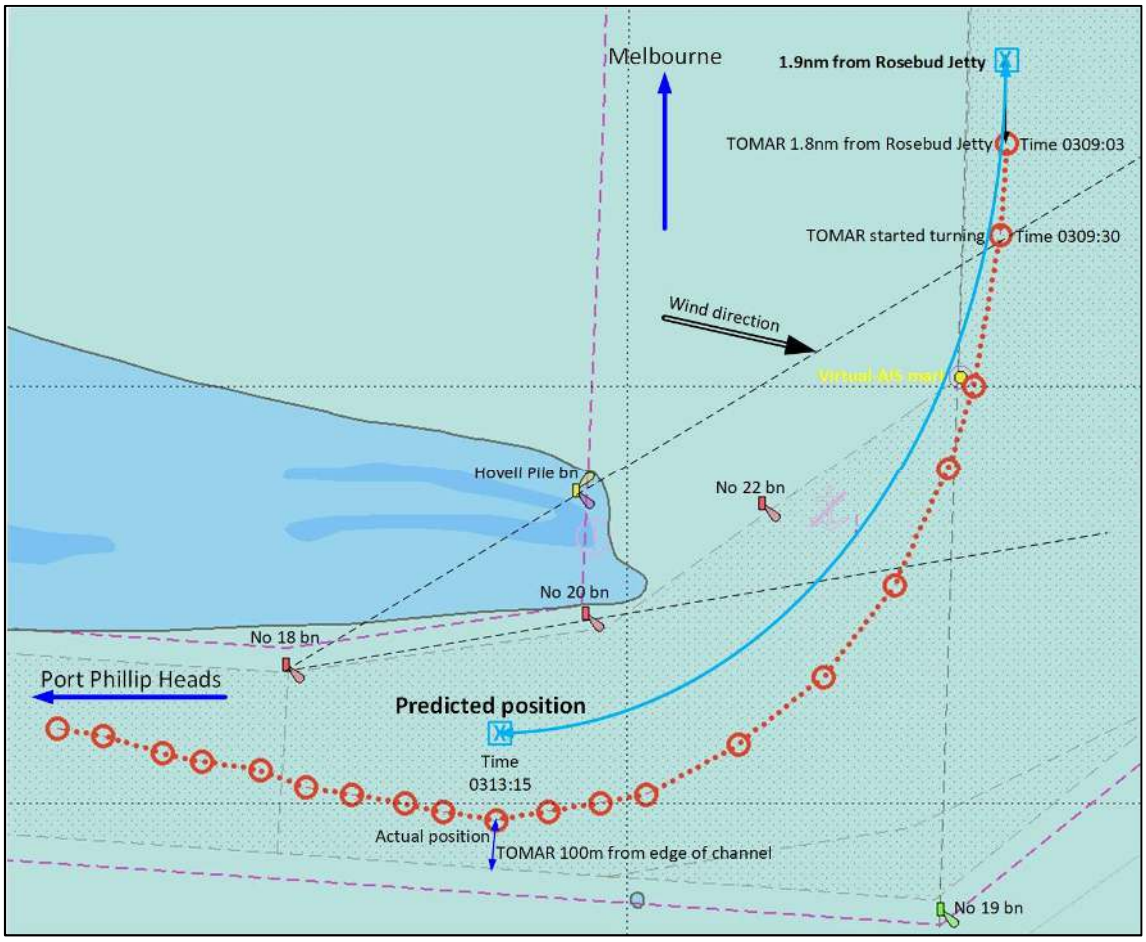
The delay in the turn was likely the result of the ship's response during the initial phase of the turn in which several forces interact before coming into equilibrium. The VTS records indicate that the ship travelled about one ship length before it started turning to starboard, at 0309:22. In addition, the 22 - 26 knot wind on *Tomar's* starboard beam probably increased the ship's drift to port, influencing the ship's turning radius and leading to a wider ship path.

[28] A 0.7 nm arc (nominally corresponding to a 25° per minute rate-of-turn) would end about 180 m north of the 0.8 nm arc.

Earlier start of turn

The track of the *Tomar* was compared to a predicted track had the turn been commenced when 1.9 nm from Rosebud jetty (or about 185 m further north). In such a scenario and in the same environmental conditions, the ship would have turned tighter around Hovell Pile, and entered the narrowing section of South Channel at a location significantly further north (Figure 13).

Figure 13: The track of Tomar (dotted red) compared to track if turn commenced 185 m earlier (blue)



Source: Australian Hydrographic Office with annotations by Chief Investigator Transport Safety

It was concluded that the point at which *Tomar's* manoeuvre to round Hovell Pile was commenced, combined with the ship's turning radius, resulted in *Tomar* sailing south of the centreline of South Channel.

Monitoring of turn and response

The planned turn was not plotted on the pilot's PPU or the ship's navigation systems. As a result, there was no charted reference against which the ship's actual track could be monitored by the bridge team.

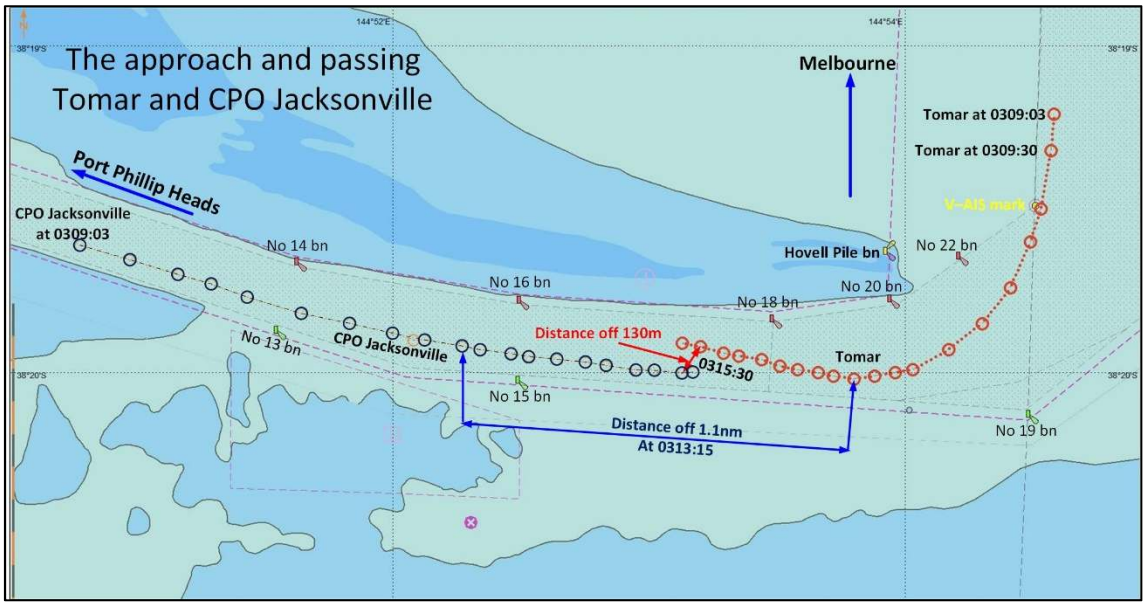
The pilot reported that he was monitoring the turn by checking ship headings at key points during the turn. The ship's heading was about 10^0 less than that required when No 20 and 22 beacons were aligned, and about 20^0 under when No 18 and 20 beacons were aligned. The pilot stated that during the turn he recognised that *Tomar* was not turning as quickly as he had anticipated. He made the decision to maintain a similar

rate-of-turn, concerned that an increase may lead to excessive ship heel.[29] The pilot stated that he was aware of *CPO Jacksonville* and believed there was sufficient sea room to complete the manoeuvre. The master of *Tomar* expressed a similar view.

At about 0313, *CPO Jacksonville* was at its planned position to alter course to port. However, with *Tomar* just over one nautical mile fine on its port bow, *CPO Jacksonville* instead maintained its course, coming to within 40 m of the edge of the channel on its starboard side. *Tomar* maintained its rate-of-turn, returning to the starboard side of the channel.

The closest point of approach occurred between 0315:20 and 0315:30, when the ships passed about 130 m apart (shipside to shipside) (Figure 14). The pilot of *CPO Jacksonville* then adjusted that ship's course to port.

Figure 14: The tracks of T*omar* and *CPO Jacksonville* until passing



Source: Australian Hydrographic Office with annotations by Chief Investigator Transport Safety

3.2 Passage planning and monitoring

3.2.1 Requirements

The development of a plan for voyage or passage, as well as the close and continuous monitoring of the vessel's progress and position during the execution of such a plan, are of essential importance for safety of life at sea, safety and efficiency of navigation and protection of the marine environment.[30] The need for voyage and passage planning applies to all vessels from berth to berth, including those areas necessitating the presence of a pilot.

3.2.2 Pilot

The APG safety management system (SMS) specified that pilots carry, among other equipment, the applicable passage plan and the portable pilotage unit (PPU). However, APG did not yet have a defined passage plan or approach to the manoeuvre around

[29] On the inbound trip to the port, a large applied helm resulted in a rate-of-turn greater than 30° per minute, and excessive ship heel. As a result, master and pilot agreed to maintain a moderate rate-of turn for the outbound passage.
[30] International Maritime Organisation Resolution A.893 (21), Voyage Planning, adopted on 25 November 1999.

Hovell Pile. The pilot deferred to his personal, undocumented plan of how to navigate this turn.

3.2.3 Pilotage services provider

The International Standard for maritime Pilot Organizations (ISPO) specified that the pilot organisation shall establish procedures for the preparation, planning and execution of the pilotage passage, with due consideration to local, national and international requirements and local best practice.[31]

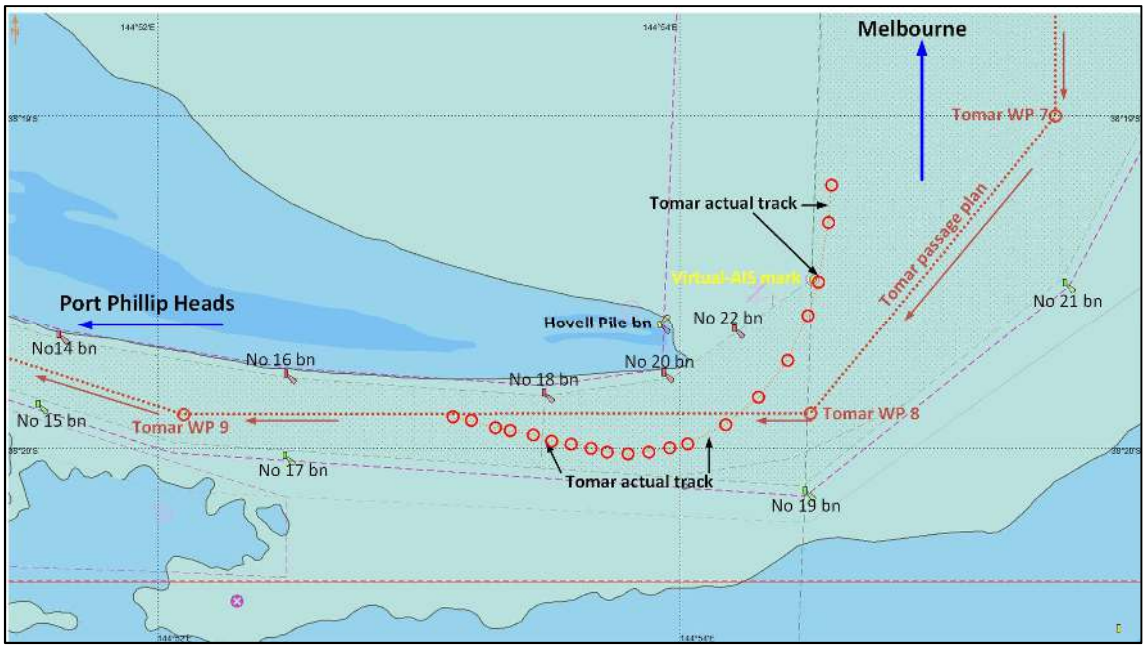
Pilotage services providers may develop plans for particular manoeuvres. Such information guides the decisions and actions of an organisation's pilots, and supports a consistent and best practice approach to pilotage. It also provides passage information for sharing with shipping companies and crew, improving the efficiency and effectiveness of the pilot-master exchange, and bridge resource management. In the case of APG, its safety management system was not yet populated with detailed passage planning information that may be expected in more mature systems.

3.2.4 Tomar passage planning

In accordance with IMO Resolution A.893, *Tomar* had developed an outbound pilotage passage plan. The plan documented the waypoints and the course to steer to each waypoint but did not define maximum allowable off-track margins or specific manoeuvring strategies.[32]

The actual track of the ship deviated from the ship's passage plan (Figure 15).

Figure 15: *Tomar*'s passage plan versus its actual track



Source: Australian Hydrographic Office with annotations by Chief Investigator Transport Safety

[31] ISPO, Part A section 7.3, 2015
[32] Guidance provided in the International Chamber of Shipping (ICS) Bridge Procedures Guide.

3.2.5 Bridge team interaction

IMO Resolution A.960(23) [33] states that the master and the pilot should exchange information regarding navigational procedures, local conditions and rules and the ship's characteristics. This information exchange should be a continuous process that generally continues for the duration of the pilotage.

During the course of a voyage, the bridge team should actively follow the progress of the vessel.[34] In the event that a deviation from the agreed plan (or a potential navigational error) is identified, the team member should not hesitate to challenge the pilot in a timely manner and confirm if the pilot is aware of the deviation.

In this instance, the pilot's plan for the turn at Hovell Pile was not documented and probably not discussed in detail with the ship's master. The pilot did not have a detailed plan loaded on his PPU and the ship's passage plan was inconsistent with the course intended by the pilot.

In the absence of an agreed plan, there was reduced opportunity for the turn to be monitored by the bridge team, and corrective action taken if required. In this instance, the bridge team was monitoring the passage of the ship but the deviation from the ship's plan was not raised with the pilot.

3.3 Risk management at Hovell Pile

Harbour Master's Directions (HMD) assist the management of risk and facilitate the safe operation of ships entering, leaving and navigating port waters.

To assist the control of traffic-related risks at Hovell Pile, the HMD specified that converging vessels communicate and agree passing manoeuvres. It required that 'the master of a vessel when notified that their vessel has a similar estimated time of arrival as another ship inbound or outbound at Hovell Pile … must, no closer than 5 nautical miles from Hovell Pile … communicate with the other vessel and … VTS to agree on the arrangements for rounding Hovel Pile ...'.[35]

However, the HMD were not specific on the meaning of a 'similar' time. The process by which the VTS may agree the arrangements was also unclear. The lack of clarity in this direction probably contributed to inconsistent application of the requirement and led to difficulty in its enforcement by VTS. In this instance, this HMD proved ineffective as a risk control.

3.4 Ship-to-ship communication

The HMD specified communication requirements for vessels converging at Hovell Pile. In this instance, direct communication was limited to a call made by *Tomar* to *Maersk Inverness*. The ship-to-ship communications between the three ships turning at Hovell Pile between 0305 and 0315 was probably inconsistent with the intent of the HMD for vessels converging on Hovell Pile.

[33] International Maritime Organisation Resolution A.960(23), Recommendation on training and certification and operational procedures, for maritime pilots other than deep-sea pilots. adopted on 5 December 2003.
[34] Australian Maritime Safety Authority (AMSA) Marine Notice 11/2016 Bridge Resource Management (BRM) and Expected Actions of Bridge Teams in Australian Pilotage Waters
[35] Harbour Master's Directions, 10th Edition, August 2017, section 3.13.4

Early, direct communication between *Tomar* and *CPO Jacksonville* would probably have clarified intent, removed doubt about their passing manoeuvre and reduced the potential for conflict between the vessels.

The ships were also under the conduct of pilots from different pilotage service providers, with potentially differing approaches to the manoeuvre around Hovell Pile. There had not been any detailed dialogue between PPSP or APG on pilotage protocols, and reliance was placed on Harbour Master's Directions for any on water interaction. Given the potential for some divergence in respective SMS, including approach to, or detail in, passage planning, on-water communications became critical.

3.5 Regulation of pilotage services

3.5.1 Background

The market environment for marine pilotage in Victoria underwent significant change with the registration of a second pilotage provider in 2015 and its commencement of services in May 2018. In light of this change, the VPCM commissioned an independent review of the Victorian Pilotage Regulation Framework.[36] Transport for Victoria (TfV)[37] also undertook a pilotage review, commissioned in March 2018 and completed in October 2018. The purpose of the TfV review was to identify opportunities to improve the regulatory framework for pilotage in Victoria, and it was conducted in consultation with the marine regulator (Transport Safety Victoria), VPCM and the Victorian Regional Channels Authority (VRCA).

It is not the intention of this report to duplicate the work of, or comment on, findings of these reviews. However, in the course of this investigation, potential limitations of the regulatory framework were identified.

3.5.2 Pilotage service providers

Matters of safety in the provision of pilotage rely in part on the regime for licensing pilots, and more holistically on the legislative requirement for pilotage services providers to meet specified safety duties.[38]

In transport and many other industry sectors, safety is managed, and safety duties fulfilled, using a safety management system (SMS). An SMS provides a systematic approach to managing safety and typically includes policies and procedures to assure consistent and safe practices to reduce risk. In terms of pilotage, this will include systems for maintaining pilot competency and medical fitness, and to support consistent and safe pilotage. Both PPSP and APG had an SMS.

In some jurisdictions, regulators oversee the SMS of providers of pilotage services. For example, applicants for an Australian Maritime Safety Authority (AMSA) pilotage provider licence (for coastal pilotage) are required to submit their SMS, and pilotage providers are subject to periodic audit of their safety management.[39] In New South Wales, pilotage providers are required to have a documented SMS to manage the risk to life, vessels, port infrastructure and the environment within the pilotage port or

[36] Thompson Clarke, Review of Victorian Pilotage Framework, Preliminary Report, August 2018.
[37] Part of the Department of Economic Development, Jobs, Transport and Resources.
[38] MSA 2010 section 29
[39] Marine Order 54 (Coastal Pilotage) 2014 made under the Navigation Act 2012

pilotage area during pilotage, in a manner consistent with the Australian Standard AS/NZS 31000:2009. [40] [41]

In Victoria, registration of pilotage services providers was a largely administrative process and the Safety Director was required to register a pilotage services provider if these administrative requirements were met. MSA 2010 included a general function of the Safety Director to 'monitor compliance with a relevant marine safety law'.[42] However, the Act did not provide specific guidance on the assurance framework against which a pilotage provider's compliance with its safety duties would be demonstrated or assessed.

3.5.3 Licensing of pilots

In Victoria, marine pilots were licensed by the Safety Director in accordance with standards developed by the Director. Licences were issued in perpetuity and the responsibility for pilots maintaining their capability resided primarily with the pilotage services providers. The relevant safety duties of pilotage services providers included ensuring pilots were medically fit, qualified, competent and trained to enable them to carry out pilotage duties.[43]

Once a licence was issued, the licencing authority (the Safety Director) undertook limited regulatory oversight of the maintenance of pilot competency and medical fitness, except in the case of a reported incident. By way of comparison, for Australian coastal pilotage,[44] licenses were valid for two years and renewal dependent on the pilot demonstrating that they had completed the minimum stipulated pilotage trips and professional development. In addition, coastal pilots were required to hold a Certificate of Medical Fitness.[45]

The introduction of a second pilotage services provider in Victoria has also added complexity to the examination of licensing of pilots. Historically, licensing of marine pilots in Victoria has drawn on the specialist expertise of the incumbent pilotage provider, PPSP. However, in a competitive pilotage environment, a new paradigm for assessment may need to be considered.

[40] NSW Marine Pilotage Code Volume One, published by Transport for NSW on 1 February 2011, Revised 23 October 2015.
[41] AS/NZS ISO 31000: 2009 Risk Management – Principles and Guidelines, provides agencies with principles and general guidelines to be considered when developing risk management frameworks and programs.
[42] Section 258 of MSA2010.
[43] Section 29 of MSA2010
[44] Administered by AMSA
[45] A Certificate of Medical Fitness is issued on compliance with AMSA's Standards for the medical examination of seafarers and coastal pilots and is valid for one year for persons aged 55 years and over and for two years for persons under 55 years.

4. FINDINGS

4.1 Context

From the evidence available, the following findings are made with respect to the navigational occurrence between *M/V Tomar* and *M/V CPO Jacksonville* in the South Channel, Port Phillip, on 12 August 2018. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

4.2 Contributing factors

- The point at which Tomar's manoeuvre to round Hovell Pile was commenced, combined with the ship's turning radius, resulted in Tomar sailing south of the centreline of the narrowing section of South Channel.

4.3 Other factors that increased risk

- **The Australian Pilotage Group did not have systems in place to assure that its pilots were provided with a documented plan for rounding Hovell Pile. [Safety Issue]**

- The planned rounding of Hovell Pile by *Tomar* was not clearly documented and agreed between the pilot and the ship's master, reducing the ability of the bridge team to effectively monitor the manoeuvre.

- **The Harbour Master's Directions for ships converging on Hovell Pile lacked clarity, probably reducing the effectiveness of this risk control. [Safety Issue]**

- The ship-to-ship communications between the three ships turning at Hovell Pile between 0305 and 0315 was inconsistent with the intent of the Harbour Master's Directions for vessels converging on Hovell Pile.

- **Marine safety legislation did not provide specific guidance on the assurance framework against which a pilotage provider's compliance with its safety duties would be demonstrated or assessed. [Safety Issue]**

5. SAFETY ISSUES AND ACTIONS

The safety issues identified during this investigation are listed in the Findings and Safety issues and actions sections of this report. The Chief Investigator, Transport Safety expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the Chief Investigator prefers to encourage relevant organisation(s) to proactively initiate safety action.

5.1 Pilotage Services Provider risk controls

Number:	2018-02-001
Issue owner:	Australian Pilotage Group

Safety issue description

The Australian Pilotage Group did not have systems in place to assure that its pilots were provided with a documented plan for rounding Hovell Pile.

Proactive action taken by Australian Pilotage Group

Australian Pilotage Group (APG) advised that safety actions include the development and implementation of an Integrated Management System (IMS) and compliance with international quality assurance standards. Within its IMS, guidance has been included on the pilotage of ships around Hovell Pile. APG also advised that information for this manoeuvre has been uploaded to pilot PPU.

5.2 Harbour Master risk controls

Number:	2018-02-002
Issue owner:	Harbour Master Port of Melbourne

Safety issue description

The Harbour Master's Directions for ships converging on Hovell Pile lacked clarity, probably reducing the effectiveness of this risk control.

Proactive action taken by Harbour Master

The Harbour Master's Directions relating to the management of vessels converging at the Hovell Pile have been amended to minimise opportunities for misinterpretation. The Harbour Master also issued a Notice to Mariners establishing a reporting point to the north of Hovell Pile in order to aid traffic management in the area.

5.3 Regulation of Pilotage Services Providers

Number:	2018-02-003
Issue owner:	Department of Transport

Safety issue description

Marine safety legislation did not provide specific guidance on the assurance framework against which a pilotage provider's compliance with its safety duties would be demonstrated or assessed

Proactive action taken by the Department of Transport

The Department of Transport advised that legislative amendments have been made to strengthen the provisions for the registration of pilotage services providers. They introduce requirements for the Safety Director to be satisfied that the provider (to be registered) has the competence and capacity to carry out pilotage services safely. Requirements to be met or satisfied for registration include requirements in relation to safety management systems, and systems to ensure pilots are qualified, competent and medically fit.[46] The Department advised that regulation prescribing specific safety management system requirements are expected to be introduced in 2020.

5.4 Additional safety actions

Department of Transport

Further to section 5.3, the Department of Transport advised that legislative changes have been made to provide the Safety Director with the capacity to suspend or cancel the licences of pilots that have not been in service for over 12 months or have indicated that they do not intend to act as a pilot in the future. The Department advised that these amendments provide a capacity to end perpetual licences.

Ship Management of Tomar

Wilhelmsen Ship Management (WSM) advised that:

- Following an internal review of the occurrence, WSM conducted advisory training of its masters and senior officers. The training covered the master-pilot exchange and used the *Tomar* occurrence as a case study.
- The experience of this occurrence has been distributed to the entire WSM fleet for discussion at Bridge Team Management Meetings.

[46] These MSA 2010 amendments came into effect on 1 January 2020.