



***R2A CASE STUDIES***  
***SYDNEY PORTS PILOTAGE SAFETY***  
***DUE DILIGENCE REVIEW***

## BACKGROUND

The following case study has been developed based on the review for Sydney Harbour (Port Jackson). It is presented with the approval of the Harbour Master.

In late 2013, R2A were commissioned to complete a safety due diligence review to confirm that all reasonable practicable precautions are in place for all credible, critical safety issues associated with the movement of ships in Port Botany and Sydney Harbour. The results of which were incorporated into the Pilotage Safety Management System (PSMS). This case study only considers Sydney Harbour.

R2A is an independent consultancy of due diligence engineers specialising not only in due diligence and defensible risk management, but also consulting, education and general troubleshooting.

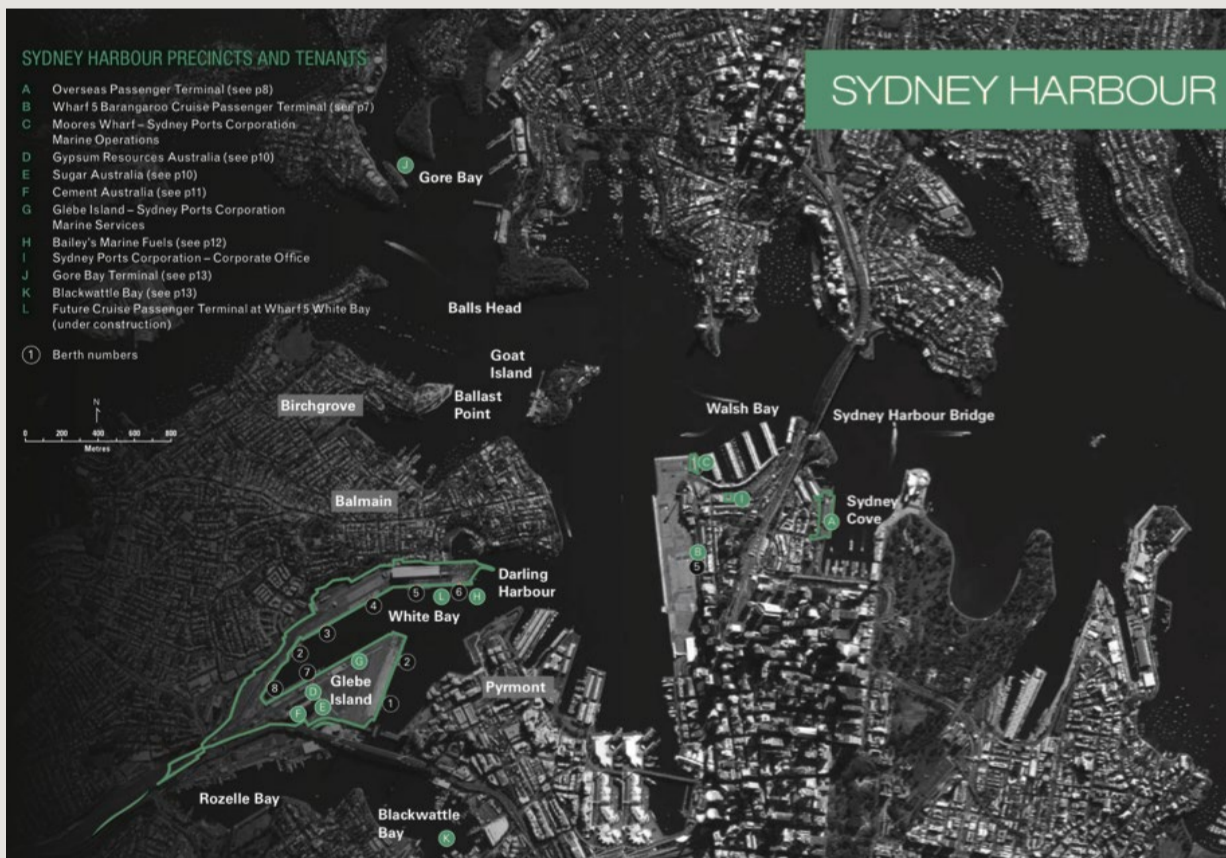


# PORT JACKSON

Port Jackson containing Sydney Harbour is a thriving port that caters for an unrivalled mix of commercial shipping and recreational boating activities. Sydney Harbour’s commercial wharves are located less than 10km from bluewater shipping lanes.

Sydney Harbour is a leading destination for cruise ships, with passenger vessel facilities located at the Overseas Passenger Terminal at Circular Quay and the White Bay Cruise Terminal. Sydney is the only port in Australia with two dedicated cruise terminals.

The port handles a wide range of vessels through its 11 berths shown here, including dry liquids, general cargo and cruise. Facilities covering a total of 41.7 hectares are located in Walsh Bay, Glebe Island, White Bay and Circular Quay. Private facilities are located at Gore Cove.



# PILOTAGE DECISION SEQUENCE

A due diligence approach was used for this review as the Risk Management Standard (ISO 31000) approach is not defensible for high consequence - low likelihood events.

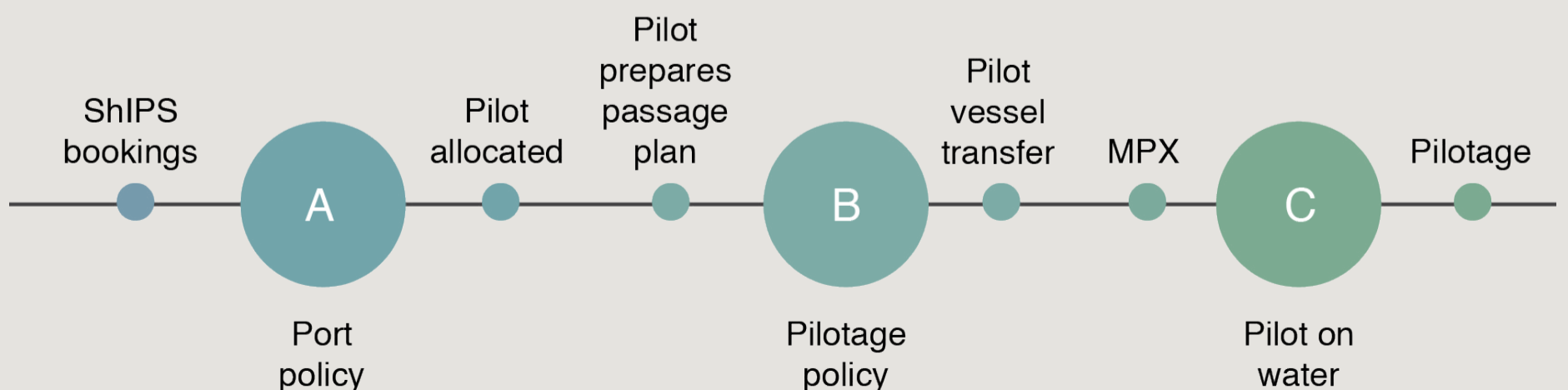
With regards to pilotage operations in Port Jackson, there appears to be three go, no-go decision points as shown in the pilotage time sequence below.

- A Port Policy as described in the Harbour Masters Directions and Central Booking System Procedures. This checks for vessel size, type age, berth specific parameters and vessel condition, under keel clearance etc.
- B Pilotage Policy based around environmental conditions go, no-go decision. Generally determined by pilot embarkation safety. Special cases determined after consultation with the pilots (Pilot Manager and some check pilots).
- C Pilot on water go, no-go decision. This is based on the actual conditions on the water. For example, unexpected high winds or fog, insufficient tugs available etc.

A completeness check using a zonal vulnerability approach was used to ensure key issues were not overlooked.

Four critical issues were identified:

- Pilot boarding safety
- Collision with other vessels
- Grounding
- Allision (with infrastructure, typically wharves)



## **SYDNEY HARBOUR ZONAL VULNERABILITY AND PRECAUTIONARY ANALYSIS**

The following table lists the identified issues (on a zonal basis) and the precautionary analysis for Sydney Harbour (Port Jackson). A first cut of the issues and precautions was developed during generative interviews with representative pilots. The pilot group then reviewed the list and responded accordingly. Finally, this was tested and further refined during a larger stakeholder workshop.

To complete the due diligence process, two further questions were asked at the conclusion of the workshop:

- Are there any other issues of concern which have not been considered?
- Are there any other practicable precautions, the value of which has not been tested?

The Sydney Pilots were not aware of any outstanding safety issue which is not already considered in the PSMS, or in the issues table which is being progressively incorporated into the PSMS.



| ZONAL REFERENCE  | ISSUE   | POSSIBLE FURTHER ACTION   | PILOTS' RESPONSE  | STATUS   |
|--|---|---|---|--|
| Pilot Embarkation to Line Zulu                         | Should the pilot be on board and have conduct of the vessel at the 4nm port limit (compulsory pilotage area)?<br><br>From an arrival safety perspective, the pilot should have conduct of the vessel at 2nm and be north of the separation zone. If not, there is adequate sea room to turn back.<br><br>On departure, if all clear and safe to do so, pilots often disembark at 2nm, well within the compulsory pilotage area. | Reduce the port limit and compulsory pilotage area to 2 or 3nm whilst leaving the pilot boarding ground at 4nm as shown.  | Any solution needs to take into account that pilots need to comply with relevant legislation. Of the possible solutions considered the one considered the most suitable is to lobby for an amendment(s) to the NSW Marine Safety Act 1998. The purpose of the amendment(s) would be to create a "compulsory pilotage zone" inside the port limits of each port. It is proposed that the limit of the new zone would be a line of radius approx. 1.5 – 2.0nm from Henry Head in Botany Bay & approx. 1.5 – 2.0nm from South Head in Sydney Harbour, i.e. 2.0 – 2.5nm inside the port limits of each port.<br><br>The harbour master has committed to consult with the pilots to come to an agreed position regarding any proposed amendment(s) to legislation, which may include the solution above. | Port limit to remain but compulsory pilotage area to be redefined consistent with the requirements of the PSMS.<br><br>Harbourmaster to liaise with review of the legislation.<br><br>May take 6 or 12 months to resolve.  |
| Line Zulu to Sea Buoy                                  | Controlling the ship during blackout or steering failure and tugs not tied fast when approaching the Western Channel. Tying tugs fast is difficult in a big swell.<br><br>Simulations suggest it is possible to control ship with two anchors and tugs pushing prior to manoeuvring for or entering into the Western Channel.   | Wave rider buoy at Sea buoy might be desirable to accurately determine swell (see following issue too) and determine a go, no go pilotage.  | 1. The option of installing a waverider buoy near the Sea Buoy should be considered by the Technical Committee. With increasingly frequent adverse weather more information would be helpful for pilots when having to make the "go/no-go" decision.<br>2. The issue of having tug(s) at the port entrances for all ships is a matter for the consideration of the SPC/harbour master.<br>3. All ships with tug(s) in attendance should not proceed at a speed of more than 10 knots, & when they are required to make fast should not proceed at a speed of more than 8 knots. This needs to be documented in the PSMS.<br>4. Define when a tug is "in attendance".  | Wave rider buoy at Sea Buoy not seen to be needed.<br><br>Not one size fits all.<br><br>Review of different scenarios and ship types, for how a blackout etc should be handled (anchors, speed etc) including recognition that if a tug is available it ought be used. |
| Western Channel (Sea Buoy/Middle Head to Georges Head) | A large ship foundering here will block Sydney Harbour to large ships. Western channel is dredged in sand (approximately 270m wide).<br><br>A blackout etc on a large ship in channel without tugs made fast makes this a credible possibility.   | 1. Swell conditions resulting in the tugs not being able to be made fast might be a second criteria in deciding that Port Jackson should be closed (in addition to pilot embarkation safety requirements).<br>3. On departure tugs to hold fast until clear of the Western Channel.<br>3. One way traffic from the southern end of Western Channel to Line Zulu (one way traffic in Western Channel is coordinated by advisory VTS).<br>4. Escort tug desirable for safe departure transit through the Western Channel. | 1.It is more important to have tug(s) in attendance & the ship at a suitable safe speed, than having tug(s) fast.<br>2.Past experience indicates there is minimal likelihood of a ship emergency after passing Fort Denison when departing Sydney Harbour. Therefore, current arrangements are considered suitable.<br>3.Recent reductions in the volume of shipping in Sydney Harbour means that requiring only one way traffic in the Western Channel will have minimal impact on port efficiency & therefore should be considered. To be documented in Harbour Masters Directions & the PSMS.  | Captured in previous item.<br><br>Advise VTS to avoid, where possible, passing ships and tows in Western Channel.  |
| Western Channel to Bradleys Head                       | Yacht races and regattas sail anywhere creating collision potentials. This can include kayakers, pleasure craft and unannounced dives.<br><br>Presently an escort vessel is always provided, usually the pilot vessel. However, the escort vessel is not authorised to issue infringement notices.  | Formalise the escort function and powers of the escort vessel (acting with the delegated authority of the Harbourmaster via the Pilot) and range, for example, berth to Sea Buoy and vice versa.  | 1. The powers of the escort vessel is the responsibility of the Harbour Master.<br>2. The escort function has been in effect for a number of years. It is proposed to further refine & formalise the escorting function & include the requirements in the PSMS.<br>3. The variability of performance of the escort vessel is noted, e.g. not establishing contact on the VHF working channel, positioning too far ahead of ships, etc. Feedback to be passed on to crews performing this important function.<br>4. Safe speed of the ship, proper lookout & appropriate use of the ship's whistle also assist to mitigate the risks associated with smallcraft.   | Harbour Master to provide pilots with copy of escort vessels delegations.  |
| Western Channel to Bradleys Head                       | Potential winds   | None Stated   | Potential winds are well known & managed by pilots  | Harbour Master to provide pilots with copy of escort vessels delegations.  |
| Bradley Head to Fort Denison                           | 11.5 m depth level just east of Fort Denison (see PSMS Section 10.6 & 5.1.4).   | Rule change for all vessels of 12m draft to go north of Fort Denison.   | Already addressed in PSMS 10.6 (5.1.4.b), i.e. at the discretion of the pilot to proceed either north or south of Fort Denison. Proceeding north of Fort Denison requires clearance from VTS.   | Existing PSMS seen to sound.   |

| ZONAL REFERENCE       | ISSUE   | POSSIBLE FURTHER ACTION   | PILOTS' RESPONSE   | STATUS  |
|-----------------------|---|---|--|---|
| West of Fort Denison  | Large ship collision potentials west of Fort Denison.   | No commercial ships to pass (each other) west of Fort Denison.  | No current requirement in Harbour Masters Directions. However, it is current practice for large vessels not to pass west of Fort Denison.<br><br>This should be considered for inclusion in the HMD's. However, any new provision needs to be worded to avoid restricting the movement of smaller vessels.   | Functionally in place. To be documented in Harbour Master's directions to ensure general port compliance. |
| West of Fort Denison  | Sydney Harbour Bridge clearance requirements.   | Sydney Harbour Bridge clearance distance (2m) requirement included in PSMS.   | Check the instruction that VTS use.<br><br>Thought to state "a minimum 2.0m clearance under the Sydney Harbour Bridge & 1.0m clearance under the maintenance gantries". This can be included in the PSMS.  | CLOSED. Appropriate amendment included in PSMS 10.7 on 01/01/14.  |
| Gore Cove             | Grounding due to strong tidal currents (The Umm Said).  | Banning ship movements when the current at the Ball's Head current meter is above 0.5 knots.  | This has been a long term requirement with regard to the movement of large tankers to/from Gore Cove & is included in the PSMS.<br><br>The requirement was relaxed to a maximum of 0.7 knots for large tankers outwards with draft less than 10.0m. It is not considered necessary to apply these restrictions to smaller medium range tankers.  | No further precautions needed.  |
| Gore Cove             | Grounding on the 10.8m shoal at Mann's Point.   | 1. Mark this shoal on the charts.<br>2. Distinguish between the 10m contour (fully blued) and the 13m contour (marked with blue outline) on charts. | 1. Not considered necessary.<br>2. Minimal influence over the Hydrographic Office to require such changes.<br>3. Use of the usual transits will assist to avoid grounding.   | No further precautions needed   |
| Glebe 7 & 8           | There are different pilot opinions as to the best place to swing arrivals   | Determine if one is safer than the other and in what conditions, or if it is OK to leave up to the pilot on the day include in the SMS.             | The only place considered available to swing vessels berthing at these berths is the swing area off the end of the Glebe No.2 berth.<br><br>Direction to swing vessel is at the discretion of the pilot, dependent on variable issues, i.e. wind, transverse thrust, any vessels at White Bay Nos. 4 or 5 berths, etc. Therefore, no need to include in the PSMS.  |   |
| Passenger Ship issues | Some Captains like to take control of maneuvering approaching the berth but this can create discussion at the wrong time. | Agree any maneuvering transfer point (to the Captain) at the MPX, not discussed on the water in the Harbour.  | In all circumstances, this should be confirmed at the MPX.   |   |
| Passenger Ship issues | Excessive thruster wash holding passenger ships alongside at Sydney Cove can affect unsuspecting commuter craft.          | Excessive thruster wash holding passenger ships alongside at Sydney Cove can affect unsuspecting commuter craft.                                    | Pilots need to be mindful of this issue & where possible minimise any thruster/azpod/tug turbulence. However, passenger ships only manoeuvre in Sydney Cove outside of the Sydney Cove closure times & they have been given clearance to move by VTS.<br><br>Therefore, pilots cannot be held responsible for the actions of commuter craft who manoeuvre close to the passenger ships while any residual turbulence exists. This is an issue for the harbour master & other vessel operators. | This is an issue for the harbour master & other vessel operators.   |

## CONCLUSION

R2A applied a due diligence approach for the pilotage of large vessels into Sydney Harbour as the Risk Management Standard approach is not effective for high consequence - low likelihood events. Four critical issues were identified:

- Pilot boarding safety
- Collision with other vessels
- Grounding
- Allision (with infrastructure, typically wharves)

At the conclusion of the review, the Sydney Pilots were not aware of any outstanding safety issue which is not already considered in the Pilotage Safety Management System (PSMS), or in the issues table which is being progressively incorporated into the PSMS.

The next step is to ensure that outstanding issues are resolved and that all the agreed precautions arising from this due diligence process are successfully transferred to the Pilotage Safety Management System.





## WHERE TO NEXT

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