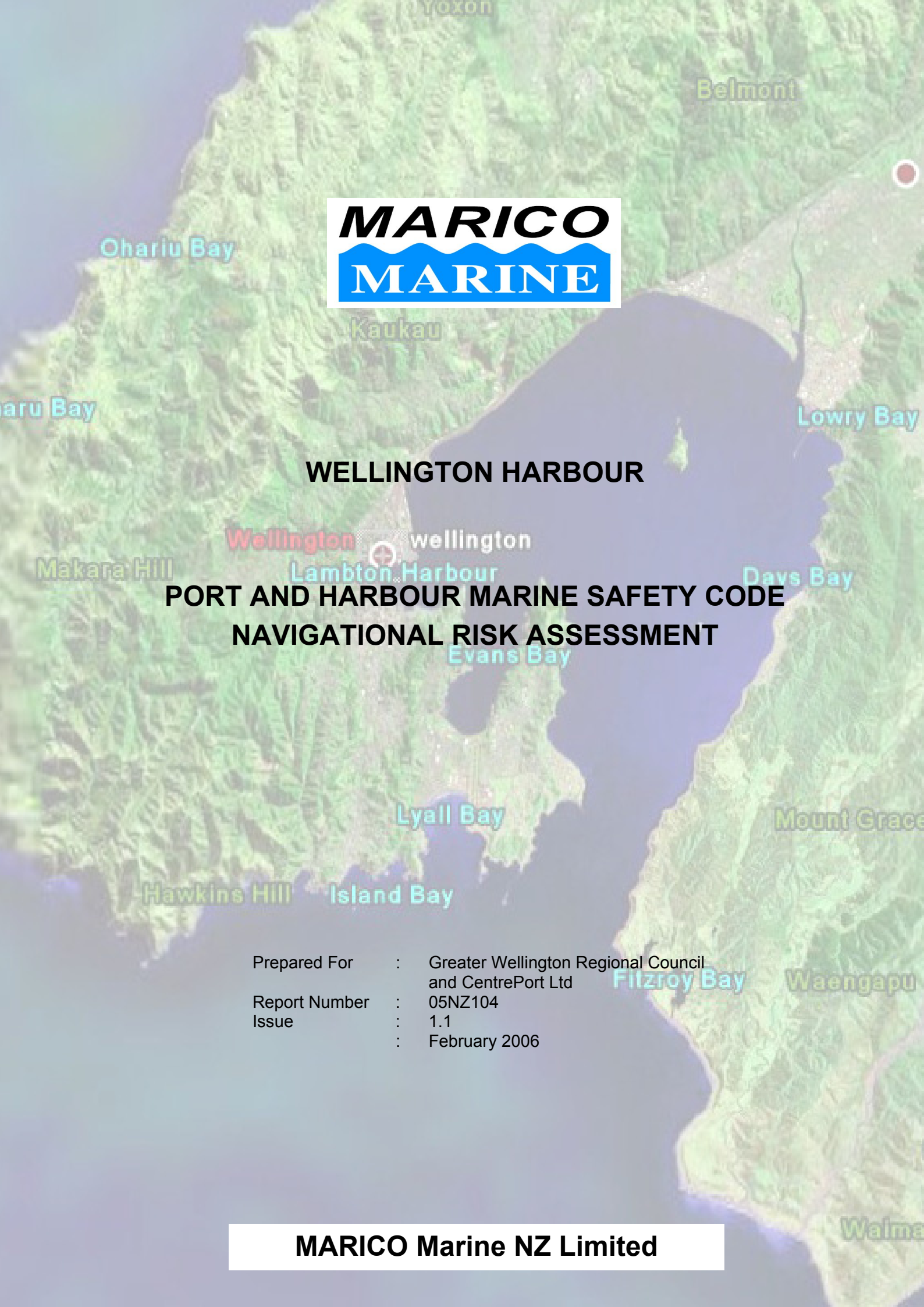

MARICO MARINE

WELLINGTON HARBOUR

PORT AND HARBOUR MARINE SAFETY CODE
NAVIGATIONAL RISK ASSESSMENT

Prepared For	:	Greater Wellington Regional Council and CentrePort Ltd
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MARICO Marine NZ Limited

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PORT AND HARBOUR MARINE SAFETY CODE
NAVIGATIONAL RISK ASSESSMENT

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EXECUTIVE SUMMARY

This document reports the findings of a navigational risk assessment for Wellington Harbour in accordance with the requirements of the New Zealand Port and Harbour Marine Safety Code. It is intended to be a comprehensive document allowing stakeholders to understand the risks and reasoning behind risk control recommendations. It can also be used to construct the Harbour Safety Plan as required by the Code and develop the Harbour Safety Management System for the future.

A total of 78 navigational hazards were identified at overview level, using; the domain expertise of Marico Marine; the local experience of the Harbourmaster and staff; the expertise of the CentrePort Pilotage Service and finally by input from consultation with numerous Wellington Harbour Stakeholders. The identified hazards were ranked according to risk using expert judgement informed by incident records maintained by the Wellington Harbourmaster. The risk assessment has used a risk scale of 1 to 10 in accordance with national guidelines, and set risk management criteria against that scale (see section 3.2). The greatest risks identified remain associated with the passenger and freight RoRo services (which dominate the vessel movement profile) and difficulty being encountered by a vessel at Wellington Harbour entrance features highly in the rankings. These scenarios provided a score of 6.8 (out of 10), being at the upper limit of the As Low As Reasonably Practical (ALARP) criteria set for the study. This study recognises the safety management strides being made by RoRo ferry operators, but also recognises that the harbour system can assist considerably. Risk control recommendations are mostly presented in sections 12 and 13, with recommendations made in other areas to encourage use of the whole report. Full conclusions are made at page 100. Key recommendations are summarised here:-

a) Tug power is due for upgrade in Wellington as available bollard pull is no longer sufficient without environmental limitations being considered.

b) A strong conclusion by Authors from this risk assessment is that the future role of Beacon Hill Signal Station needs to be defined, its equipment improved, its skill base functionally described, trained where necessary and brought into the 21st Century. The capability of its role to assist pilots in poor visibility, manage entry transit, recommend sequencing when needed, as well as providing the focus of contact for those transiting towards Wellington, will remain

immature until the future Safety Management System obtains stakeholder buy-in to its role and necessary upgrade.

A Service Level Agreement between the two key organisations involved in running the harbour could be one way to facilitate a professional link between the pilotage service of CentrePort and movement management by the Harbourmaster system.

c) CentrePort and the Beacon Hill traffic management system have a common purpose with respect to the movement of piloted vessels. Closer liaison between pilots and an upgraded Beacon Hill are recommended to both use new technology and commence a move towards Vessel Traffic Management by information service. Electronic integration of radar and AIS data between Beacon Hill and the pilotage service would provide benefit.

d) The pilotage jurisdiction requires redesigning and a system of Pilotage Directions is strongly recommended to define requirements for the Wellington Harbour System. As Maritime Rule Part 90 is MNZ jurisdiction, such a system would need setting-up under Part 90 and Pilotage Directions therefore approved by MNZ. The approval link would retain the MNZ control link established following incidents involving vessels in other New Zealand pilotage waters. This represents a change to the approach being used by Maritime Rules and may be applicable to other harbours in New Zealand.

e) From Section 13.5.1, MNZ is encouraged to consider making the setting of Pilotage Criteria, including minimum size to take pilots a matter for Pilotage Directions as referenced in Section 13.5 Note 2. That would remove the difficulty that is inherent in changing Maritime Rules. Pilotage criteria in general should be reviewed every three years against the traffic profile of the harbour.

f) Recommended Tracks require formalising for use by all and referred in Harbour Bylaws.

g) Improvements in the present frequency of Hydrographic survey and the use of risk-based techniques to develop a dredge programme based on known accretion rates are recommended.

h) The implementation of wind, tide and wave measuring equipment on the Front Lead, measuring the environment at the most critical part of a deep draft vessel's transit is encouraged. With this in place data

interpolation between this and measurements made by the offshore buoy would allow conditions anywhere in the entrance to be determined.

CentrePort and the Beacon Hill traffic management system have a common purpose with respect to the movement of piloted vessels. Closer liaison between pilots and an upgraded Beacon Hill Signal Station are recommended to both use new technology and commence a move towards Vessel Traffic Management by information service. Electronic integration of radar and AIS data between Beacon Hill and the pilotage service would provide benefit, especially in reduced visibility conditions.

1 INTRODUCTION

This document provides the initiating report for introduction of a navigational safety management system to Wellington Harbour, as part of the introduction of the New Zealand Port and Harbour Marine Safety Code (the Code). It describes a marine risk assessment and its findings in summary form in accordance with the requirements of the Code. The risk assessment has been undertaken on behalf of Greater Wellington Regional Council and CentrePort Ltd.

This document is intended to be a comprehensive report, with risk management recommendations contained in more than one section. It can be used as a basis to develop a joint Harbour Safety Plan and ongoing Harbour Safety Management System (SMS) as required by the Code.

Authors would like to sincerely thank all stakeholders and independent contributors who provided input into this large Risk Assessment and its outcomes.

1.1 PURPOSE AND SCOPE

The purpose of the assessment was to identify key hazards associated with navigation of merchant or other vessels and smaller craft in the area bounded by the harbour and pilotage limits. After ranking these in order of relative risk, measures for management of higher levels of risk were then derived.

The scope of the risk assessment also included consideration of:

- Incident data and near-miss reports;
- The views of relevant harbour stakeholders about navigational safety;
- The varying trade and commercial activities using Wellington Harbour;
- The varying environmental conditions at the entrance to Wellington and within the harbour;
- The organisational structure available (within Wellington Regional Council and CentrePort) to manage any identified risks of significance.

1.2 PREVIOUS RISK ASSESSMENTS OF RELEVANCE

MarConsult Pacific Ltd carried out a Safety Audit on tanker berths in the Port of Wellington in August 1999. Oil Companies and Silver Fern Shipping have completed their own Audits subsequent to this. As far as the project team are aware, there have not been other assessments of water-based activities outside those based on the experience available to the Port Company and the Regional Council Harbourmaster, which is significant.

2 METHODOLOGY

This section of the report describes in an overview how the risk assessment project was undertaken.

The methodology used followed the New Zealand Risk Assessment and Safety Management System Guidelines[1]. The Criteria used for the risk assessment scoring was also taken from the guidelines and are attached at **Annex A** for ease of reference. Additional information about how the NZ criteria have been applied is recorded in Section 3.

The methodology deployed is intentionally practical and used experience drawn from port and harbour risk assessment as well as the marine experience provided by representatives from the harbour regulator and key harbour users. The methodology also considered the incident background of the area. It thus provides the widest possible input of hazards for consideration by the risk assessment. However, the Council, in its role as Harbour Authority should expect to introduce ongoing hazard identification and review to ensure that all relevant hazards have been considered and accurately assessed.

2.1 INTERVIEWS AND FAMILIARISATION TRIPS

A series of interviews were held with personnel involved in both Port Company operations and those managing the Harbourmaster's department, including the Harbourmaster and Deputy Harbourmaster. Stakeholder lists were prepared from the view of both the Port Company and Harbourmasters' department and preliminary visits made. The pilotage system was assessed and trips undertaken with serving pilots to gain experience of transiting Wellington harbour. Trips were also undertaken on RoRo ferries entering and departing Wellington.

Tripping with pilots included both vessel arrivals and tanker shifts between harbour berths. Experience was also taken with tug operations and the berthing of vessels.

Time was spent with Harbour Rangers, both with full time and seasonal staff. Interviews were conducted and trips completed with Rangers on a workboat during summer weekends to observe yacht racing, leisure use and

[1] The methodology follows the guidance provided by the Australian and NZ Standard 4360 and the NZ Port and Harbour Marine Safety Code.

a special regatta. Harbour Rangers have interests and close liaison with most yacht clubs, also with Coastguard, Rowing Clubs and inshore fishing interests.

Most stakeholders were visited in person or by organisation. Stakeholders were contacted by the Regional Council Harbourmaster and CentrePort by letter. A list of key stakeholders invited to input into the assessment (whether by participation in meetings or from invited feedback) is attached at **Annex B**.

2.1.1 Risk Consultation Input

Consultation meetings were held with the harbour team; port company staff; and key harbour stakeholders, some on an individual basis. Hazard Identification mostly involved those close to the vessel movement operation, from both the regional council and the port company. PEC input was taken from ferry masters by tripping, with other vessels visited when possible (e.g. Cement trade). Other consultation meetings were held with MSA and ferry interests in Wellington, June 2005, at which the ranked hazard list was circulated for comment. Comments over risk scoring were received from Maritime New Zealand.

2.2 INCIDENT DATA AND DOCUMENT REVIEW

Marico Marine were provided with incident and near-miss data covering a five year period, both from the MNZ database and the Harbourmaster's database. This is not repeated here as a whole being readily obtainable from the public domain; instead it is made relevant to each section of this report or vessel type. The Wellington Harbourmaster maintains an incident database, which is regularly reviewed. Incident data has been used directly to review frequency and consequence estimations made by expert judgement within this risk assessment.

Significant incidents that have occurred over a much longer period were reviewed with respect to frequency. Special consideration was later given to the WAHINE incident records. Frequency of significant events were reviewed and taken into account both to assist in the initial compilation of the hazard lists and also later in assigning frequency and consequence to the respective hazards.

Publications and various documents relating to navigation within the harbour area were provided by both the Harbourmaster's department and the port company. CentrePort has comprehensive procedures, both for pilot

training and operation. These were reviewed and used for initial hazard identification. Beacon Hill procedures were considered in a similar manner.

2.3 HAZID MEETINGS AND WORKSHOPS

Hazard Identification commenced at an early stage, with a draft but generic list being developed by Marico staff. The generic list represented most of the available and realistic accident scenarios given the type and mix of navigational traffic in any one area.

This was followed by a hazard identification review meetings, held at CentrePort. These involved senior harbour personnel familiar with marine operations and navigation within harbour limits as well as the Study Team. These meetings were led and structured by experienced facilitators who took the discussions sequentially through the identified accident categories and vessel types affected for each area in turn.

Using the data obtained from interviews, familiarisation trips, document studies, HAZID meetings and workshops, a preliminary hazard list was focussed and further derived, from which a hazard database was constructed and populated in the Hazman software package. Consequence of hazard realisation and causation were considered alongside the hazards. Hazard identification was thus comprehensive, proactive, and not confined only to hazards that have materialised in the past.

A total of 78 hazards were identified at overview level as being associated with navigational activities within the Wellington Harbour Limits. These were developed into a format suitable for scoring by a subsequent meeting.

2.4 RISK ASSESSMENT SCORING

A further meeting was held with the hazard identification team to consider the hazards and assess each one against the NZ Risk assessment guideline frequency and consequence criteria. This was achieved for both most likely and worst credible scenarios. Using risk ranking methodology, the hazards were ranked in risk order on the basis of the most likely and worst credible scoring. These were then reviewed both independently and at further meetings with individuals and with stakeholders. The incident database records for the Harbour were then reviewed to provide consistency and underpinning to the quality of hazard scoring. The scored hazard list is attached in ranked order at **Annex E.**

2.5 IDENTIFICATION OF RISK CONTROL MEASURES

After the hazard list was generated and rationalised, a number of risk control identification meetings were held, both at CentrePort and at the Harbourmaster's Office. These were then developed in relation to the 30 key hazards ranked at the top end of the hazard list. The risk control available to Wellington Harbour is quite significant and is spread between the operating procedures of CentrePort and the risk management applied by the Harbourmaster system and Maritime Rules. This is discussed in the body of this report, at section 11. For this risk assessment, the existing risk control was also considered against each of the 30 key hazards. This is mapped in relation to the risk control supplied by CentrePort and the risk control supplied by the Harbourmaster system. This mapping is attached as **Annex F.** Generic anti collision bylaws and maritime rules are referenced at **Annex G.** Risk Control Options as identified against the top 30 hazards are presented in section 12 and discussed further in section 13.

2.6 RISK MANAGEMENT SOFTWARE UTILISED

Authors used the HAZMAN Risk Assessment and Safety Management software package, developed by Marico Marine in consultation with Harbourmasters internationally. The program is a practical and comprehensive tool facilitating port and harbour risk assessments, then helping with initiation and monitoring of a Navigational Safety Management System. HAZMAN is fully compatible with the Port and Harbour Marine Safety Code.

A Hazard List and Hazard Ranking (see 3.1.1) are the key outputs to which risk control measures can be linked. The system also has a comprehensive audit trail, automatically recording all changes made to hazards and risk control barriers in place.

3 CRITERIA FOR DEVELOPMENT OF RISK MANAGEMENT

3.1 RISK MANAGEMENT DEFINITIONS

Using the risk matrix (**Table 1**, below) taken from **Annex A**, each hazard was scored against a scale of 1 to 10 for each of the four consequence categories within the NZ Risk Assessment Guidelines, forming part of the Port and Harbour Marine Safety Code (i.e. impacts on: Life; Property; Environment; Harbour Stakeholders).

Consequence						
	C4	5	6	7	8	10
	C3	4	5	6	7	9
	C2	3	3	4	6	8
	C1	1	2	2	3	6
	C0	0	0	0	0	0
Frequency		F 5	F 4	F 3	F 2	F 1

Table 1 - Risk Matrix

Where:-

0 & 1	Negligible Risk
2 & 3	Low risk
4, 5, 6	Assessed to be in the ALARP region
7, 8 & 9	Significant Risk
10	High Risk

From the frequency and consequence data (see **Annex A**), risk scores were obtained for each hazard using these criteria, in both the 'most likely' and 'worst credible' scenarios (i.e. providing eight risk scores per hazard). Each hazard was scored optimistically, to provide the risk assessment with a cautious approach when the average situation is taken into account.

It should be noted that occasionally, most likely scenarios can generate higher risk levels than worst credible; this is due to the increased frequency naturally associated with the most likely event. In effect, the assessment is scoring the risk associated with two different outcomes from the same initiating event. This tends to occur when consequence levels are similar between most likely and worst case and/or where the frequency of the worst credible is very much less than that of the most likely.

Where the most likely event does show higher risk levels it is worthy of special note as, for example, in the case of berthing contact, it may be suggesting that a large number of small berthing contact damages are of greater loss significance than a single heavy contact at a much lesser frequency.

3.1.1 Hazard Ranking for Risk Mitigation Assessment – Hazman Software

The risk data of each of the four categories (Life, Property, Environment and Port Business) was analysed within the Hazman software to obtain four indices for each hazard as follows:

a) The average risk value of the four categories in the 'Most Likely' set.
b) The average risk value of the four categories in the 'Worst Credible' set.
c) The maximum risk value of the four categories in the 'Most Likely' set.
d) The maximum risk value of the four categories in the 'Worst Credible' set.

Average risk values are sensitive towards hazards that score moderately or highly over a number of categories, whilst the maximum risk values are sensitive towards hazards which score particularly high in any category.

These values are combined in the Hazman software to produce a numeric value representing each of the four indices. The hazard list was then sorted in order of the aggregate of the four indices to produce a Ranked Hazard List, in descending order, with the highest risk hazards prioritised at the top. This list, comprising 78 hazards, is produced in full in **Annex E**. This Ranked Hazard List describes the Risk Profile of the Harbour with regard to navigational operations.

The use of the Most-Likely and Worst-Credible approach is very useful in obtaining a transparent risk assessment in the eyes of practical stakeholders, and these abound around maritime activities. The most likely event references outcomes that those with professional experience of the harbour can relate to. The concept of the Worst-Credible event is a consequence of outcome that is a realistic worst accident outcome. This is

differentiated from the Worst Case, which is often used by risk assessors with generic backgrounds, with disbelief from those with professional attachment to the subject being risk assessed. A Worst-Credible event of a RoRo capsize at a harbour entrance may involve loss of life of 25% of the complement, whereas a Worst Case is total loss of the vessel complement. The former is more realistic. The Most-Likely case occurs at a higher frequency (or probability) than the Worst-Credible case. The true level of risk lies somewhere between the extremes of the Most-Likely and Worst-Credible levels of risk, and opinions around the range are always available. The Hazman Software calculates a median average to take the middle ground between viewpoints at each extreme. The strength of this process is that the range becomes defined and where risk mitigation strategies are needed, the consensus achieved within those professionally involved makes the introduction of risk management more robust.

3.2 RISK MITIGATION ACTION CRITERIA

Table 2, below describes the approach that was taken to risk mitigation, based on the developed risk profile. The "As Low As Reasonably Practicable" (ALARP) principle of risk management has been used in the derivation of risk management recommendations. This can be applied for risks that should only be tolerated if the risk mitigation measures in place provide risk reduction into the ALARP region, and where they cannot be reduced further without grossly disproportionate cost or disruption.

For this risk assessment, the principles of reducing risk to ALARP need to be applied for the longer term to ensure that risk reduction measures are considered for all identified risks. However at this stage in the process of compliance with the Code, particular emphasis has been placed on identifying additional risk reduction measures for those risks that are found to be “significant”.

MATRIX OUTCOME	Risk Definition	Action Taken
0 & 1	Negligible Risk	A level where operational safety is unaffected.
2 & 3	Low risk	A level where operational safety is assumed.
4, 5, 6	As Low As Reasonably Practicable (ALARP)	A level defined by Study at which risk control in place is reviewed. It should be kept under review in the ensuing Safety Management System.
7, 8 & 9	Significant Risk:	A level where existing risk control is automatically reviewed and suggestions made where additional risk control could be applied if appropriate. Significant risk can occur in the average case or in individual categories. New risk controls identified should be introduced in a timescale of two years.
10	High Risk	An area where the Harbourmaster needs to recommend rapid action.

Table 2 - Risk Management Action Criteria

3.2.1 Use of the Concept of ALARP in this Risk Assessment

There needs to be a note of caution in using the criteria above. The application of the concept of ALARP should not fool those responsible for Harbour Navigation into thinking that little needs to be done if the overall risk lies within the ALARP range set. ALARP is only a concept and there are risks in any harbour which can result in loss of life. Consequence to people is only one scale used by the risk assessment, but it is scale of priority when compared with others. The risk assessment scoring overall can only take an average across risk categories and risk in an individual category may dictate the need for action. That need may also affect a hazard someway down the hazard list when ranked in order of risk.

The NZ risk assessment guidelines recognise the existence of ALARP, but also recognise that risks need to be managed in a qualitative and comparative way in situations where the actual levels of risk are very

difficult to determine. Part of the reason for this difficulty is that, whilst a Harbour Regulator (i.e. the Harbour Authority which is exercised through the office of the Harbourmaster) will aim to reduce risk to ALARP, not all contributory factors and circumstances are under the harbour regulators' control. A Harbour Regulator can only set comprehensive requirements that, as far as is foreseeable, would reduce the risk to ALARP levels. It then has to monitor compliance and take action if necessary. This is further compounded by the Open Port Duty of a Port or Harbour, in which vessels have some rights to navigate within the criteria established on safety grounds. It is important to be aware that in the case of a vessel, the responsibility for ensuring the ALARP case exists is in part the vessel operators' responsibility (and crew) and in part the responsibility of the Harbour Regulator (and in New Zealand the Port Company's terminal that it is transiting to). Where risk levels are found to be significant or high (i.e. outside the ALARP region), the Harbour Regulator needs to be in the position to influence an improvement in safety performance of vessels using the waterway. It then needs to be in a position to monitor the effect of the improvement.

A vessel declaring Port of Refuge status may also pose a risk outside the ALARP region. Under the International Maritime Organisation (IMO) Resolution A.949(23), there is no obligation for the coastal state to grant this (i.e. it is an MNZ decision) but reality is that shelter should be granted where it appears to be practicable. In taking a balanced decision the Director of Maritime New Zealand may need to allow a disabled or damaged vessel into Wellington Harbour to avert a greater catastrophe offshore. Notwithstanding the ability of the Harbourmaster to refuse entry, it becomes difficult not to facilitate entry if it was in order to uphold the principle of safety of life at sea.

The use of ALARP in this study is therefore practical in nature, reflecting the practical problems that a Harbour Regulator has in influencing the navigation of a vessel that may not itself be operated to an ALARP standard.

4 WELLINGTON HARBOUR - OVERVIEW AND TRAFFIC PROFILE

Figure 1 – Satellite Image of Wellington Harbour

Wellington harbour is a natural haven for shipping, with a roughly circular area of approximately 85 square kilometres and average depth of 14 metres, with a controlling depth of 11.3 metres at the bar near the harbour entrance. The entrance is also relatively narrow, protecting the inner harbour from most sea conditions. The general geography of the harbour is shown in **Figure 1,** which also references names of the various bays within the harbour. The layout of berths and topography into Evans Bay is shown in **Figures 2 & 3**. **Figure 2** shows an aerial view of the ferry finger berths in central Wellington, as well as Thorndon container terminal and general berths along Aotea Quay. **Figure 3** shows the Harbour looking SouthEast towards Lambton Harbour and Oriental Bay. The layout of Evans Bay can also be appreciated.

Figure 2 - General Layout of berths. The Ferry finger berths are shown at the bottom mid, with dedicated berths operated by Interisland Line shown in the top left corner of the picture. The layout of Thorndon Container terminal can also be appreciated.

Figure 3 – View of Harbour looking towards Oriental Bay, with Lambton Harbour mid right. Evans Bay (Tanker Terminal) and the Harbour Entrance.

4.1 HARBOUR LIMITS AND PILOTAGE DISTRICT

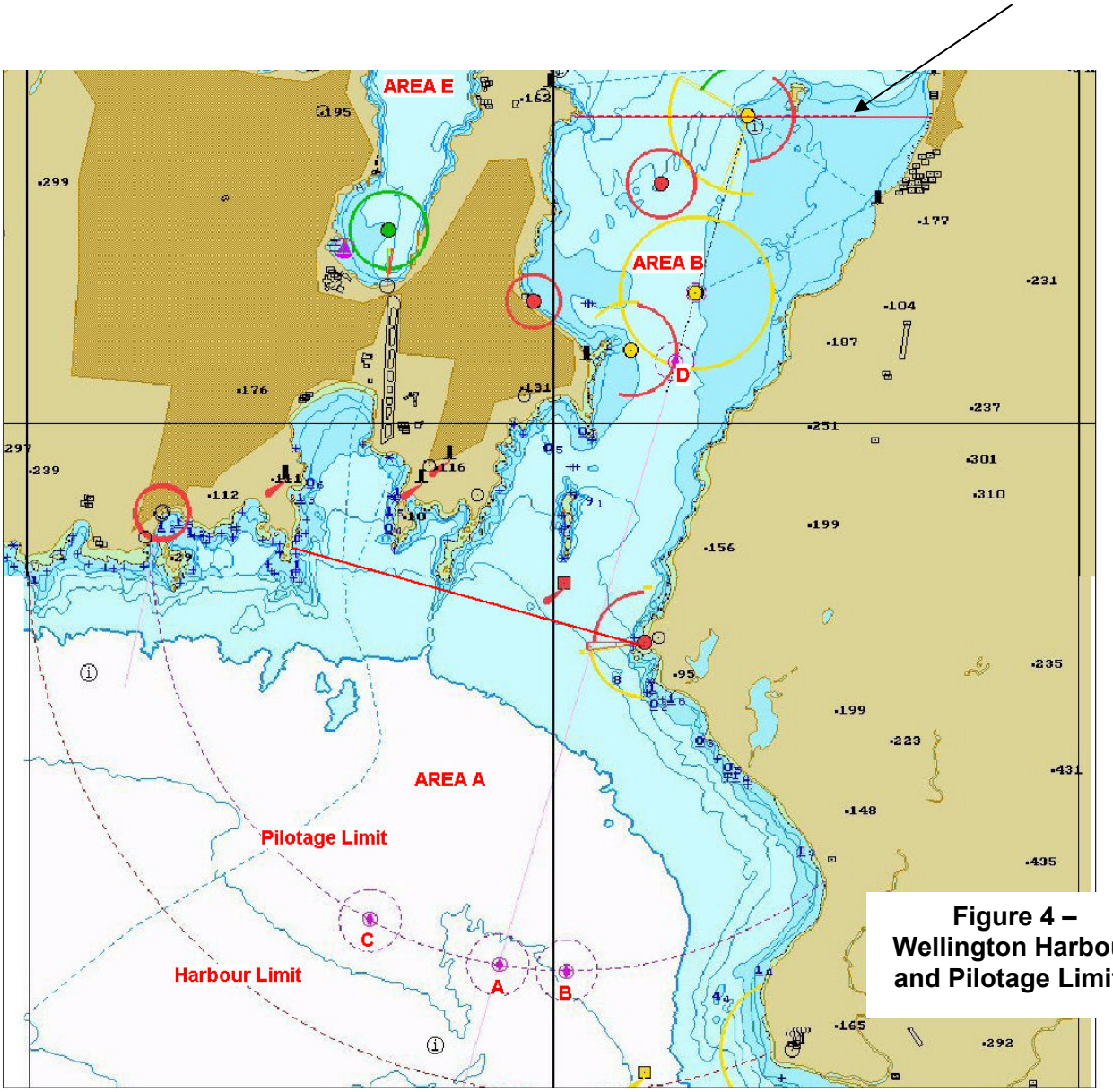

Figure 4 – Wellington Harbour and Pilotage Limits

The Wellington Harbour Limits are shown in **Figure 4,** which remain as originally gazetted. The limit is an arc extending 3.85 nautical miles from Outer Rock – this line still being a reference point for commencement of vessel charters (which is common worldwide). The Regional Council Bylaw Jurisdiction is in approximately the same location, extending to three miles from the waters edge from the Otaki River round to Cape Palliser. It is the Bylaw Jurisdiction that empowers regulation within harbour limits (with pilotage being regulated by Maritime Rule 90), this jurisdiction being entered as a vessel crosses the arc of Pilotage Jurisdiction.

The outer limit of the present Pilotage Jurisdiction is an arc of 3NM radius centred on Outer Rock. Three designated boarding areas, A, B, C are located on this arc, each of which is relevant for boarding in different sea or weather conditions. However, the outer limit of jurisdiction is not the commencement of compulsory pilotage; this commences at a line running from Point Gordon through the Rear Lead to the eastern shore (depicted on **Figure 4**). Vessels over 500 tonnes, unless a valid pilot exemption certificate is held by the master, must proceed under the advice of a pilot northward of this line.

4.1.1 Code Application Assessment

With the Wellington area of Bylaw Jurisdiction remaining at a steady 3 miles off over its coastline, there is a slight anomaly with its alignment to Harbour limits. However it is the pilotage area jurisdiction which is relevant to a Code Application Assessment. This is dealt with in the Pilotage section of this report and recommendations for a solution are referenced in the risk control section. As there were no issues other than pilotage and traffic management in the approaches (which could also be undertaken under a change to pilotage jurisdiction), the Code Application assessment came to a rapid conclusion that the Regional Council had already taken powers beyond the charted line of the harbour limit and that the preliminary considerations could not provide evidence to make a change of Bylaw jurisdiction (if they did the Regional Council would be impinging on Cook Strait). Although Gazetted at Wellington (see paragraph above) marked harbour limits in New Zealand have no legal authority[2] and the point at which the Regional Council sets its Bylaw limits is the point at which a vessel enters an area of navigation regulated by local rules. Modifying the harbour limit to the Bylaw limit would be a worthless exercise as it would create a harbour of varying limit all around New Zealand! Leaving the Harbour line in its present position would allow an option to introduce a regulatory charge to fund Harbour Regulation and movement facilitation.

The Code Application Assessment is a requirement of the Risk Assessment Methodology that did not appear to provide benefit to this project. However, in the detail of the risk assessment, issues were identified to recommend

[2] This is an area where New Zealand Law in modifying the harbour Regime has deviated from practices established worldwide. The Harbour limit was the basis within which the body empowered to provide navigational regulation and facilitation could charge for the cost of supplying the service. It required marking on the Chart so transiting vessels were aware that regulatory charges were due on crossing the line of harbour limits and that Bylaws applied within those limits. The New Zealand system requires a Regional Council (in its role as Harbour Regulator) to decide on a location offshore at which its Bylaws apply. Thus technically, there are no longer harbour limits –a most confusing situation for the International Mariner to comprehend!

modification to the MNZ Pilotage Jurisdiction. Recommendations are in section 13.5, dedicated to pilotage.

4.2 WELLINGTON HARBOUR – CLIMATOLOGY

Wellington is well known for its windy conditions, which affect both navigation and tug power needed for berthing. The Cook Strait creates a natural wind funnel by providing a narrow break in the mountain chain running down the axis of the North and South Islands, which gives the Wellington area its frequently windy environment. Statistics are readily accessible and the following is relevant to this risk assessment.

- Wellington averages 173 days a year with wind gusts exceeding 32 knots;
- There are an average of 22 days per year where mean wind speeds exceed 40 knots;
- October is the windiest month with a mean of 27 days where wind speeds exceed 15 knots, with 19 of these days where the wind speed exceeds 20 knots (October to January are the most windy months);
- July is the calmest month with a mean of 21 days where wind speed exceeds 15 knots (February to July are the least windy months).

Winds categorised as gale force and above (i.e. 33 knots and over) are therefore common in Wellington.

4.3 SEISMIC AND WAVE CONSIDERATIONS – TSUNAMI, SEICHES AND LONG WAVES

Wellington harbour has recorded tsunami from distant seismic events and also seiching from local events in its recent history.

The distant earthquake events off Western South America in 1868, 1877 and 1960 were reported to have generated waves of between 1.0 to 1.6 metres height in the inner harbour. A local earthquake in 1855 caused seiching by a wave in the order of 3m height, with a period of about 20 minutes.

More recent events such as the December 2004 Indonesian earthquake affected predicted tidal heights and times that were able to be measured with instruments, but still insufficient to cause any damage locally or to justify warnings being given to shipping. Long range warning systems are in place for advance notice to be given to shipping of an impending tsunami from a distant event, but it will not be possible to provide advance warning for the local event which causes sudden generation of a seiche or tsunami.

Return periods for recorded tsunami events affecting Wellington have been investigated by researchers with a 1.0 metre high wave considered a 50 year event and a 2.8 metre high wave considered to be a 100 year event. Without researching the accuracy of this data, it was appropriate to consider tsunami as a hazard which could affect operational use of the harbour.

CentrePort have undertaken an interesting study of sea waves and long waves in Wellington Harbour. Conclusions by consultants advise that Wellington has at least six seiche periods, the longest of which is 174 minutes and 100mm height. Long waves at Seaview Wharf have periods between 5-25 minutes and significant wave heights of 0.17m. There is a reported inaccuracy of 0.25m in predicted tidal heights, making the use of real time tidal data important (tidal gauge located at Queens Wharf). The study also suggested that shorter period effects occur, but to measure these accurately a tide gauge would be needed at the entrance[3].

4.4 WELLINGTON TRAFFIC PROFILE

Movements through the harbour entrance total approximately 14,000 a year. This figure is obtained through observation and logging by staff at Beacon Hill Signal Station and therefore includes fishing vessels and larger pleasure craft transiting the entrance. It does not include the regular harbour ferry crossings or charter vessel operations within the harbour. If these were

[3] Report by Mulgor Consulting Ltd, November 2004.

included, total recorded movements would be around 17,000 per annum. **Table 3** provides a breakdown of commercial movements to the CentrePort berths. Data has been taken from July 2004 to July 2005, broken down by vessel type. This represents the number of entrance transits for vessel types trading to Wellington. In the case of fishing vessels it is possible that some have arrived in Wellington but not departed in the timescales of the movement data sample; these may be an approximation.

Movement Type	Number (2004-5)	Totals
Coastal Ro-Ro (cargo and passenger)		
Toll	5536	
Strait Shipping	2554	
Pacifica	290	**8,380**
Pilot Exempt (other)		
Cement Carrier	128	
Fishing	296	**424**
Vessels subject to Pilotage[4]		
Container	360	
Forest Products	230	
Car Carrier	210	
Tankers (Petroleum and Chemical)	160	
Fishing	188	
Cruise	40	
Bulk Dry Cargo	16	
Miscellaneous	244	**1,448**
Total Movements (12 months)		**10,252**

Table 3- Vessel Movement Breakdown – (July 2004-July 2005)

It can readily be appreciated that RoRo ferry movements dominate the movement profile and any safety risk assessment in the harbour is going to be influenced by any problems with the dominant traffic pattern. Annually, there are around 1.2 million passengers passing through the Wellington

[4] In the last operating year there were 183 shifts between harbour berths, many being tankers shifting between oil terminals.

harbour entrance on the RoRo services[5]. Ferry capacity by vessel ranges from 360 to 1600 passengers.

Container vessels, car carriers and bulk carriers collectively account for 800 movements (2004-2005). The number of large foreign fishing vessels visiting Wellington is declining (expected to be less than 100 in 2005-2006).

4.4.1 Gross Tonnage Patterns 1995 to 2004

Table 4 considers the movement data by piloted vessels, and breaks down the movements by gross tonnage. As piloted vessels are mainly customers of CentrePort, it shows an underlying upward trend in vessel size (and thus potential cargo payload), which is belied by an apparently consistent number of movements under pilotage. Vessels trading to the port are thus getting larger – there has been an increase of 45 % in average gross tonnage over the past 10 years[6]:

Period	Piloted Vessels	Gross Tonnage (GT)
2004-2005	1412	18 512
2003-2004	1407	18 612
2002-2003	1320	19 090
2001-2002	1304	19 207
2000-2001	1303	17 272
1999-2000	1226	18 241
1998-1999	1352	15 445
1997-1998	1180	16 808
1996-1997	1439	14 382
1995-1996	1418	12 727

Table 4 – Vessel Movements by Pilotage Acts and GT

Vessel carrying pilots have been relatively constant in numbers on a historical basis, but there has always been a recordable increase in the summer months (November to March), which corresponds to the time when passenger RoRo ferries carry their highest complements. This corresponds to the time when there are also cruise vessel visits.

[5] Passenger numbers exclude cruise vessel complements.
[6] This is also relevant to tugs, see section 9.3, tug limitations.

4.4.2 Container Traffic

Container vessels are the second most frequent visitor to Wellington, although with 360 vessel movements per year, these are still relatively infrequent when compared to the ferry movements. It is interesting to note that in the mid 1990's to 2003 about 62,000 boxes per annum were handled by Wellington, a relatively steady throughput, which appears inconsistent with the growth in GT. However, since 2003, there appears to have been growth in TEU numbers, rising to a reported 89,000 in 2004/2005. Although this number is small by international standards, it does underpin a scenario of healthy growth at the Port of Wellington. It also would not suggest problems of terminal delay due to container congestion, or ability to handle numbers, although the wider question of road and rail infrastructure to service port facilities is relevant.

4.4.3 Small Vessel Movements

Beacon Hill holds data for the overall number of vessels transiting the entrance annually (about 14,000 for the past year). This relates to a figure of approximately 3750 vessels not subject to Pilotage in any form (i.e. under 500GT) transiting the entrance annually. Such vessels include inshore fishing vessels and Cook Strait Cable Protection Zone patrol craft. Other common categories are small charter vessels relocating between Wellington and the Marlborough Sounds (without passengers) and some operating fishing or diving charters along the South Coast. The Wellington Police Maritime Unit launch and Wellington Volunteer Coastguard vessels will also be counted in this data. Also included will be large pleasure craft or any pleasure craft transiting the entrance by night, as these are reporting vessels through Bylaw.

In addition to the movements referenced, Wellington harbour supports a wide variety of maritime leisure activities, both organised (by clubs or licensed hirers of pleasure craft) and by the general public. Although most activity takes place over the summer months, leisure use continues steadily throughout the whole year. Many calm periods occur in winter, which makes it possible for leisure activities such as fishing and kayaking /rowing to take place all year round.

In addition to vessels and craft transiting the entrance, there are regular movements of commercial vessels within the harbour which are not included in the above statistics, including an estimated 2,500 sailings of the harbour

ferry and movements of tugs and pilot launches (combined total of around 3,300 movements).

4.4.4 Harbour Ferry

A trans-harbour ferry operates from Lambton Harbour to Days Bay (also including Matiu/Somes Island on some sailings). There are up to nine return sailings a day in light displacement catamarans with capacity for around 90 passengers. The service crosses east to west and crosses the track of in and outbound shipping. Historically there have been few near-miss incidents although contact berthing has occurred on several occasions with significant damage to the ferry or injury to passengers, on one occasion. The vessel is a reporting vessel under the Navigation and Safety Bylaws and integrated into the traffic and weather reporting system through Beacon Hill.

The harbour ferry also operates as a charter vessel over summer with evening harbour cruises. A second, nearly identical, vessel has entered service, effectively doubling passenger capacity. There is a possibility of other routes being established, such as a Petone Wharf service. The previous harbour ferry grounded while approaching this berth with significant damage to its propeller shaft and water ingress to the engine room.

4.5 OTHER VESSEL TRENDS OF RELEVANCE TO THIS RISK ASSESSMENT

The average draught of large vessels, excluding ferries but including cement carriers and fishing vessels, is around 7.5 metres. There are approximately 70 movements a year where draught is 10 metres or over, which is close to the draught where movements become dependent on tide in order to maintain an acceptable UKC. The maximum draught is 11.4m (usually inbound tankers). Coastal Tankers aim to enter on the maximum permissible draught for Wellington for practical cargo reasons.

Vessels posing heightened movement risks due to high windage are car carriers; cruise vessels; RoRo Ferries and occasionally heavily laden container vessels. It is worthy to note that by November 2005, car carriers of 200 metres length are to be regularly trading to Wellington (see section 9.2 – tugs). Tankers are included in the heightened risk category due to the nature of cargo. Most tankers regularly trading to the port are double hulled, with the exception of one which is single hulled (with double bottom).

High Speed Craft passenger operations across the Cook Strait recently ceased due to economics. It is uncertain whether or not these will resume; advice suggests this will not be in the reasonably foreseeable future.

4.5.1 Pilot Exempt (PEC) traffic

Cook Strait Ferry operations account for about 8900 PEC movements. In 2004-2005 there were also approximately 140 PEC cement carrier transits and 50 fishing vessels with PEC status. Cement carriers range from about 2,500–6,000GT, or up to approximately 120 metres length, while fishing vessels are usually around 40–50 metres length, with a maximum of 80 metres length. The NIWA research vessel TANGAROA is a Norwegian trawler design with a length or around 80 metres. This visits about 12 times a year for crew changes or lay over.

4.5.2 Timetabled RoRo Movements and Risk

Ferry operators arrange timetables according to their perceived operational needs and there is no planned staggering of departure/arrival times to avoid congestion on any part of the harbour. Heavy weather and berthing delays and vessels at differing steaming speeds, frequently results in 2 or 3 ferries transiting the harbour at the same time. Passing and overtaking is also common. Freight ferries from different operators are time tabled to leave at the same time each morning, meaning that one is likely to overtake the other at some point in the harbour. Close quarters situations have occurred at alter-course waypoints including the joining area on the leading line and within the enclosed harbour area as well, most frequently, but not exclusively, between ferries.

Where a heavy southerly swell is present in the entrance channel, or a vessel is deep draught, then in practice a pilot arranges movements for the sole use of the leading line by inter-ship negotiation, Beacon Hill taking an observing role. In effect it should be an implicit Harbourmaster decision through Beacon Hill Signal Station to grant a vessel sole use of the leading line, allowing Beacon Hill to take a wider co-ordinating role in the interests of all traffic. This is a useful example of the ability of Beacon Hill Signal Station could contribute further to traffic management through the harbour entrance, with appropriate training of operators. In the last operating year there were approximately 70 transits by vessels of 10 metres draught or more, or less than 1% of all piloted movements. At present, unless the privilege of navigating as a vessel ‘Constrained by Draught’ is being exercised there are no restrictions on passing within harbour limits.

5 WELLINGTON HARBOUR - RISK ASSESSMENT AREAS

To undertake the risk assessment, the Harbour was broken down into areas appropriate to the needs of the risk assessment. The areas are next described with respect to the topography of the Harbour and its effect on incident potential and references types of incident that have occurred. Some feedback from interviews with users and tripping on ferries is incorporated into this section.

The risk Assessment Areas are shown in **Figure 5,** below. Five areas where derived for Wellington. In summary, Area A represents the Harbour approaches and outer boarding areas. Area B represents the entrance channel; Area C represents the Waters of the Main Harbour; Area D represents Lambton Harbour and Area E represents Evans Bay.

A description of each area follows **Figure 5**.

5.1 WELLINGTON'S PINCH POINTS AND TRAFFIC CONFLICT

Although Wellington Harbour is not a busy waterway on an international scale, it is common for two or three large vessels to be transiting the harbour at the same time requiring some planning and inter-ship negotiation to avoid congestion at several locations. There are also other areas of Wellington which when considered in detail expose a harbour with an interesting risk profile. As part of the data collected in this risk assessment was comprehensive, a detailed look at Wellington's "pinch-points", which underpin both the content and scoring of the hazards, is attached at **Annex D.**

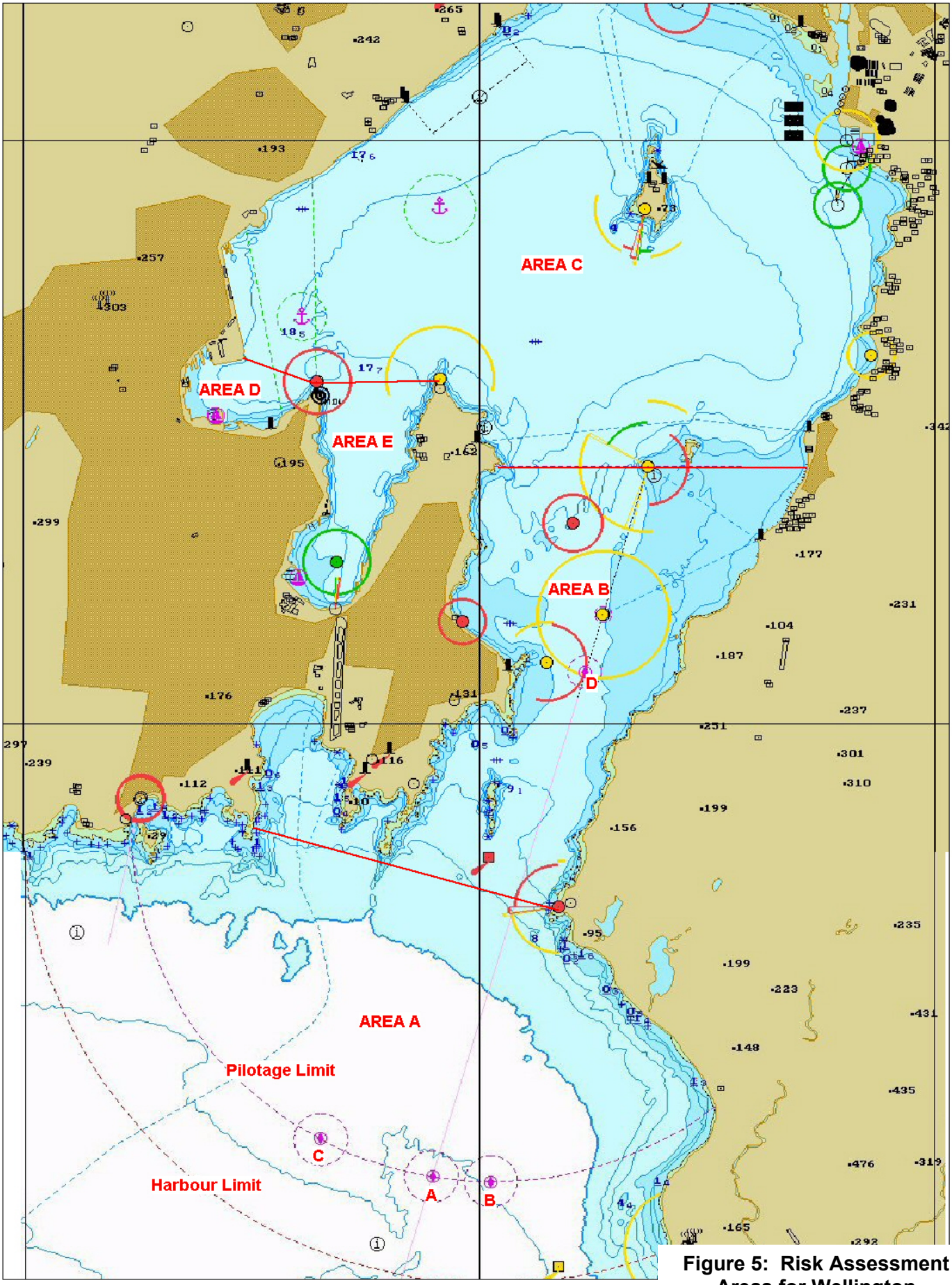

Figure 5: Risk Assessment Areas for Wellington

5.2 AREA A - APPROACHES

This area represents the coastal margin of the Wellington Harbour Limits, the harbour approaches and outer boarding areas. The area is geographically part of Cook Strait where weather and sea conditions frequently present adverse conditions for all navigation categories, with potential for heavy seas, strong winds and tidal flows.

The navigational use of Area A is primarily for transit to and from the inner harbour areas. However, leisure use is also significant, as are fishing activities.

5.2.1 Area A - Physical Description

The approaches to Wellington are relatively straightforward, when compared with some other New Zealand ports, with a bold coastline either side of the entrance providing good radar echoes (although the NZ Pilot cautions mariners that the high terrain inland of Baring Head can give a similar picture to the actual coastline and misinterpretation of position).

The coast to the east is generally free of outlying dangers with the exception of Arabella Rock, 0.4 miles West of Baring Head at 4.4 metres depth. Another rock lies at 8 metres depth, 3 cables South West of Pencarrow Head. As these dangers are respectively only 1.4 miles and approximately 3 cables from the nearest Pilot Boarding Area or line of the leads, there is not a significant margin of safety for boarding pilots if things go wrong.

To the west of the entrance the coast is indented with several bays and outlying dangers such as West Ledge, a reef extending 0.5 miles out from Palmer Head. There are many sunken rocks throughout. These dangers are located in areas outside normal trading vessel routes, but are relevant to small and leisure craft, making local knowledge vital for navigating close to shore.

Depth of water is in excess of 30 metres is until approximately one mile south of the entrance. At this point the sea floor shelves relatively steeply to between 14 and 16 metres at the harbour entrance. Swell from the southerly quarter tends to become attenuated as it approaches the entrance with decrease of wavelength and increase in steepness as the coast is approached. The height and period of swell can change significantly in a short time as can be appreciated from **Figure 6.**

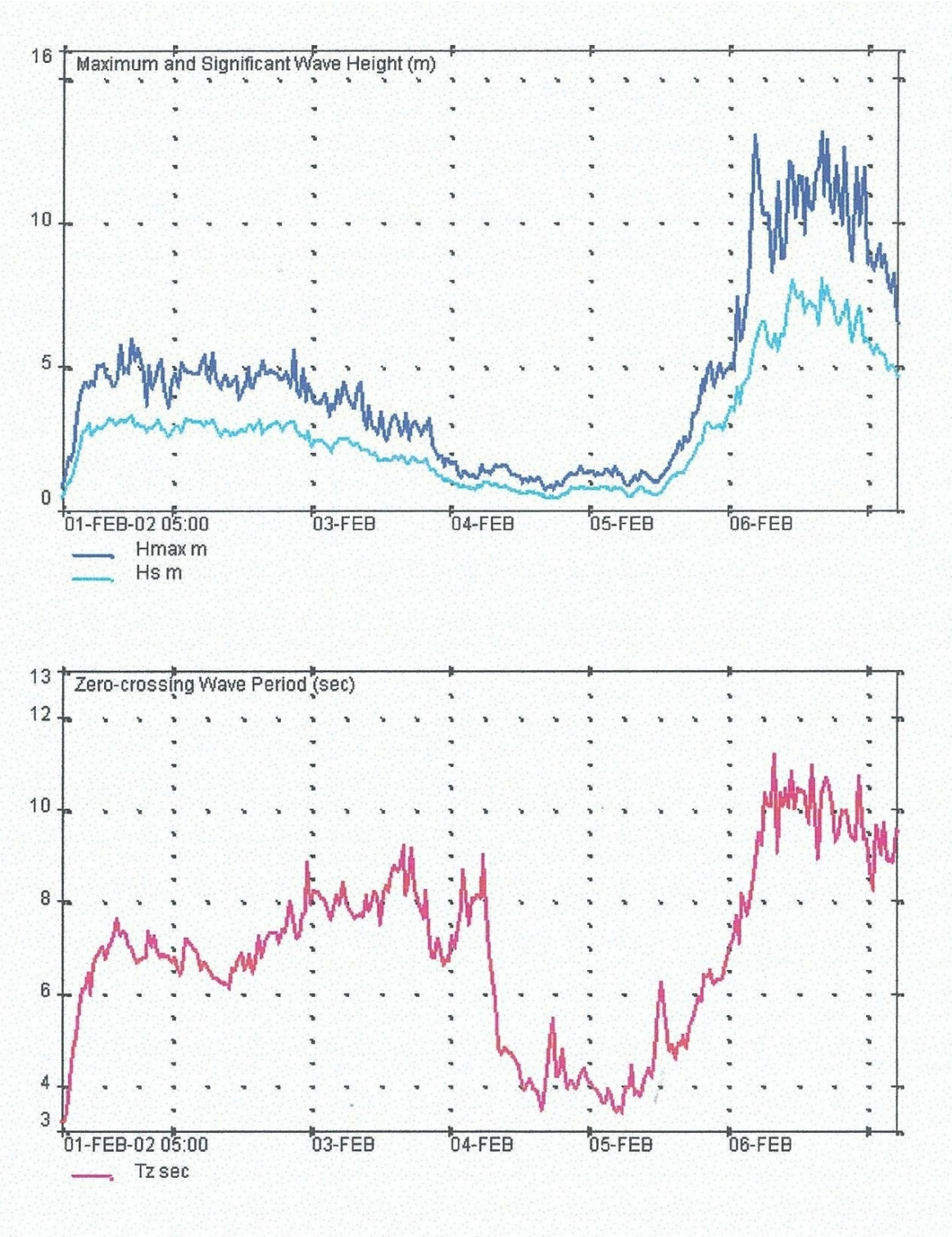

Figure 6: Wave data record taken from a wave rider buoy at Baring Head, showing the rapid change of wave height and period does occur off the Harbour Entrance.

With the exception of Lyall Bay, which has a gently sloping sandy floor and extensive beach development, the coastline of the approaches is mostly backed by cliffs or rocky shores, providing an unforgiving shoreline for any vessel suffering loss of power or steering.

In northerly conditions wave generation is limited by a relatively short fetch in the approaches, but short seas which are hazardous to smaller vessels and craft can be generated, particularly in conjunction with a contrary tidal flow. Winds from the northerly quarter are also subject to considerable orographic control through coastal valleys. Local accelerations, particularly off Sinclair Head and Owhiro Bay are easily capable of producing gusts over 70 knots during gale force winds. Visibility may be affected in flying spray on larger vessels, while leisure craft, particularly yachts, are likely to be knocked down under such conditions.

A southerly ground swell is present at least 80% of the time, onto which local wind generated waves are superimposed. This can have implications for pilot boarding at an outer area, as making a lee in such conditions is difficult.

Southerly winds blow over a greater fetch and are capable of generating large waves, to which a swell may also be added, with the net result of very high seas. A wave rider buoy is located off Baring Head which has provided wave data for a number of years and has recorded waves in excess of 14 metres during southerly quarter gales (note again **Figure 6**). There have been recorded instances where low powered and light draught cargo vessels have struggled for hours to make headway; some have been blown about or have elected to return to the shelter of the harbour. A vessel returning in such circumstances is likely to retain little ability to control its entrance transit.

There are no anchorages in Area A, although large vessels have successfully anchored in emergency and held for short periods of time, but the shelving nature and coarse gravel of the bottom make the area generally unsuitable. Shelter is available in northerly winds for small craft in Island Bay 3 miles west of the entrance. Large vessels, if unable to enter the channel for any reason generally proceed (or are advised to proceed) to anchor in Cloudy Bay on the other side of Cook Strait.

During southerly conditions, vessels are approaching the harbour entrance and surrounding coast on a lee shore. Realistically, tug assistance is not generally available inside one hour in the event of a vessel drifting after losing power. It makes prompt call-out (or prompt standby notice) important

for any event with search and rescue (SAR) implications, which should be reflected in MNZ standing orders.

The approaches are affected by currents which can be significant for vessels attempting to maintain position at a pilot station or approaching on the leads. The ebb tide can also cause considerable steepening of seas as occurs at the entrance (Area B).

Charted information in the form of tidal diamonds states the maximum set across the leads to be 2.3 knots in spring tides, while pilots report that a set across the entrance to the east can be significant at any time. A major cause of the grounding of the PACIFIC CHARGER in 1981 at Baring Head was thought to be the bridge teams' lack of appreciation of the southeast set towards the coast while waiting for pilot boarding.

Currents in Cook Strait are strongly influenced by the wind, and it has been reported that wind induced currents may be up to 3% of wind speed during a prolonged gale or storm event. It has been suggested that during the 'WAHINE Storm' of April 1968, where mean wind speed exceeded 70 knots and gusts exceeded 100 knots, a surface current of 2-4 knots was attained. This can have considerable effect on vessel progress in severe conditions.

5.2.2 Navigational Use

With approximately 14,000 vessel transits of the harbour entrance annually, the approaches are relatively busy when traffic arrivals and sailings provide coincident scheduling.

The outer pilot boarding areas are located 3 miles south of the harbour entrance; around 1,500 vessels a year require pilotage services (further information on use of boarding areas is in section 8).

Given the dominance of ferry traffic most vessels making for the entrance are approaching from the west to join the leads two miles south of the entrance.

The south coast generally is an important area for various forms of recreational activity including diving, surfing and fishing. Trailer boat launching ramps are accessible at several sites and provide access for both recreational and emergency craft of the Airport Fire Service and Police Maritime Unit. Island Bay serves as a base for local fishing vessels and craypots are commonly set along the coast close to shore. Wellington yacht clubs also routinely set race courses into and through this area several times a year (for example an Island Bay Race twice a season). Although the most

severe sea conditions occur during southerly gales, it is during rising northerly winds that most leisure users require assistance, most frequently from engine failure or inadequate power to return to shore against a strong offshore wind. Although not within the scope of this risk assessment, there have been a number of diving accidents along the south coast where divers have been swept away by strong tidal flows. This is similar to the poor recreational diving statistics of the Marlborough Sounds.

A Marine Reserve is proposed for an area of this coast around island Bay and the former RNZN frigate WELLINGTON was sunk in 2005, seaward of Island bay (in 23 metres of water). This is likely to result in an increase in the number of small craft navigating in the area for fishing and diving purposes and possibly sight-seeing purposes. Future SAR response plans for this could need to be considered.

5.2.3 Area A – Incidents of Note

There are records of vessels being wrecked on the Wellington approach shoreline going back many years. However the recent data record is dominated by reports of mechanical failure. Such a record only underpins the conclusion that the Wellington approach is an unforgiving area. Mariners who experience difficulty with their vessels tend to report problems at an early stage - they are literally between a rock and a hard place if mechanical problems cannot be rapidly rectified. It is an area where a planned and rapid SAR response is justified, with early precautionary call out recommended.

5.3 AREA B - ENTRANCE

Area B essentially covers the entrance channel and the bar. The entrance into Wellington harbour lies between Palmer Head to the west and Pencarrow Head to the east. The entrance is divided into two channels by Barrett Reef, a rocky outcrop of about 5 cables length lying about 4 cables south of The Pinnacles in a north-south direction. The main channel is east of Barrett Reef, approximately 7 cables width, with depths 11.3 metres over the bar and 16 meters maximum.

A smaller secondary channel, Chaffers Passage, lies to the west of Barrett Reef. This separates Barrett Reef from the shoreline of The Pinnacles and Point Dorset. The controlling depth of this passage is 9.6 metres with a width of about 2 cables at its narrowest point, but there is at least one sunken rock and also kelp beds in the area. There are no Aids to Navigation

for Chaffers Passage and local knowledge is essential. In practice only leisure craft, small commercial and fishing vessels use this passage (i.e. none requiring pilotage). This passage affords shelter in north northwest winds, and also allows smaller craft to keep clear of larger vessels using the main channel. Chaffers Passage may be dangerous in strong southerly conditions, when heavy surge or swell are present.

The narrow bottle neck shape of the entrance channel runs north for a little under two miles between Barrett Reef Buoy and Steeple Rock beacon, this area being known locally as 'The Narrows'. The western shoreline is characterized by rocky ledges and pinnacles extending seaward from a wave cut platform, while to the east a larger platform, under 10 metres depth, runs along the eastern side of the channel from the Eastbourne coast.

Makaro/Ward Island marks the northern extremity of this shoal area, while the Front and Rear leading lights help to mark its western boundaries. The navigable channel for large vessels (i.e. water depth over 10 metres), narrows with distance north (around 7 cables at Barrett Reef to 4 cables off Steeple Beacon).

The channel minimum depth (of 11.3 metres) occurs close west of the leading line and about one mile north of the entrance. Depths along the line of the leads and inward/outward tracks taken by large vessels vary between approximately 19–11.3 metres (the average being 14 metres). With the width restriction formed by the platforms on each side, there is an effective channel width of six cables or less for large vessels until the deeper waters of the harbour basin (Area C) are reached.

5.3.1 Channel Morphology

The section between the south end of Barrett Reef and Steeple Beacon ('the Narrows') is also the area of least depth. If the seafloor profile was examined as a cross-section, it would be seen as a bar-like formation, connecting the deeper harbour approaches to the basin of the inner harbour area. Although Wellington entrance does have a bar profile and therefore occurrence of heavy breaking waves, depths do not appear to change rapidly, nor is there a counter current as in other bar harbours (e.g. Greymouth or Westport). Academics would therefore not refer to Wellington as a Bar Harbour, but for navigation in severe weather the effect is the same.

The seafloor is generally fine sand and is mobile during storm events, but this does not significantly affect depth, rather the pattern of sediment distribution changes. Underlying gravel is exposed periodically, particularly

is severe southerlies. Wave formations on the seafloor (sand-waves), occur off Steeple Beacon and have been measured at one metre amplitude by various studies. These formations are noticeable on echo sounders during transit and are a potential cause of an increase in squat. They are not thought significant except for those operating with minimum under keel clearance for the port (1.5 metres static).

5.3.2 Wind and Wave Regime

Wave generating capacity is relatively limited in winds from the north quarter due to limited fetch. These are probably limited to a significant height of around two metres (this is not known accurately), but are hazardous from a small vessel/craft point of view, especially near Steeple in strong Northerly winds.

Well developed waves and groundswell are incident on the entrance from the south. Southerly winds blow over a much longer fetch and both wave and swell combine to produce heavy seas, particularly at the seaward limits of the entrance and Steeple Beacon area. After this point, waves and swell diminishes rapidly in height as the channel opens out and energy is spent on the Eastbourne platform (of which Hope Shoal is a part). Northerly gales outnumber those from the south by at least 2 to 1.

There is no wave measuring instrumentation in the entrance although Beacon Hill staff do make estimates of wave height to reporting vessels (during daylight and good visibility). They use Outer Rock, which provides observers with a reference point of known height on which to base judgements. Visual estimations have suggested that the most frequent swell has a height of around 1.2 metres and 9 second period, with the largest mean swell being in the region of 3 metres and period of 11 seconds. Locally generated wind waves are added to any southerly ground swell (thought to be present at least 80% of the time).

Deep water waves from Cook Strait reduce in length abruptly as the sea floor rises. They therefore increase in steepness, breaking right across the entrance in severe southerly gales. The rail ferry ARANUI was once witnessed in difficulties on an over-breaking wave; the vessel lost steerage, aborted the passage, returning to Wellington.

Ferries transiting the entrance in severe southerly gales can experience severe pitching. Photographs (**Figures 7& 8**) showing an 84m Cook Strait ferry transiting the entrance on Waitangi Day, 2002, in waves reported at around 14 metres, illustrates the difficulties of the entrance.

Figures 7& 8: Cook Straight Ferry Transiting the entrance in seas reported to be about 14m.

Wave direction is controlled by the channel topography to north-south directions (with some variation only by a few degrees either side possible). Waves are therefore incident from ahead or astern during entrance transit, resulting in pitch and heave rather than roll. However, in a broad southwesterly, wind and sea conditions are on an inbound vessel's port quarter, making course keeping difficult with significant yaw and roll. In these conditions, pilots advise they normally proceed at reduced engine speed allowing application of extra thrust should excessive yaw occur.

Both sea state and wind can make progress difficult, even for ferries with reasonably high power to displacement ratio. There is a danger of losing steerage while in or outbound, through either operational failure, or effects of weather – the shallowness of the channel also has an effect from seafloor interaction. The initial loss of control of the WAHINE incident (1968) is still

not explicitly understood, but it is widely accepted that a factor was loss of rudder effect in heavy following seas. Vessels routinely experience yawing while entering with a heavy following sea and occasional reports of broaching with regained control are available.

Northerly conditions do not present such a hazard given limited wave development. The likelihood is that a vessel will be blown away from the entrance if problems occurred inbound. Anchoring before reaching the narrows between Barrett Reef and the eastern shoreline is also more likely to be successful. However, high windage vessels transiting through Area B can find it difficult to make course alterations due to wind pressure on the hull and superstructure, particularly where a vessel is poorly trimmed.

However, the moderate seas which develop through the entrance in a northerly can be hazardous to small craft. Smaller vessels, particularly sailing craft attempting to tack are vulnerable to weather from either direction.

5.3.3 Area B : Harbourmaster Risk Management – Heavy Swells

The entrance, like the approaches, is under the visual and radar surveillance of Beacon Hill Communications Station. There are currently no operating limits for ferry operations, but warnings are faxed by the Harbourmaster when conditions at the entrance are particularly adverse[7]. However, as in many ports the decision to leave remains with the master. In practice, operators of passenger services are likely to cease operations at this point or before. There is little doubt that there have been occasions (in the past) where vessels have proceeded in extremely adverse conditions, beyond the capability of harbour tugs to render assistance. Guidance comes from weather reports, Beacon Hill Communications Staff and the Baring Head Wave Rider Buoy. Harbourmaster warnings of entrance conditions were sent five times in the year of the risk assessment (2004-2005), representing only a small percentage of operating time.

Correlation of wave data offshore to conditions within the inner part of the entrance would be of value to Wellington. The most restricted part of the entrance channel is the most crucial part for the transit into the harbour in adverse conditions (i.e. the point of highest risk). At present, allowance for dynamic motion is made in the minimum UKC of 1.5 metres in the channel (normal transits). Given the dangers of the entrance and the concentration

[7] Warnings are sent when the recorded wave height reaches 7 meters – this often coincides with a significant wave height of five metres.

of incidents, a more scientific approach based on measurement would be more appropriate. Recommendations are made against the risk profile in section 13.7.3.

5.3.4 Area B - Tidal Regime

Normal tidal streams are reported to be no more than one knot in a northwest or southeast direction in the eastern limits of the channel, or a north or south direction through the entrance. Rates are significantly affected by prolonged gales.

5.3.5 Area B - Navigational Use

The main shipping channel is a transit area for a wide range of vessel types including leisure users. There are in excess of 14,000 transits a year by commercial and larger pleasure craft alone. The area is designated through Bylaw as a 'Narrow Channel' where Rule 9 of Part 22 of the New Zealand Maritime Rules applies, whereby any vessels of less than 20m in length, or a sailing vessel, must not impede the passage of a larger vessel. A standard NZ Harbour Bylaw restricts vessels of less than 500GT from impeding the passage of larger vessels (the "500 tons" rule). Recommended traffic routing and associated issues are referenced further in section 11.2.2.

There are a range of leisure activities taking place in the area generally, including a yacht club catering for racing centreboard craft (Worser Bay), which confines its activities to the west of the shipping channel.

Recreational fishing vessels transit the area; those based in Seaview Marina, tend to follow the eastern shoreline and pass to the east of Makaro/Ward Island. Fishing craft also anchor in the western parts of Area B, particularly off Falcon Shoals, which is an area where vessels of draught less than 7.0 metres can navigate.

The western shoreline is popular with kayakers, shore divers and swimmers, as well as charter vessels, which cruise close to shore during summer months. The eastern shoreline is less appealing to most leisure users (barren and rocky), but small craft including kayaks are used to land on Makaro /Ward island. Some setting of fishing nets also occurs along this shoreline.

Windsurfers occasionally transit the channel, crossing from Seatoun Beach to the eastern shore, favouring fresh conditions. A windsurfer school operated at Worser Bay, but is no longer active. A small wharf at Seatoun is

used occasionally by fishing vessels and small commercial vessels for crew exchange purposes, or by the pilot launch either to change pilots or await vessels. A commuter ferry service may operate from here in the near future due to planned expansion of the harbour ferry service.

5.3.6 Area B – Incidents of Note

The loss of the WAHINE on Barrett Reef, which occurred in 1968, is well documented. This particular hazard features regularly in past groundings and wrecks e.g.; EARL OF SOUTHESK in 1874, HUNTER in 1876 and WANGANELLA in 1947. Many would suggest these events to be irrelevant to modern shipping, but they do underline the unforgiving nature of Wellington's approach if something does go wrong. This involved smaller vessels as well: in 1986, the Police Launch LADY ELIZABETH II foundered off Barrett Reef in a southerly.

There have been near miss and actual collision incidents before pilotage was recommended through the entrance (1952). Since then collisions of varying severity involving unpiloted fishing vessels and merchant ships have occurred. In 1997 a container ship and fishing vessel were in collision at the harbour entrance in darkness, resulting in worst-case multiple fatalities when the fishing vessel capsized. There have been regular reports of close quarters situations involving two RoRo ferries as well as those involving RoRo and piloted vessels.

Groundings of fishing vessels feature in the incident record and two vessels have struck the front lead in reduced visibility.

Fatalities have also been associated with small craft; particularly those of aluminium or lightweight construction, which have been caught in rising northerly conditions, resulting in capsize in short and steep seas along the east side of the entrance. It was noted from the review of incidents that whilst southerly conditions provide the highest seas through the entrance, it is during northerly conditions that most incidents occur involving leisure users.

5.4 AREA C - MAIN HARBOUR

The Main Harbour is essentially a roughly circular basin of approximately 85 square kilometres area with a width of six nautical miles. The basin form is shallower at the northern and eastern shorelines, where there is extensive beach development (at Petone) and gradually pro-grading shoreline around the eastern bays. The western shoreline and coast along the Miramar peninsula is characterized by the wave-cut platform formation where the seafloor slopes away more steeply.

5.4.1 Coastal Morphology and Bathymetry

At the northern Petone and Eastern Bay's beach shoreline there is extensive shallow water (less than 10 metres) extending for approximately 4 cables seaward, but for the most part in Area C depths are generally between 16 and 22 metres with isolated soundings of 31 metres. Somes Rock is the only isolated danger which is not visible at low water, with a charted depth of four metres approximately three cables South West of Somes Light. The bottom is mud with fresh water springs issuing in several locations from the Hutt aquifer.

The Hutt River discharges at the northeast end of Petone Beach and supplies a considerable amount of debris into the harbour during flood events. The river also supplies most of the sediment load in the harbour with a smaller component brought in by longshore drift from the South Coast. Three islands in Area C are administered as reserves by the Department of Conservation and the largest of these (Somes/Matiu) have resident staff.

5.4.2 Area C - Wind and Wave Climate

Fetch lengths are sufficient to allow the development of seas, reportedly up to two metres in prolonged strong winds. Southerly swells also range up the harbour and although these are diminished greatly in height from those at the entrance, nevertheless contribute to a sea state which can be hazardous to small craft. Some areas are well sheltered depending on wind direction, such as Kau Bay in a Southerly. Similarly the Western Hutt motorway shoreline up to one mile is sheltered in winds from west to north.

The area is subject to heavy gusts off high land and funnelling down gorges (Ngauranga and Kaiwharawhara) which affect small craft, particularly those under sail, and also larger vessels manoeuvring in strong winds[8].

5.4.3 Area C - Tidal Regime

No significant streams occur in the harbour, the exception being flow from the Hutt River, particularly during floods. This is reported to cause short steep waves locally in conjunction with gale events.

5.4.4 Area C - Navigational Use

The area is not under radar monitoring or visual surveillance from Beacon Hill. Large vessels transit Area C whilst in or outbound and the area also includes the Rail Ferry Terminal, Thorndon Container Terminal, Aotea Quay and Seaview Oil Terminal; all major wharf and berth facilities. Seaview has a lack of reference points in the approach, making berthing recommended by pilots with significant experience only. Seaview is also affected in a southerly gale and the short seas which form can affect tug ability to push on. As the Seaview jetty is not aligned with the wind direction in a southerly, misjudgement on an approach has the potential to result in a serious incident.

The harbour ferry regularly transits across Area C, operating a service from Lambton Harbour to Days Bay wharf and also to Matiu/Somes island several times a day. Thorndon Container Terminal is interesting in that its geographical layout places the berth face approximately parallel with winds from the south or north (the predominant patterns). Large vessels alongside are thus mostly head or stern to wind and pilots are adept at using wind loading on the hull plane for berthing or departing.

Large vessels transiting the harbour are generally following the Recommended Tracks (see **Figure B1**, **Annex B** and section 11.2.2). These tracks occupy the south western part of Area C. However tankers and tugs routinely transit across the area to and from Seaview oil terminal, and occasionally passenger vessels will transit the harbour outbound along the Hutt Motorway and to the north of Matiu/Somes Island.

Leisure craft of all types may be encountered in Area C, including keeler yacht races throughout the area, fishing craft and kayaks along the shorelines and around the islands and all types of leisure craft transiting

[8] Large Vessels may need a speed of 8 knots to be responsive to the rudder in these conditions.

between marinas, launching ramps and other harbour areas. Seaview marina, located in the NE of Area C, has floating berths for around 130 craft of up to 20 metres length and parks for 150 trailerable craft, as well as a popular launching ramp. A keeler yacht club, Lowry Bay Yacht Club is based in the marina and holds races on the Eastern and Northern areas of Area C. Centreboard yachts clubs are also active along the Petone foreshore and also at Eastbourne.

Other organized activities are the Sea Cadets, a water ski club and a rowing club, all operating along the Petone foreshore or northwest corner of the harbour, and generally clear of large commercial movements.

A water ski access lane is provided in the northwest corner of Area C and no problems are reported between different users in this area.

5.4.5 Area C- Navigational Issues of Note

The main stakeholder feedback arising out of consultation concerned the main harbour area. These are summarised as follows:

- Yacht races being set across recommended tracks;
- General leisure craft impeding passage of larger vessels;
- Large vessels 'cutting corners' of tracks and navigating close to the Miramar peninsula where leisure users are operating or small commercial/fishing vessels are transiting, or are at anchor – a sail training vessels routinely anchor here on visits to Wellington and have been in close quarters situations with transiting ferries;
- Background shore lighting, particularly from the port and Hutt Motorway making it difficult for craft and vessels to detect one another by night;
- Kau Bay is a multi use area particularly in southerly conditions when it is well sheltered. It is a popular place for leisure craft to anchor, for shore diving, kayaking and there is a water-ski lane;
- Debris derived from the Hutt River during heavy rainfall presents a hazard to small craft and may damage small commercial vessels such as fishing vessels or the harbour ferries.
- Conflicts with anchored vessels.

There are a number of incidents of note in this area relating to berthing contacts. A fishing vessel tied up alongside Aotea Quay was lost through heavy contact with a ferry manoeuvring in adverse weather without tug assistance. There was a close-quarters situation involving a tanker and ferry in 2005 and there have also been a number of vessels dragging anchor in the changeable weather conditions prevailing in the harbour.

5.5 AREA D - LAMBTON HARBOUR

This is an area of high navigational use, both leisure and commercial. Commercial activity is most concentrated in the northern part of the area, around the Ro-Ro berths while leisure facilities are located in the southern section with a marina, boat harbour and popular beach.

Potential for conflict between various users has been identified as significant in this area.

5.5.1 Area D - Physical Characteristics

This is the smallest of the study areas and essentially comprises a basin with depths over 10 metres for the most part and a shoreline composed largely of commercial wharves and boat harbour or marina structures. The exception is the southern shoreline extending from Freyberg beach to Point Jerningham.

The area directly under the lee of Mount Victoria is sheltered in winds from the southerly quarter but the commercial berths on the northern side are affected by winds from north or south, making berthing difficult for high windage vessels such as Ro-Ro's, particularly in southerly gales.

Wave development is generally more limited than other harbour areas due to the small fetch in prevailing northwest conditions and relative shelter in winds from the south. However there is sufficient capacity for a choppy surface to develop which poses a hazard to low freeboard leisure craft, such as rowing skiffs or dragon boats.

5.5.2 Area D - Navigational Use

This is a high use area of the harbour, with large and small commercial movements and a variety of types of leisure use. This is heaviest in summer but is ongoing through winter. Lambton Harbour is a popular area in which to hold special events and rowing regattas or dragon boat racing are common. It is also frequently used as a starting area for yacht races, both special events and programmed.

A speed restriction of 12 knots applies in the area between the Carter Memorial Fountain and the southern end of the container reclamation.

Finger berths provide berthing for RoRo ferries operated by Strait Shipping, Pacifica and at time of the risk assessment also provide a temporary berth for Toll Holding's largest Ro-Pax vessel, CHALLENGER. The waterway

around these berths has been deemed a '*Restricted access area for non-commercial craft*' under the Regional Council Navigation and Safety Bylaws 2003[9].

Vessels approaching these berths may do so from either the north or south side of the harbour, depending on wind direction and master's preference. It is difficult for leisure users to predict which approach a vessel may take, but it is normal for smaller commercial vessels to communicate by VHF and negotiate safe passing.

The wooden wharf structures in this area have provided up to 100 years of service and can reasonably be described as well used, with residual loading capacity below that originally installed. Their use has changed too, from overseas ships berthing with tug assistance to RoRo services with frequent berthing events. In marginal conditions tug handling by pilot exempt masters is inevitably less polished than by the pilots who use tugs daily.

On the introduction of container shipping the priority for the port's main berths shifted to the container berth and Aotea Quay and the older wharf maintenance budgets were revised to make savings. However these wharves now experience higher frequency berthings and as a result contact berthing incidents are common. The wharves are probably outdated for the large ferry tonnage now using them and damage to InterIsland and King's Wharf has been substantial. These berths have noticeable lee and windward sides, presenting difficulties for the ship handler. The fendering systems deployed have been unable to cope with the berthing of large RoRo ferries.

The option for a ferry to take a tug to assist berthing is left to the discretion of the master[10], except in unusual circumstances where the vessel has a defect affecting manoeuvrability; it is then directed to take a tug either as a result of Port Company requirement or by the Harbourmaster.

There is no standard wind speed at which ferries will use a tug, each vessel having different characteristics and differing perception by the master of when a tug is required. Some ferry operating companies may provide more encouragement for masters to use a tug than others, so that commercial pressure is a factor.

[9] See Schedule 2 of the Bylaws – location specific information
[10] CHALLENGER was required to routinely take a tug until handling experience was gained.

5.5.2.1 Area D - Berthing

Large vessel berths on the southern side of the area are used mostly by laid up fishing vessels. The Overseas Passenger Terminal is occasionally used for berthing cruise vessels or visiting warships, but may also have fishing vessels alongside. Thus, large commercial movements may occur on both sides of the area, although most are concentrated on the northern side.

Lambton harbour also provides berth space for a number of fishing vessels (up to around 40 metres length), including several vessels which are laid up. Local small commercial vessels, harbour tugs and pilot launch, police launch, harbour ferries and charter vessels are berthed in Lambton Harbour.

5.5.3 Area D - Leisure Use

Lambton harbour is a high use area for leisure craft, organized clubs, hire craft and private leisure craft.

In this area there is a marina, a small-boat harbour (combined facility for around 250 craft up to around 20 metres length) rowing clubs, a keeler yacht club and a small craft hire operation (kayaks and paddle boats). Freyberg beach is a popular bathing beach and small craft can be launched from here (kayaks and dinghies). Hire craft are subject to licensing by the Harbourmaster and therefore should conform to safety standards and conditions of operation.

The southern shoreline is a popular anchorage for leisure craft, and sailing craft can also lie alongside inner Queen's berths at dedicated yacht finger berths.

The area is subject to speed restrictions under Bylaw; the generic 200m, 5 knot restriction (which is marked with buoys); a 12 knot restriction applies between the Carter Memorial Fountain and the southern end of the Container Reclamation.

5.5.4 Area D – Navigational Incidents of Note

In 2001 the freight RoRo KENT was holed in way of the engine room after contact with a moored barge and subsequently lost power to require tug assistance to be brought alongside the Overseas Passenger Terminal and secured. This occurred in a severe southerly.

In 2005 cumulative damage occurred to the wharf used as a temporary berth for the RoRo passenger ferry CHALLENGER.

5.6 AREA E - EVANS BAY

Area E is an area of high leisure use and some commercial use. Commercial use involves both large and small vessels, with tanker movements predominant. One of the three oil jetties in Wellington Harbour is located at the south-eastern head of the bay. Berths are also available for several laid up fishing vessels.

Wellington airport is located south of Evans Bay and larger vessels must report air draught to Beacon Hill prior to transiting the bay.

5.6.1 Physical Description, Morphology and Bathymetry

Evans Bay runs in a north-south direction for two miles and is entered between Point Halswell and Jerningham, each of which is marked by lighthouses. The entrance is approximately one mile in width but the bay narrows with distance south to reduce to 4 cables between Greta Point reclamation and the Miramar Peninsula shoreline. After this point the bay widens to a roughly circular shape, but becomes shallow for the most part with depths of less than 10 metres in the west. Depths of about 12–19 metres exist in the eastern lower part of the bay, and this area is used for swinging and manoeuvring tankers or other large vessels onto the berth.

In common with much of the harbour, the rocky shoreline is characterised by a narrow wave cut platform from which depths shelve away rapidly. Small beaches of pebbles occur along the northern and eastern sides of the bay, but the lower south-western area is dominated by softer sediments and shoal water. The southern shoreline lacks any significant beach development and a layer of boulders has been added for erosion control.

Evans Bay acts as a wind funnel causing local acceleration of wind from the north and south. In northerly conditions there is sufficient fetch for relatively rough seas to develop which pose a hazard to small craft, particularly around the narrow section of the bay. Fetch is also limited in southerly conditions but steep waters develop at the entrance to the bay which can be hazardous to small craft (these are unlikely to exceed 1-1.5m height). Small craft, particularly yachts with small auxiliary motors, can find it difficult to progress against the wind. On one occasion in 1992, the rapid onset of a storm force southerly caused chaos amongst a large number of yachts racing in the bay and stretched rescue resources.

5.6.2 Berthing – Tankers Evans Bay

Strong winds result in restrictions on tanker movements in the bay, particularly broad northwest winds which tend to cause a tanker to round up into the wind, and make it difficult to keep hull speed down. Accelerated gusts are also common and tankers can thus inadvertently berth in gusts that may peak outside recommended limits. Swinging ability in strong winds is limited by available tug power and operational failure of a tug while swinging leaves little room for recovery with the limited sea room and depth available.

Manoeuvring of tankers in Evans Bay is controlled by Pilotage Service Standard Operating Procedures (see section 8, Pilotage).

5.6.3 Navigational Use

There are around 12 tanker arrivals a year to Burnham Wharf. The NIWA research vessel "TANGAROA" also berths regularly when there are no tanker operations. Several fishing vessels of around 40 metres length are laid up on Miramar Wharf. In the past, these have (frequently) broken out of their moorings in northerly gale conditions. They are recovered by tugs. Usually these vessels are unattended and worn or parted mooring lines are reported by members of the public or Harbour staff on patrol.

Evans Bay is a high leisure use area, with a range of activity types, including:-

- A yacht club catering mainly for centreboard and trailer racing yachts;
- Evans Bay marina, administered by the Wellington City Council and catering for both private keeler yachts and launches as well as several inshore fishing vessels (total facility around 150 berths for craft up to 20 metres length);
- Sea Scout and Sea Cadet units operating whalers and other small craft;
- Public launching ramps for trailer craft;
- Waka-ama and kayak activity;
- Water-Skiing -a water-ski lane lies at the head of the bay;
- Windsurfers launching from beaches in the northern half of the bay;
- Shore diving.

There are number of swing moorings in the lower western area. The Wellington Volunteer Coastguard base and launching site is located in the marina and two dedicated rescue craft operate from this site.

In summary, Evans Bay is used as a transit for leisure craft moving to other harbour areas for activities such as yacht racing and fishing, while windsurfers tend to cross the bay and the local yacht club race courses in summer weekends. Inshore fishing vessels and large commercial vessels mostly tankers may also transit during periods of high leisure use, although most tanker movements occur night, which avoids traffic conflict. It is not clear if this is by chance or planning.

6 ANCHORAGES IN THE HARBOUR

There are four designated anchorages marked on NZ 4634, including an explosives anchorage. Generally the minimum depth in anchorages is 13m and the maximum is 21m. Anchoring is prohibited within close proximity to areas where underwater cables exist, all of which are marked ashore with white triangular beacons. Anchoring is not recommended in the fairway marked by a pecked line off the Container Terminal and Aotea Quay due to the volume of shipping traffic transiting this area.

Vessels are routinely anchored in an area close to the termination of the inward track on 315 degrees. Holding is considered to be relatively good in the mud base at that location. Other areas where vessels may be anchored close to shipping traffic are between the south end of the container terminal and Point Jerningham in south-westerly conditions. This is an area used by vessels transiting to Lambton Harbour and the container terminal and anchoring. Prohibiting Anchoring close to the inbound recommended route (especially the 315 degrees track termination) needs to be considered. This could be both by VTS (Beacon Hill) advice and chart markings.

Wellington experiences frequent strong wind events and vessels need to put out sufficient cable to maintain good holding. CentrePort's Pilots recommend that vessels put out seven shackles on one anchor with three on the other, well spread out to prevent the vessel yawing. This configuration is considered sufficient to hold in most conditions. However vessels are then susceptible in any undetected wind change (this has happened with a ship requiring tug assistance to swing and remove turns in anchor cables).

At present Beacon Hill Signal Station is unable to monitor the position of a vessel at anchor by radar and occasions have seen members of the public informing the Harbourmaster or port company that a vessel was dragging. During the risk assessment, the ability to monitor vessels at anchor by AIS was introduced - provided the vessel is fitted with such equipment.

Changes in wind direction can be rapid with little warning, particularly when the wind backs from a strong northwest to south. The timing and strength of these changes can be difficult to predict and Beacon Hill promulgates warnings of observed wind change to vessels at anchor. Changing wind direction is also important for vessels which have anchored in the lee of Point Jerningham in a strong south-westerly as a shift to northerly quarter wind puts the vessel close to a lee shore. In 2004, a container vessel

narrowly avoided dragging ashore in this area during a northerly gale. Other vessels have also dragged, again providing nears miss grounding or contact events.

7 HARBOUR NAVIGATION – SMALL VESSELS AND CRAFT

7.1 FISHING ACTIVITIES

Wellington is no longer a busy fishing port and has only a few inshore trawlers operating from Lambton Harbour. Cray fishing vessels may operate both from Lambton Harbour berths and moorings at Island Bay, and also from various marinas. These vessels are seldom over 20 metres length.

Fishing vessel numbers do tend to increase during the Cook Strait Hoki season (June to September). Although these appear to favour Picton, entry into Wellington by skippers who are unfamiliar with the harbour and recommended tracks for shipping is an area of concern for the Harbourmaster's department.

Net fishing does occur in parts of the harbour, but generally in the east away from areas navigated in routinely by large vessels.

7.2 CHARTER VESSELS AND CRAFT

A number of charter vessels offer evening cruises and fishing trips in the harbour. The highest passenger capacity for charters is 80 and smallest 5, with charter vessels ranging from 6 to 40 metres length. As expected the peak period is during summer months, particularly the six weeks over Christmas and New Year. Charter vessels operate within Area B, C, D and E, although there are some operators offering fishing or diving trips along the south coast (Area A). There have been fires onboard charter vessels on two occasions in the past 10 years, which have required assistance from other vessels to control.

With all charter vessels deployed, it is possible to have around 600 passengers on the water - this being based on passenger capacity only.

Interestingly, the Police Maritime Unit provides enforcement of charter standards in Wellington, checking qualifications and certificates held, including Safe Ship Management.

7.3 SMALL COMMERCIAL - NON PASSENGER

There are relatively few vessels of less than 500 gross tons trading on or to Wellington Harbour on a regular basis. The most frequent are cable protection vessels transiting to and from the Cook Strait cable zone[11] and a NIWA research vessel. Although tug and barge operators are active in Wellington, these occur only on an occasional basis.

7.4 LEISURE USE

Wellington Harbour supports a wide range of marine leisure activities (described in each area description). An illustration of the range is as follows:-

- Organized yacht racing from centreboard dinghies to keelers;
- Kayaking, both under hire and individual private owners;
- Cruising yachts and launches;
- Water-skiing and Personal Water Craft use;
- Rowing skiffs;
- Dragon boating and waka-ama;
- Windsurfing;
- Recreational fishing;
- Diving, both from shore and boat;
- Swimming, including multi-sport events and training.

The majority of the coastline is accessible to the public by road and there are many launching ramps where trailer craft can be launched directly into Cook Strait or within the inner harbour areas. Several marinas cater for a resident population of larger yachts and launches while small craft such as kayaks are easily launched from beaches around the coastline.

Leisure activity is naturally highest between October and April, although some activities (e.g. kayaking and fishing) do carry on throughout the year.

In terms of leisure traffic density, this is highest overall in Areas C, D and E (i.e. inner harbour areas). Where use is concentrated within these areas, the Harbour Organization has already put in place additional measures to manage navigational safety.

[11] These occur on a regular two weekly basis.

7.4.1 Yacht Racing

Yacht clubs are located in all harbour areas, except Area A. In general, centreboard yacht activity occurs away from the navigational tracks of shipping, except in Evans Bay where tanker or occasional other large movements occur. In practice most tanker movements occur at night when centreboard yachts are not active.

The two clubs which cater for keeler yachts are located in Lambton Harbour (the Royal Port Nicholson Yacht Club (RPNYC)) and Seaview Marina (Lowry Bay Yacht Club). The Lowry Bay yacht club reports generally confining their race courses to a line approximately east of Matiu/Somes and Makaro/Ward islands. Potential for conflict with large vessel movements is again mainly related to tankers, which are relatively low in frequency. RNPYC have more extensive courses which often start in Lambton Harbour and may extend to any part of the main harbour, including races to Island Bay twice a season which include transit of the entrance. Offshore races are also held once a month in season, which start from the harbour and finish outside harbour limits. Races are held on weeknights, often Wednesday evenings, and also weekends.

Yacht club policy for course setting is to minimize conflict with shipping, on the basis that avoiding conflict is better than a race area being constrained by regulation. All yacht clubs appear to have good liaison with the Harbourmaster through the Harbour Rangers, and meetings have been held pre-season between the RPNYC and the Harbours Department, Police Maritime Unit, Maritime Safety Authority and CentrePort to discuss safety issues.

As part of attempts to minimize yacht and shipping conflict, the club policy is for the Race Officer to advise Beacon Hill of the course in use and planned start time. Thereafter the Race Officer will monitor VHF channels 14 and 62 and time the start to avoid shipping conflict. In practice it is reported that most Beacon Hill Communications Officers will update the Race Officer with delays or amendments to shipping, although this is not uniform practice across all staff.

However, errors of judgement can occur in the timing of a race start by the Race Officer, through lack of experience or failure to monitor VHF Channel 14 while organizing the race start. It is also inevitable that, although the race may start without conflict, racing yachts are still likely to cross

Recommended Tracks at some point throughout the duration of the race, with the potential for conflict.

7.4.2 Special Events

Organisations seeking to hold special events generally apply to the Harbourmaster for a permit to do so under Bylaw, although it is not a specific requirement that they expressly do so. Around 40 permits for special events are processed annually by the Harbours Department, and activity type is varied, including yacht regattas, powerboat races and dragon boat festivals. Many of these take place in Lambton Harbour as this provides a good vantage point for spectators ashore. Liaison between the event organizer and the harbour management system occurs, and information such as location, duration, number and type of craft involved, requirement for a temporary speed uplifting or exclusion zones are transmitted to navigational users generally.

Some events attract large flotillas of spectator craft, such as major yacht races and the Police Maritime Unit assisted by local coastguard provide vessels to mange observers.

Annual fireworks displays are organised from a moored barge in Oriental Bay. Leisure craft traffic can be heavy at these times, but the events have a good safety record and are well organised.

7.4.3 Leisure Incidents

The high energy wind climate and resulting development of steep waters have been contributing factors in a number of fatalities over the years. Despite observations that general leisure use has increased by around 5 times compared with 30 years ago, the number of fatalities as a proportion may be reducing. Leisure users are now required to carry lifejackets and evidence is that they are used.

Relatively few incidents involving commercial movements and leisure craft are reported. This may be due to the physical lay out of the Harbour, where generally vessels sight one another with time to take avoiding action or navigate appropriately. The perceived low frequency of incidents is also likely to be due to the functioning of the harbour system, which has means in place to both educate users and enforce Bylaws and other regulations. Weather and general accident issues are significant, and resources to mitigate these are often overstretched.

The Wellington Police Maritime Unit attended approximately 80 Level II incidents (i.e. close to shore) in the period July 2004-Feb 2005, the majority of which were leisure related. Engine failure or lack of fuel is a reported cause in around a third of incidents. Failure to obtain a weather forecast and suitability of the craft for the conditions are also referenced. Sailing craft and power driven craft appear to rank equally in terms of craft assisted.

Close quarter situations between racing yachts and ferries or large vessels feature relatively often, and it is typically racing keelers which feature in these incidents. A collision has been recorded some years back, when the harbour ferry encountered an unlit dinghy, which passed between the ferry hulls at slow speed. At the time the ferry was in use as a charter vessel.

8 PILOTAGE

8.1 INTRODUCTION

Although there are natural navigation hazards, the pilotage is relatively straightforward with weather, particularly at the entrance and outer boarding areas, providing the biggest limitation. However, if a vessel does get into difficulty in adverse conditions in the approaches, there is only a minimal margin of safety before a vessel is in serious danger of grounding. The length of transit under pilotage from the outer boarding areas to a main city berth is about 10 miles.

8.2 JURISDICTION AND REGULATORY RESPONSIBILITY

The outer limit of the Wellington Pilotage District is marked on NZ4633 as an arc centred on Outer Rock of three miles radius and is therefore 0.85 miles inside Wellington Harbour Limits. Thus the Pilotage District is approximate only with the Regional Council Harbour Bylaw area of jurisdiction, pilotage being the jurisdiction of Maritime New Zealand. However, as introduced in section 4.1, the limit of compulsory pilotage is inside the entrance[12] and the outer limit of pilotage jurisdiction in reality provides only guidance for boarding. This is taken further to a recommended solution in section 13.5. **Figure 9**, below, repeats the limits of pilotage jurisdiction and shows the four designated boarding areas, all outside the compulsory area.

Nationally Pilotage is regulated under the provisions of the Maritime Transport Act 1994 through Maritime Rule Part 90. This Part came into force in 2003. Vessels of more than 500GT (with the normal exception of warships), are subject to Pilotage in the Compulsory Pilotage Limit of Wellington Harbour.

8.3 BOARDING AREAS

Four Pilot Boarding Areas are designated within the Wellington Pilotage District and located both within and outside the harbour entrance (shown on **Figure 9**). Areas 'Alpha', Bravo' and 'Charlie' are outer areas, located at the seaward extremity of the Pilotage Limit and approximately 3 miles south of the entrance. These are placed on and to either side of the line of the leads

[12] The Compulsory Pilotage Limit for Wellington encompasses the harbour area north of a line between Point Gordon and through the Rear lead to the eastern shore, as marked on NZ4633. This also coincides with the boundary between risk assessment areas A and B.

(Alpha is on the line of the leads)[13]. An inner boarding area, 'Delta', is located in the entrance channel approximately 0.5 mile south of the front Lead.

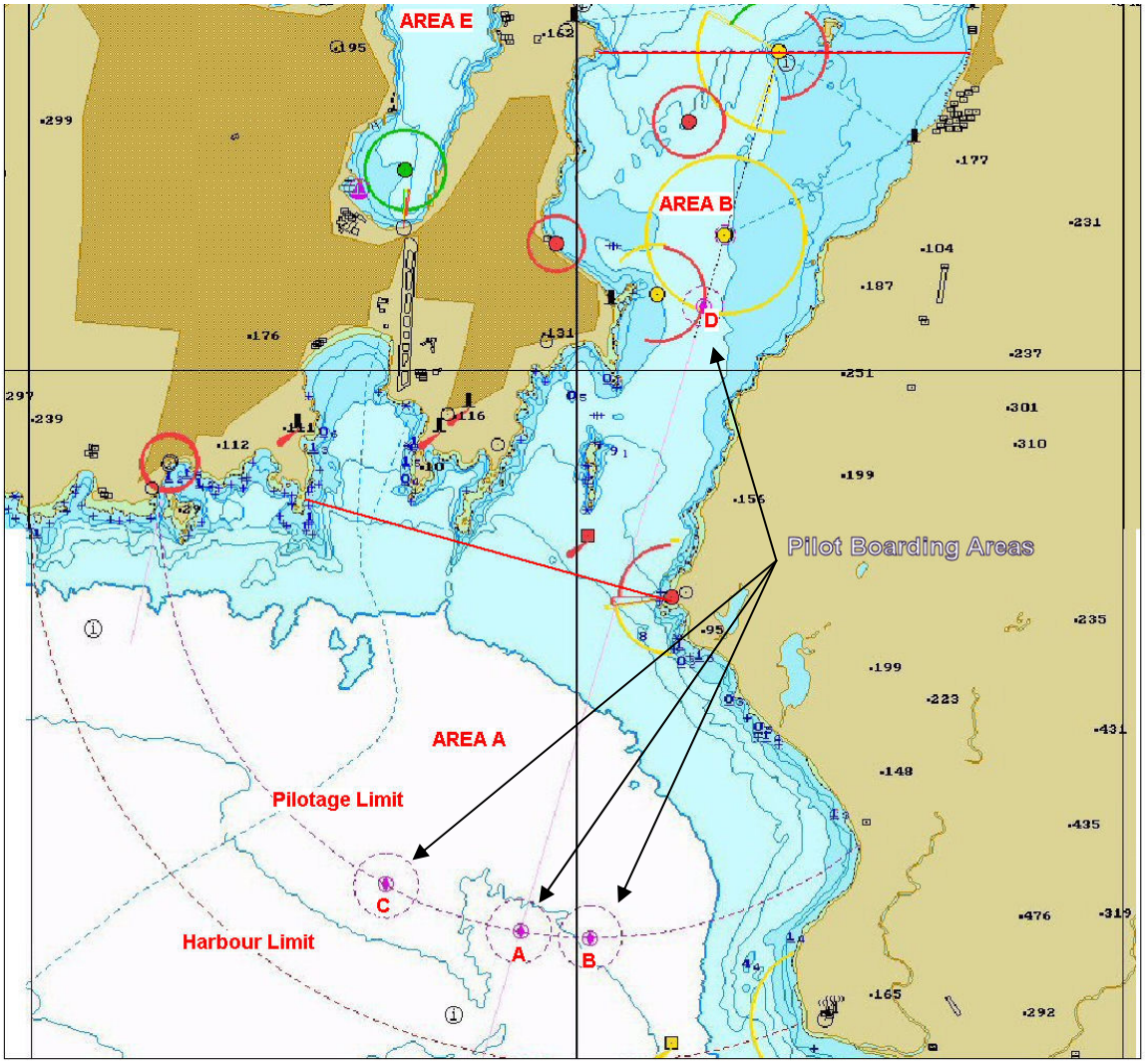

Figure 9: Pilotage Jurisdiction and Boarding Areas

8.3.1 Outer Boarding Areas

The outer boarding positions, Alpha', Bravo' and 'Charlie', are intended to suit vessels approaching from various directions rather than to suit prevailing weather conditions. However in adverse weather, where there is doubt as to whether a vessel will be boarded outside or led in to Delta, then the vessel is usually directed to wait on the line of the leads at least 3 miles off (ferry traffic is likely also to be joining the leads further out too). Then the inward run is commenced from Alpha. This makes navigating to an

[13] They were promulgated after comment by the Court in the Formal Investigation of the grounding of PACIFIC CHARGER, where the Court found that precise positions for the pilot boarding should be given … and defined on charts.

initial approach position simple, particularly for a foreigner. This system does however rely on Beacon Hill monitoring of the vessel to ensure it does not commence transit inbound on the leads in an inadvisable attempt to meet the pilot vessel.

Weather and sea conditions at the outer areas can be extremely adverse during gale or storm southerly events. Conditions may be hazardous for transit of the pilot launch through the entrance, where the sea state may be worse than at the boarding area due to the sea floor rising and the effect of wind against tide. The heavy swell and steep seas at the entrance on an ebb tide may preclude the launch transiting he entrance.[14]

Vessels are directed to a Pilot Boarding Area by the Pilot through the Beacon Hill communications centre. The role of Beacon Hill is limited to that of a communications facility, although when a vessel is being led into the Delta boarding area, a request may be made for Beacon Hill to monitor a vessel's progress and advise of excursion from the line of the leads.

The Outer Boarding Areas are usually clear of the area used by pilot exempt and smaller vessels approaching the entrance inbound, as the Bylaws require vessels to join the leads at least two miles off. In practice vessels join at no more than two miles off, except in the case of adverse southerly weather, where vessels are more likely to join further out even as far as five miles.

Use of the Alpha boarding location can pose a situation where an inbound vessel has manoeuvred to offer a lee for the transfer and will then join the leads within two miles of the entrance with potential for conflict with other traffic transiting the area. As reported instances of conflict are low and given that at least one of the vessels is under pilot control with support from Beacon Hill, this was not seen as a significant problem in the risk assessment.

8.3.2 Inner Area 'Delta'

As introduced in section 5.2, conditions at the entrance and outer boarding areas can be difficult in gales, especially southerly, conditions. These are not uncommon for Wellington (recalling that the weather is from the south approximately 25% of the time and that there are 284 days a year where wind speed exceeds 24 knots). Embarkation takes place at Delta, the inner

[14] This area, in gale southerly conditions, saw the foundering and breakup of the police launch LADY ELIZABETH II in 1986.

boarding area, where a pilot transfer or transit to Alpha, Bravo or Charlie boarding locations is considered unsafe in the prevailing conditions.

A CentrePort Standard Operating Procedure (SOP) exists for leading vessels in to the Delta boarding location. Embarkation at this is estimated to occur 5-10% of the time by pilots, which would translate to no more than 75 embarkations a year, using the movement records for July 2004-July 2005.

Use of Delta is far more common however for disembarkation of pilots in any weather condition where the pilot and master jointly consider it appropriate and safe for the vessel to proceed past this point without the pilot on board. Such a common practice should be treated with caution as there are many instances of incidents worldwide where a pilot has departed a vessel prematurely, even with the vessel on the leads. A confused master will also remain on the leads outbound, when they may be needed for a vessel inbound. Recommendations are made in the risk control section to involve Beacon Hill more in the disembarkation decision-making and interfacing, as well as procedural tightening up and training.

8.4 PASSAGE PLANNING

The Wellington passage planning system is comprehensive and well thought out, providing planning guidance on a single piece of paper. It is also universally in use and has buy-in commitment from all involved. Masters interviewed referenced its informative nature and provision of clear advice. This is attached as **Annex C**.

8.5 LIMITATIONS OF THE PRESENT PILOTAGE JURISDICTION

At present there is little preventing an inbound vessel transiting inbound to Wellington, negotiating the entrance and requesting a pilot whilst approaching the Delta boarding position. In practice this may never happen, because of Beacon Hill and VHF communication with the vessel (although communication with some crews can be difficult). The system presently makes regulatory requirement for pilots to be on board after passing one of the greatest hazards – the entrance itself! Pilotage is the jurisdiction of MNZ and recommendations are made for change out of this risk assessment.

Maritime Rule Part 90 and the design of the pilotage limit and jurisdiction presently facilitates the use of Delta boarding area when boarding outside is not considered feasible, by leading of vessels in appropriate circumstances. Although it can be argued the system is working at present, as pilots are

always reported to be on the pilot vessel when talking a vessel into the Delta boarding location, Authors fear the system (both from the regulatory and port company perspective) cannot defend itself from liability if something did go wrong. Despite Part 90 the system needs checks and balances for leading a vessel into the entrance and a jurisdiction that has no legal control until the harbour basin is reached needs to be modified. The recommended solution to this is in the risk control section of the report (Sections 12; 12.5 and 13.5).

8.5.1 Alpha and Delta Locations

Alpha is located on the line of the leads, meaning a vessel waiting for a pilot at Alpha is also on the leads. There are many instances of a pilot being delayed and a vessel then proceeding inbound (inadvisably) when the pilot vessel was observed outbound. The bridge team do this because of the psychological comfort that being on the leads provides. Consideration could be given to shifting Alpha to one side of the leads, which allows the boarded pilot to bring the vessel onto the leads inbound. Any decision to do this should recognise the utility that Alpha can provide when leading a vessel into Delta (i.e. a vessel advised to go to Alpha is placed on the leads), and the fact that improved monitoring from Beacon Hill can prevent a vessel proceeding inadvisably, by VHF call.

The location of the Delta boarding position is also directly on the line of the leads (for more practical reasons a "led" vessel needs to be on the leads) and also located in the narrowest part of the entrance channel. The use of Delta therefore implies a clear channel requirement and vessels outbound constrained by draught need to make this clear by the normal signal and interface with Beacon Hill. In practice pilots leading in a vessel would not wish for any other vessel to proceed outbound, particularly if the led vessel is yawing.

8.6 PILOT TRAINING AND SYSTEM

Wellington has seven pilots, one of whom is the Chief Pilot/Marine Manager and there is a pilot under training. Each pilot, with the exception of the Chief Pilot carries out between 200-300 movements a year. There is a wealth of experience in the system with senior pilots having over 30 years experience. But, like many port systems, the average age is rising and the underlying cause of movement risk is often when people retire, from what today is a well oiled system. All new pilots are trained first as tug masters and continue to be rostered as tug masters to maintain currency. Some

pilots routinely act as tug masters in rotation and all are designated as 'Marine Officers'.

CentrePort has comprehensive pilotage procedures, particularly in limiting parameters with emphasis on UKC and tug use. Like all procedural systems, constant attention is needed and from operational interviews and meetings; it was noted that not all pilots were aware of recommended limiting parameters. A review of these to provide clarity of limitations by summary should be considered. Using procedures as a training tool would also help.

CentrePort also has a Maritime New Zealand approved pilot training plan. Pilots progress through five grades from Probationary to Unlimited. Progression to unlimited status is expected to take around 3.75 years and involves completion of some 1,000 pilotage tasks. In the opinion of Authors, the system of pilot training and ultimate ship-handling ability produced is excellent; one of the best we have experienced. Consistent feedback from stakeholders reported the professionalism of the Wellington pilots – some referenced the fact that they remain the only NZ pilotage service that wears a traditional uniform[15], which in Author's opinion underpins what can only be described as a professional approach.

[15] Some stakeholders referenced the service as being old fashioned.

8.6.1 Pilot Exemption Certificates

Pilot Exemption certificates may be issued by MNZ to masters of vessels which are not oil, chemical or gas carriers, with two types of exemption grading:

- 'Standard' for vessels less than 145 metres length and 8,000GT;
- 'Extended' for vessels up to 205 metres length and 25,000GT.

A surprisingly low minimum number of transits under a pilot or exempt master are required for a Chief Officer or Master to sit for an exemption and Authors think this should be reviewed. Fishing vessel skippers also sit the same pilotage exemption examination process as the masters of merchant vessels.

Maritime New Zealand delegates the PEC examination to the Harbourmaster. In the case of Wellington, candidates are examined by a pilot in both written and oral format on behalf of the Harbourmaster. The examination process is well documented and uses the format of NZQA assessments. The process also involves a visit to Beacon Hill and an observation visit on a tug task. PEC master's can use a tug without the assistance of a pilot, but where two tugs are used, CentrePort policy is always to supply a pilot to the vessel[16]. This is considered to be a prudent policy as PEC holders become extremely competent at handling their own vessels, but are often not at all accomplished at managing tugs (tug masters also know the style of each pilot, whom they are working with regularly). Authors recommend CentrePort (with the support of the Harbourmaster) taking this policy further and providing an annual PEC training event for RoRo ferry masters to berth with tugs. Further information is contained in Section 13.5 risk control for pilotage.

Vessels with pilot exempt masters are currently ferries, cement carriers and fishing vessels. Long standing Harbours Department practice has been to record the PEC masters name on each transit. This was originally done to maintain a log by which currency of PEC masters could be monitored. Names are still recorded at Beacon Hill but the information is not actively used to monitor exercise of privileges conditions (this information would normally be monitored by the Pilotage Regulator, in the case of New Zealand MNZ). It is recommended this should be the case.

[16] This follows an incident where misjudgement by an exempt master, in manoeuvring his vessel, resulted in a tug line parting and killing a crew member.

8.6.2 Tug and Tows – PEC Status

Tug and tows are considered for PEC on the basis of the tonnage of the tug only, irrespective of the tonnage of any vessel or object under tow. Tugs and tows are an infrequent movement to Wellington and are given special attention by the Harbourmaster and port company management systems. Beacon Hill is also naturally involved with the movement. Authors are wary about management of tugs and tows by harbour systems and as these can pose difficulty for other movements, are often overlooked. Standards can differ enormously even within one operator. Even respecting the attention that is given to these by the Wellington movement management system, as in other New Zealand Ports reviewed by Authors, consideration should be given to regulating the total GT of the tug and tow as a package.

9 CENTREPORT MARINE SERVICES

9.1 PILOT VESSELS

CentrePort operates two pilot vessels. One is a twin engine, 14.6 metre, aluminium design with the good seakeeping ability necessary for boarding operations in the harbour approaches. A backup is provided by a 12.6 metre rigid hulled inflatable powered by twin petrol outboard motors. This is operated on a joint venture basis with the Wellington Volunteer Coastguard.

Tugs are occasionally used to transfer pilots – normally to a vessel anchored in the stream prior to berthing[17]. Authors normally discourage this practice unless it occurs in sheltered waters (as is the case) as the heavy displacement of a tug can trap the pilot ladder as a pilot boards, with relative hull movements causing it to part.

9.1.1 Pilot Vessel - Manning

All launch masters hold Inshore Launch Master qualifications and undergo a formalised training programme based on the NZQA National Certificate 'Pilot Launch Operations'. This involves at least 28 training days and a minimum of 50 transfers, half of which are carried out during the hours of darkness. Launch masters are also required to demonstrate familiarity with the harbour by completing a blank harbour chart to near Pilotage Exemption standard (the characteristic of lights, soundings etc). In common with other areas of marine personnel, the majority of launch crew have been drawn from shipping backgrounds and are qualified AB's in addition to holding Launch master qualifications.

[17] On occasion, this may also occur in the channel in emergency situations when a pilot launch is unexpectedly unserviceable

9.2 TUGS

CentrePort operates three Voith Schneider water tractors, KUPE, NGAHUE and TOIA. These have approximately 24 tonnes[18] static bollard pull in direct mode, with around 50 tonnes if used in indirect mode (this option is infrequently used in practice[19]). These tugs were built directly for the Wellington Harbourboard and two entered service sequentially around 1971, the third (NGAHUE) six years later. They were procured to satisfy a ship-handling role and a capability need for emergency assistance or rescue and salvage response to a vessel at or close to the entrance in distress. The emergency assistance rescue and salvage need was identified out of the WAHINE enquiry, following this vessel's foundering at the harbour entrance, April, 1968. Procurement was rapid following recommendation from the enquiry judge. The harbour tugs then in service had proven unsuitable for rendering assistance to a large vessel in severe weather conditions. Wellington's tugs are now in the order of 35 years old, but with high maintenance attention, availability has been 100%. 80% of all ship handling involves two tugs.

The three tugs are of similar design. KUPE and TOIA have fire fighting monitors and carry sufficient foam for approximately an hour. These two have capability and accommodation facilities for coastal towage.

Tugs are vital to the movement of large vessels at Wellington, given the sudden deterioration in weather conditions that can occur.

9.2.1 Manning and Training

Each tug is manned by three persons dedicated to tug operations; a tugmaster, an engineer and a deckhand. This is one more than in some parts of New Zealand[20]. These work on a 48 hour on/off basis. Training is to a high standard and deck crew are AB qualified with relief or extra crew drawn from AB qualified lines personnel. Most deck crew and at least one engineer have ILM qualifications. A trainee tugmaster would undergo a

[18] Tugs have a design bollard pull of 28 tonnes, but factors associated with age and normal line losses during towage result in the suggested data.

[19] The prospect of active escorting by Tug through Wellington harbour entrance was raised by Tanker stakeholders. Authors have been involved with escorting at Milford Haven, another unforgiving entrance and like Milford Haven; the Wellington entrance is too narrow for effective active escorting intervention once a vessel is committed to entry.

[20] A Safety Risk Assessment found when the tugs were fitted with modern winches that three man crewing was essential given the frequent rough sea operations in the harbour.

training programme of around 12 weeks depending on existing competencies and experience.

Tugmaster training has been developed to a high standard and is based on the NZQA Certificate in tug operations. Voith Schneider has adopted CentrePort's training material as a standard training manual, which is in use worldwide.

9.2.2 Use of Tugs

CentrePort Standard Operating procedures require that one tug is used for movements of vessels between 110-170 metres length and two for vessels over 170 metres length. A pilot is always supplied to a ship where two tugs are to be used, given the skill set required to make safe use of tugs in shiphandling operations.

There is a duty tug available with crew on first call for any call out and the system reports ability to have two tugs underway within half an hour to an hour of a call. CentrePort are confident in their ability to man three tugs at any time utilizing pilots, off duty tug personnel and other qualified marine personnel, the remaining tug being underway within an hour of call out.

9.2.3 Tanker Operations

Tanker movements generally require two tugs, except at Seaview where a tanker of less than 120 metres may use one tug. All tanker movements to Burnham wharf in Evans Bay require two tugs. Tugs join north of Evans Bay, or between Makaro/Ward and Matiu/Somes islands, approximately two miles off the terminal at Seaview[21]. However one tug can be used if thrusters are fitted capable of substituting a tug, in conjunction with other factors such as pilot experience and prevailing conditions. In practice this seldom occurs.

Facilities exist at Seaview for tugs to connect to the fire main at Seaview but tugs are not maintained at standby during tanker operations.

9.2.4 Emergency Towing Assistance Offshore

The tugs are routinely fitted with light rigs for ship-handling but a near-port quick-connection rig is held in a wharf store for loading in the event of necessity. This could be dropped by helicopter and fitted while the tug is on route to prevent loss of time returning to the berth.

[21] Tanker Stakeholders referenced the possibility of tugs meeting Tankers at an earlier stage when inbound.

9.3 LIMITATION OF TUGS

Figure 10: One of Wellington's Tugs Deployed in Windy Conditions

Wellington's tugs were prudent purchases by the Harbour Board and state of the art at the time, but 35 years ago vessels were also a lot smaller than today and had greater power to weight ratios of their own. They were built to handle generation one container vessels, at that time the largest vessels using the port. These vessels had a gross tonnage (GT) of about 25,000 tons. The port now accepts vessels up to 115,000 GT [22] and laden tankers of 55,000 tonnes displacement. Authors are always cautions about tug recommendations as berthing larger vessels with lower powered tugs is often a case of no more than extended manoeuvring times, but given the rapidly changing weather conditions at Wellington, it is difficult to conclude that the present fleet is adequate for the tonnage using the port[23]. Wellington has the lowest per-unit bollard pull in any New Zealand port handling large tonnage as well as the oldest tugs in regular service. To be fair, two tugs can

22 Passenger vessels of 115,000 gross tons have visited Wellington.

23 The CentrePort Marine Manager provided comprehensive information on wind load pressures on vessels which underpinned Authors conclusions on the need for more bollard pull.

be mustered reasonably quickly and provide a combined bollard pull of around 48 tonnes, but this is unlikely to be used at one end of a vessel[24].

In berthing vessels in winds at the container terminal and Aotea quay, pilots use the wind shear off a vessel's hull to provide loading to assist the vessel coming alongside (or departing) the wharf. This is possible because the berth is laid out almost in parallel with the prevailing wind (this is from the northerly quadrant around 60% of the time). However if such a manoeuvre got out of control in high wind speed, the port simply does not have the tug power to manage the load created on a high winded vessel, beam on in extreme wind conditions (conditions that regularly occur). Table 5, below, shows recommended bollard pull in tonnes to manoeuvre different vessels in increasing windspeed.

		Recommended Tug Bollard Pull Required				
At working Draught	**Windage (m^2)**	**Beam wind 15 knots**	**Beam wind 25 knots**	**Beam wind 30 knots**	**Beam wind 40 knots**	**Beam wind 50knots**
PCC 199m	**5,000**	22	67	104	185	289
PCC 175m	**4,000**	18	34	68	122	130
Large Passenger 280m	**>10,000**	50	110	160	300	450
Passenger 220m	**5,300**	23	45	65	115	180
RoRo 180m	**4,100**	19	35	72	126	135

Table 5: Windspeed Affect on Bollard Pull Required for Differing Vessels

CentrePort has evolved a speciality for RoRo car carriers, which are getting larger. Car Carriers are designed to berth starboard side to, resulting in a difficult downwind manoeuvre to berth a vessel. At time of finalising the risk assessment, the largest RoRo to be handled at Wellington to date was programmed[25]. In most ports, having limited tug power can almost be a "so what", because the net affect is that it takes longer to berth and depart. However, limited tug power also requires recommended limits on moving in wind speeds that overcome the ability to control the vessel. In the case of Wellington, this can happen rapidly and relatively frequently.

[24] During last cruise season a cruise vessel (SAPPHIRE PRINCESS) operated without bow thrusters and two tugs were utilised in a forward position.

[25] This RoRo Car Carrier is 200m in length, with associated high windage and represents a vessel type set to visit Wellington regularly.

The available bollard pull to vessel GT ratio has been falling over the years as larger vessels trade to the port. Unless CentrePort accepts windage load limitations on the large vessels it is handling, it simply cannot and should not put off replacement tug procurement much longer. At 35 years of age, procurement of original spares is becoming difficult.

A recommended solution is made against the risk profile in section 13.3.

10 KEY RISKS - THE RISK PROFILE FOR WELLINGTON

There are 78 hazards in the Hazman database relating to navigation in Wellington harbour. It is thought that the risk profile has been adequately represented, but by necessity, hazards have been identified and scored at the overview. The full ranked hazard list for Wellington is attached as **Annex E. Annex E** should be reviewed in total as the records for individual risk categories are sometimes elevated in one consequence category. Ongoing hazard identification and review of this should form a natural part of the Safety management System to be introduced in the next stage.

10.1 KEY RISKS – INTERPRETING THE RISK ASSESSMENT

Wellington's Risk profile is quite complex and some of the areas of heightened risk are subtle and relate to both the geography of the harbour as well as the traffic types using the port. For example, there are a series of generic "pinch points" that have been identified, which affect traffic using the harbour. These are explained and referenced in **Annex D**. Risk scores of 1.3 to 6.8 (on a scale of 1-10) were found across the 78 hazards in the database as a whole. **Table 6**, over the page references the top 31 hazards in the database, in ranked order, which reflects hazards which scored approximately 4 and above. The table presents the overall risk score, followed by risk in each individual Most Likely and Worst Credible categories. Reference is also made to section 3.1, which references the risk criteria for this assessment. For ease of reference, a relevant section is repeated below (**Table 5**), but note the advice in Section 3.2.1 with reference to the use of ALARP.

Risk Score	Categorisation	Treatment
4, 5, 6	Risk Assessed in the ALARP region of the risk matrix.	Risk control reviewed or improved.
7, 8 & 9	Significant Risk.	New Risk Control introduced in two years.

Table 5 – Summary of Risk Assessment Criteria

As can be appreciated from **Table 6**, the risk profile for Wellington Harbour suggests that there are no risks which score as significant arising out of the study. Maximum risk levels are assessed to lie within the As Low As Reasonably Practicable (ALARP) area of the risk matrix definitions for this study.

Rank No.	Hazard Reference	Hazard Description	Risk Overall	Risk By Consequence Category							
				M L				W C			
				People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders
1	5	Ferry grounding at the harbour entrance	6.81	6	0	0	9	7	7	7	7
2	21	Two ferries in developing collision situation during an overtaking or passing manoeuvre near alter-course waypoints.	5.75	0	0	0	7	7	7	6	7
3	18	Passenger ferry and large vessel in developing collision situation, wider angle of approach.	5.75	0	0	0	7	7	7	6	7
4	20	Inbound passenger ferry in developing collision situation with outbound container or large vessel (or tanker departing Evans Bay by night).	5.68	0	0	0	7	7	6	6	7
5	54	A vessel with high windage breaks mooring lines in high offshore winds (other than a vessel berthed at a finger berth).	5.61	0	6	0	0	7	8	3	7
6	46	Ferry berthing without tug assistance in adverse weather in heavy contact with berth or adjacent vessel.	5.59	0	6	0	6	6	7	3	7
7	27	Yacht engaged in racing and ferry or large vessel in developing collision situation.	5.29	0	0	0	6	8	6	0	7
8	1	Inbound large vessel (> 500GT) in grounding situation in adverse southerly conditions through operational failure.	5.28	0	0	0	6	6	7	7	7
9	44	Ferry berthing at Rail Ferry Terminal (RFT) in heavy contact with berth or adjacent vessel.	5.28	0	6	0	6	6	6	0	7
10	59	Leisure craft founders in the harbour.	5.22	6	0	0	6	7	3	0	7
11	15	Ferry and deep draught ship in developing collision situation between the Pinnacles and Falcon Shoals.	5.05	0	0	0	6	6	6	4	7

Rank No.	Hazard Reference	Hazard Description	Risk Overall	Risk By Consequence Category							
				M L				W C			
				People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders
12	63	Lines crew injured due to a mooring line accident.	4.85	0	6	0	0	7	3	0	7
13	76	Deep draught vessel (e.g. Tanker) in potential grounding situation while transiting harbour entrance	4.81	0	2	0	6	3	6	6	6
14	28	Inbound vessel or ferry in developing collision situation with tanker outbound from Seaview.	4.68	0	0	0	4	6	6	6	7
15	70	RoRo ferry has shipboard fire while transiting the approaches or entrance.	4.65	3	0	0	3	7	7	4	7
16	74	Leisure craft in potential collision situation with commercial vessel swinging or transiting Lambton Harbour.	4.63	0	0	0	6	7	0	0	7
17	47	Large vessel such cruise vessel, car carrier, container or general cargo ship in contact berthing with wharf or container cranes in restricted visibility, strong onshore winds, berthing in very strong wind conditions.	4.63	0	6	0	0	4	6	4	6
18	67	Fire on board a harbour ferry or passenger carrying charter vessel.	4.61	3	3	0	3	7	6	2	6
19	16	Ferry and leisure craft in developing collision situation.	4.56	0	0	0	6	7	2	0	6
20	45	A vessel manoeuvring in the vicinity of a Tanker working cargo (discharging or backloading gas oil) or a vessel bunkering, contacts or interacts with the vessel alongside. This includes the same event involving a large cruise liner at Aotea Quay.	4.52	0	0	0	3	6	6	6	7
21	52	Laid up fishing vessel parts mooring lines in heavy northerly gale.	4.51	0	6	0	0	6	3	3	6
22	53	Vessel or ferry breaks lines or is unable to berth at no.3 berth, due to strong offshore southwesterly or broad northwesterly wind.	4.43	0	3	0	3	7	3	3	6
23	61	Rowing skiff or dragon boat swamped or capsizes in Lambton Harbour. Hazard relates to organised events and associated practice activities.	4.38	3	0	0	3	8	0	0	7

Rank No.	Hazard Reference	Hazard Description	Risk Overall	Risk By Consequence Category							
				M L				W C			
				People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders
24	2	Foreign flagged fishing vessel of less than 500GT in grounding situation in the harbour approaches.	4.3	0	0	0	3	7	6	4	6
25	78	Tanker in contact berthing situation at Seaview Wharf	4.3	0	3	0	0	4	7	6	6
26	9	Charter fishing vessel in grounding situation e.g. Chaffers Passage.	4.3	3	3	0	0	7	4	2	6
27	17	Ferry or large vessel and fishing vessel in developing collision situation on approach to or within harbour.	4.3	0	0	0	3	7	6	4	6
28	49	Harbour ferry in contact berthing situation at any berth.	4.29	0	6	0	0	6	3	0	6
29	48	Vessel at container berth in contact berthing with container cranes during departure.	4.24	0	3	0	0	6	7	2	7
30	60	Recreational fishing craft swamped or capsized by wash of passing large vessel.	4.22	6	0	0	0	6	2	0	6
31	57	Fishing vessel founders at harbour entrance in adverse southerly conditions.	4.17	3	0	0	0	7	6	2	6

Table 6 : Top 31 Ranked Hazards

However**, Table 6** reports that the highest risk (a serious ferry incident at the harbour entrance), has have an overall risk score of 6.8. This is at the end of the ALARP region[26], when considered against the treatment criteria. Although this risk involves passenger ferry operations with associated consequence potential from any serious incident, the frequency of initiating

[26] The difference in individual risk scores between the most likely and worst credible data sets is because the frequency (or probability) associated with the worst credible case is lower, but the consequence scores are all maximum.

event is supported by incident data associated with both ferries and other vessel types in the harbour entrance area.

It is unsurprising that ferry operations dominate the risk profile at Wellington when the Harbour traffic profile is taken into account (section 4.4). However it is worth noting that although the worst credible case of a ferry grounding in heavy seas at the entrance is the highest case, ferry operations in other parts of the harbour also feature in the upper hazard rankings.

Of note is the rate of contact berthing incidents, which both reflects Wellington's changeable weather patterns and high wind speed. Incidents are mostly associated with the RoRo Ferry trade, but the state and design of fendering should not be ignored. There has been lack of expertise applied to the design of fendering for RoRo operations and both CentrePort and RoRo operators are encouraged to address this as solutions are readily available; safety costs money, but in this case there are likely to be some lower repair returns to offset cost.

The system also has the option of routinely deploying pilotage and/or tugs when conditions are extreme and commercially it is a cheaper alternative than the ongoing investment needed to repair wooden berths. This may be partly funded via P&I Insurance, but Owners are funding this in the long term either way.

The harbour safety system as a whole should consider the overall interests of all who wish to navigate through its waters and consider if it is content with the risk management system presently in place. Ferries are CentrePort's most regular customers. Given the difficult harbour entrance, a disabled RoRo ferry of the type being introduced (or any other large vessel) could not be given significant assistance by the existing tug capability in deteriorating weather conditions.

To be fair to Cook Strait ferry stakeholders, Authors have recently experienced a sea change in attitude and approach to safety management by ferry operators, which if taken through to lasting implementation will deliver significant improvements to the risk profile. Additional risk control options are tabled on the assumption that the harbour system can positively contribute to that improvement.

The next section of this report looks at the risk mitigation available to the risk profile.

11 STATUS OF PRESENT RISK CONTROL SYSTEM

This section of the report considers the existing risk management system, and reflects what is in place, which is ultimately part of the risk profile. Risk management in place has been mapped in detail against the top 30 hazards and the results of that are attached as **Annex F.**

11.1 RISK MANAGEMENT PROVIDED BY THE HARBOUR MASTER SYSTEM

Although this section represents the existing risk-management system provided by the Harbourmaster system, it must be noted that the risk mitigating role provided by pilotage in moving vessels is also part of this, which includes port movement planning. As the NZ port system clearly differentiates the Harbourmaster risk management system from the normal operations at ports and terminals, the Harbourmaster system is described in its role of risk mitigation.

Wellington has a good selection of Bylaws and CentrePort has a clear and comprehensive operational safety management system based on procedures, with staff on 24hr duty. In most areas that Authors reviewed, risk control was found to be both working and effective. The Harbourmaster and Marine Manager have been working together, but in different organisations, for a considerable period of time. One complements the other and there is little doubt that the system will continue to manage risk effectively until one of the key players retires. At that point the system will become vulnerable to erosion of standards and limited experience unless succession planning is considered soon. This is a classic organisational risk scenario[27]. The Wellington Safety Management System introduced under the Port and Harbour Safety Code needs to plan for that happening.

11.1.1 Harbourmaster Staffing

Harbour management staff at Wellington comprise; a Harbour Master and deputy; two full time harbour rangers and one seasonal harbour ranger. There is also a full time office administrator. A ranger is on duty after hours to provide back up to the Harbour Master or deputy, who also share a 24 hour on duty arrangement. Harbour rangers carry out most of the liaison with leisure/small craft users, including organized clubs and members of the public. A workboat is available to enable an on-water presence, although 'patrols' as such do not occur. Rangers provide the Harbourmaster system with an ability to respond quickly to any aids to navigation outages

[27] This was an underlying causal factor in a catastrophic tanker grounding at the Port of Milford Haven in UK.

and maintenance of various harbour works such as signage at ramps, marinas and launching ramps. The Harbourmaster and his Deputy respond to issues arising from commercial shipping, marine oil spill reports and vessels wishing to carry out hotwork operations.

The Police Maritime Unit are appointed as enforcement officers and enforce the Maritime Transport Act. Honorary enforcement officers (of which there are about 30) also support the harbour management system, although honorary officers are not able to issue infringement notices.

11.1.2 BEACON HILL COMMUNICATIONS STATION

11.1.2.1 General Overview

The GWRC Harbours' Department operates the Beacon Hill Signal Station, which also provides services to CentrePort in support of pilotage and passes initial approach information to inbound vessels. Operation of the Signal Station is part funded by CentrePort[28].

With good planning from a previous era, the harbour is well endowed with a signal station sited in an ideal situation and appropriate elevation[29] for monitoring the approaches and entrance. However, the station is overdue for an equipment upgrade and staffing expertise needs addressing against standards set by International Convention agreements[30].

Beacon Hill is presently equipped with basic ship-type ARPA radar, an AIS monitoring system (a trial commenced during the risk assessment) and has Communications Officer staffing to provide 24 hour coverage. The approaches and entrance (risk assessment Areas A and B), are directly under visual and radar surveillance but harbour areas west of Point Gordon are obscured by shore topography, which affects a considerable area of the main harbour (Area C).

VHF channels 14, 62, 16 and 04 are monitored, with Channel 04 providing coverage over the eastern approaches to Cook Strait.

[28] CentrePort pays the Regional Council an annual sum of $580,000 derived from ship's port dues towards the cost of regulating the harbour, managing Aids to Navigation and operation of Beacon Hill Signal Station. This is about half the Regional Council budgetary expenditure in this area.
[29] Beacon Hill is approx 130 metres above sea level.
[30] The International Association of Lighthouse Authorities (IALA) is the body that authored vessel traffic system (VTS) management standards (equipment and training), these in turn being ratified by the International Maritime Organisation (IMO), and a UN body. New Zealand is a signatory to IMO Conventions and thus the IALA requirements.

At present, the primary purpose of the station is to provide information to navigational users by provision of a weather and traffic service. This function is undertaken in a purely advisory capacity and Communications Officers are instructed by Operational Manual not to offer navigational or other direction unless this is provided via the Harbourmaster or pilot.

Other functions of the Harbourmaster are also accessed through the station, such as requests for Hot Work Permits[31] or any other situation where a point of contact is required between the Harbourmaster and navigational user, for example to report an operational spill or incident. In the event of maritime incidents within harbour limits, Beacon Hill is equipped to act as the initial alerting station for relevant emergency services and to expedite communication flow between these services as required.

11.1.2.2 Beacon Hill – Stakeholder Feedback

Beacon Hill featured strongly in stakeholder feedback and is highly valued by all. Cook Strait RoRo ferry operations liaise closely with Beacon Hill and the audit review of the harbour system suggested that all (some belatedly) recognise a prudent decision was made to keep Beacon Hill operational when most others in New Zealand were being dismantled. Out of this review and risk assessment, Authors are convinced the role and profile of Beacon Hill Signal Station is vital to Wellington Harbour.

In its role as harbour stakeholder, CentrePort has referenced shortcomings in the technical equipment and the ability of watchkeepers to provide assistance to pilots. It has been prepared to make its viewpoints and recommendations for equipment and training improvements in writing[32]. A worry was also expressed that measures were outstanding to address limitations and the time taken to achieve agreement on this.

A strong conclusion by Authors from this risk assessment is that the future role of Beacon Hill Signal Station needs to be defined, its equipment improved, its skill base functionally described, trained and brought into the 21st Century. The capability of it role to assist pilots in poor visibility, manage entry transit, recommend sequencing as well as providing the focus of contact for those transiting towards Wellington will remain immature until the future Safety Management System obtains stakeholder buy-in to its role and necessary upgrade.

[31] 600 hotwork permits are issued annually

[32] A letter of June, 2003 was referenced, which showed a changing attitude by CentrePort in favour of the value that Beacon Hill could provide to the Harbour Safety Management System.

A Service Level Agreement between the two key organisations involved in running the harbour could be one way to facilitate an enduring professional relationship across pilotage and movement management.

11.2 TRAFFIC MANAGEMENT AND PASSAGE GUIDANCE

11.2.1 Traffic System in Place

There is no VTS control of navigational users within harbour limits, partly due to traffic levels and partly from the practicalities of not having full radar coverage and partly due to the qualification level of the Communication Officers. The role of Beacon Hill Communications station is to provide movement information (commercial and organised leisure use) which assists vessels to plan their passage and negotiate with other vessels directly by VHF if required to achieve safe passing or crossing.

Navigational use also managed through legislative means and the Wellington Bylaws support this. **Annex G** provides more detail about key areas of the Bylaws with respect to collision prevention within harbour limits.

11.2.2 Recommended Harbour Transit Tracks

"Recommended Tracks" are published for harbour navigation by large vessels; these having evolved from pilot practice. The Pilot Passage Plan is available in both chartlet and text format on the CentrePort website, although it is not known how many vessels make use of this information before approaching Wellington. It is a good system, given the topographical layout of the harbour and improving adherence to this guidance is a worthy goal. Recommendations for improvements in consistency are made below and in section 13.6.

Yacht clubs have recently been supplied with copies of Recommended Tracks by CentrePort as part of club-Harbour Organisation liaison.

11.2.2.1 Submission of Passage Plans

Bylaws require that all vessels carry out an appropriate passage plan when transiting the harbour. In practice, some regular operators of Pilot Exempt vessels have submitted their passage plan to the Harbourmaster. Although based on the Recommended Tracks, these plans are not necessarily the same as the tracks nor are they uniform between operators. Passing distances off certain points can be significantly closer than those recommended. The pilotage system uses the recommended tracks as the

basis of the passage plan and it is recommended that exempt vessel passage plans follow recommended tracks to provide consistency. If all such operators were required to submit passage plans and subsequent amendments, then the Harbourmaster system would be able to assist individual plans conform to the recommended track system.

11.3 UNDERKEEL CLEARANCE AT THE ENTRANCE

CentrePorts' Standard Operating Procedures for pilotage focus on underkeel clearance (UKC) as a key factor limiting vessel movement. A static channel clearance of 1.5 metres UKC and 0.9 metres at the berth is set (although it appears this may be exceeded at the Marine Manager's discretion[33]). Any vessel with a draught greater than 9.8 metres is likely to navigate with minimum UKC, given the controlling depth of 11.3 metres in the channel. SOP's require pilots to consider tidal height and influence of changes in barometric pressure in UKC calculations.

A conservative UKC formula is used to calculate squat thereby providing additional safety margin. An Operating Note additionally provides pilots with guidance on the loss of UKC expected through pitching and rolling. A remote tide gauge at Queens Wharf is available for obtaining actual height versus predictions at any time.

It would be useful to determine if there is any tidal gradient between the area of tidal flow restriction near the Front Lead and Queens Wharf. A tide gauge situated on the Front Lead would provide, assisting with passage planning of deep draught vessels. Further risk control by provision of real time wave and tidal height data in the entrance is tabled in section 13.7.3.

11.4 WIND AND FOG LIMITATIONS

Prescribed wind limits are only in force for tankers but the deployment location of container cranes which have ceased operation in winds over 40 knots may also stop movements on or off the berth.

Departure in fog is permitted but deep draught vessels and tankers require a minimum of 0.3 cables visibility. Arrivals are more restricted and different limits are set relating to vessel length, draught and for tankers.

[33] This is done on one off situations and involves consideration of the vessel, cargo, pilot skill, swell and risk factors. Procedures make reference to liaison with the Harbourmaster and inn practice it is unlikely that the marine manager would take such a decision without Harbourmaster involvement. The limit is also close to the commonly accepted rule of thumb value of 10% static UKC.

11.5 RISK CONTROL FROM AIDS TO NAVIGATION

Aids to navigation within harbour limits are administered by the Harbours Department, whilst wharf and marina identification lights are maintained by the operator, such as CentrePort or the local authority. An exception to this is the sector light at the head of Evans Bay which was placed specifically for night tanker movements by CentrePort. This light was established in 1996.

Main harbour aids to navigation have back up battery systems, with the exception of Barrett Reef Buoy. During periods of adverse southerly weather, maintenance of this light can be difficult and delayed for several days. Given the past history of vessels ending up on Barrett Reef, this is obviously a key Aid to Navigation[34]. Records show however, that reliability of Aids to Navigation is very high.

11.5.1 Defect Monitoring

Lights visible to Beacon Hill staff are formally checked four times during the hours of darkness (five times in winter) by Beacon Hill staff by visual observation (these are Pencarrow, Barrett Buoy, Steeple Rock, Leading lights and Falcon Shoals Beacon). The report sheet is faxed daily to the Harbourmaster's office and if any defects are noted, it is passed on to the Marine Services Manager at CentrePort. This could be automated with modern monitoring systems (as used in lighthouses).

Defects in other lights such as Point Halswell or Jerningham, are generally quickly noticed by other harbour users and reported to Beacon Hill.

In the event of an outage, Harbour Rangers are generally available to effect repair at short notice. However, there are times when adverse weather has potential to cause delay, particularly with regard to the leading lights or Barrett Buoy. In practice however, complete outages of the main harbour Aids to Navigation are rare and compare well to IALA Standards[35].

11.5.2 Channel Marking

The approaches to and transit of Wellington Harbour are adequately marked by the system of lights, several of which are sectored. Sailing directions and the Recommended Tracks (used as the Pilotage Passage Plan) are developed

[34] The positioning of the buoy allows a vessel navigating in fog and out of position to pass close inside the buoy on a heading of 023° and clear the Reef.

[35] See Section 1 of Guideline for providing Aids to Navigation in NZ (MNZ August 2004).

around the existing positions and sectors of lights and generally provide good references for transiting vessels.

11.5.3 Harbour Approach

The entrance is marked by Pencarrow light on the eastern shore with Barrett Reef buoy marking the southern end of the reef and the western extremity of the main entrance channel. Chaffers Passage is unlit and seldom used by commercial vessels.

While Pencarrow is not obscured by any background shore lighting, some mariners reported that Barrett Buoy can be difficult to detect visually by night, particularly in adverse weather when approaching from the west. However, it has been upgraded in recent years and it does present a reasonable, if small, radar target. Options for improving to Aids to Navigation in the approaches are made in section 12.2.

For fishing vessels and other small craft using Island Bay, a set of leads provides a reference to the western channel, which is the narrower of the two. These leads are marked as 'Occasional' on the chart but in fact operate whenever the street lighting is on.

11.5.4 Main Leads

The main leads have a nominal range of 21 and 22 miles and are easily detected by night in good visibility. Shipmasters comment on the clarity of the leads and the benefits of manual control in daylight. Background shore lighting is not reported as a significant issue for the leads, however in times of reduced visibility e.g. rain, the structures can be difficult to detect from seaward. The Lights are dually controlled by sun switches and also under manual control from Beacon Hill. They can be switched on by Beacon Hill at the request of a master or pilot at any time.

The leads are relatively close together (1.3 miles), making them quite coarse to use and reference[36]. Vessels can find it difficult to keep on the lead line continuously in adverse southerly weather mainly because of yawing. However this is of little concern to vessels other than those with deep draught or high windage, as there is navigable water east of the leads. It is also recommended practice for vessels to proceed inbound east of the leads, if weather allows, in order to keep to the starboard side of the channel and provide safe passing with outbound vessels.

[36] The distance between the fore and aft marker of a lead is related to the rate at which they appear to diverge to an observer on a vessel tracking across them. Leads that are more sensitive to the changing track of a vessel are further apart. They are, however, better spaced than other leads in the entrance to Tory Channel.

In addition to the leads, the entrance channel is also marked by the sectored Somes Island light, which originally provided the reference for transiting vessels before establishment of the main channel leads. This light provides a back-up should either leading light fail completely or be damaged from contact by a vessel (which has occurred on one occasion in the past). The Somes light brings vessels through the entrance to east of the existing leading line, and thence diagonally across the channel to the western side. An inbound vessel or craft using this line instead of the primary lead line would contravene both the existing Recommended Tracks for transit of the harbour and Maritime Rule 9. However this would be in unusual circumstances. Inbound vessels are therefore expected to use the main lead for entry when both leads are operable, while outbound vessels may find it useful to use the Somes light as a reference while proceeding down the western side of the channel.

The intensified white sector of the Somes light does however show a white light over the 10 metre contour south of Steeple Light, and recommendations were made (and accepted by the Harbourmaster) to modify this.

11.6 HYDROGRAPHIC SURVEY OF CHANNELS AND BERTH SOUNDINGS

The Harbourmaster system is responsible for marking the channel with Aids to Navigation, in part funded by annual fees paid by CentrePort. Maintenance of channel depth and depth alongside the main commercial berths is the responsibility of CentrePort. Surprisingly, there is no routine hydrographical survey programme for the harbour; Authors assume on the basis of a perception that accretion rates have historically been low. Yet there does not appear to be enough evidence (i.e. data) to accurately establish what the accretion trends actually are.

The last survey of the entrance channel was in 1996 and carried out by CentrePort. The Approaches and Entrance were also surveyed by the Wellington Harbour Board in 1976-77. Depths alongside the minor wharves at Seatoun, Days Bay and Petone have not been sounded since 1987 (Authors understand on the basis that these have no commercial relevance to CentrePort). Petone Wharf may soon be used regularly by an expanded harbour ferry service after not being in use by commercial vessels for a number of years.

Berth soundings to the Port's main wharves are carried out by CentrePort on an 'as required' basis rather than to any planned programme. Recommendations for change are made in sections 12.3 and 13.7.2.

11.6.1 Dredging Programme

Authors understand that dredging of the entrance channel is planned[37] to provide a depth of 12.4 metres at Chart Datum. This is reported to facilitate an increase in the draught of vessels trading to the port. This will be a large scale dredging proposal. It is clear from stakeholder consultation carried out for the risk assessment that coastal tanker operators would welcome increased arrival draughts, but the total case and it cost-benefit assessment has not been a focus of this safety study. Dredging of pockets at Seaview Wharf, Aotea Quay berths 1-3, Container berth 1 and 2 and Burnham Wharf will also provide for an increase of draught alongside these berths.

[37] The entrance channel is 5,000 metres length and with width varying between 200-450 metres

12 NEW RISK CONTROL OPTIONS

12.1 INTRODUCTION

In order to develop justified new risk control options, the existing risk control measures were mapped against the top 30 ranked hazards, the result attached as **Annex F,** which should be considered in conjunction with this section.

Risk control options represented below were derived from both interaction with harbour stakeholders and direct consideration of the top 30 risks in the ranked hazard list. In order to improve readability, new risk control options are presented in this section by function as opposed to individual hazards. The hazard areas mitigated are referenced below each function.

It is the decision-making remit of the Harbourmaster system to select the final risk management package to be implemented under the safety management system. However, these are recommended as a result of the most comprehensive risk assessment that Wellington harbour has ever undertaken.

12.2 AIDS TO NAVIGATION

- The Arc of the Somes White sector (harbour entrance lead) shows white over the 10 metre contour to the south of Steeple Beacon. The option exists to reduce risk by re-aligning the intense white sector of Somes Light to prevent this [38].
- The intensified Green sector of the Rear Lead brings vessels within 2 cables of Point Halswell. Consider realignment to take vessels three cables off this point.
- Consider reinstatement of the Racon at the Front Lead light, which will improve the visibility of the leads when transiting towards the harbour entrance from sea in inclement weather. Any vessel or craft fitted with radar would benefit. Alternatively, consider installing an AIS AtoN based system (has a limitation that only vessels with AIS transponders and ECDIS would benefit).

Risks Mitigated : Grounding of deep draught vessels, Collisions within Area C, grounding and collision hazards in Area B. - any radar equipped vessel/craft.

[38] This option was initiated during the course of the risk assessment.

12.3 NAVIGATIONAL CHART MODIFICATIONS AND HYDROGRAPHIC SURVEY

- Add in no-anchoring symbols to charts in relevant locations around recommended routes to keep these clear in key areas where anchored traffic can impinge on moving vessels (termination of 315 track referenced in Section 6). Beacon Hill or pilots can then additional provide appropriate anchoring advice to vessels wishing to anchor.
- Review the Beacon Hill monitoring procedure with special reference to the Alpha boarding Icon being placed on the line of the leads. Alternatively, consider the option of moving this slightly to one side of the line of entrance leads.
- Introduce a programme of hydrographic survey for the harbour as the present time between surveys is unrealistic by standards required under the Port and Harbour Safety Code.

12.4 BEACON HILL SIGNAL STATION

- Introduce radar surveillance, which is supplemented by CCTV, of Areas C, D, E to provide movement information to the duty Communications Officer.
- Equip Beacon Hill with a Windows based electronic chart interfaced with Radar and AIS data for accurately identifying and monitoring the progress of vessel movements (equipment should be of a standard to allow the beginnings of a Vessel Transiting Service to be developed). This may involve multiple radar sites.
- Allow updated radar monitoring system to also overlay on the electronic chart and/or radar against the recommended tracks for harbour transit. Introduce the use of guard alarm rings for anchored vessels.
- Commence a programme of training for Beacon Hill Officers to make best use of new equipment, capability. Training for any new recruit should be to IALA Port traffic management guidelines. Training to IALA standards can remain within the scope of the existing communication and traffic facilitation role of Beacon Hill.
- Introduce a DGPS correction station at Beacon Hill. This would assist in Hydrographic survey and positional accuracy of vessels fitted with the capability to resolve DGPS corrections (some Passenger RoRo ferries).
- Provide for trained relieving communications staff at Beacon Hill to cover leave (both planned and sickness) and to reduce overload on current staff.

Risks Mitigated : Collision hazards in all harbour areas, possibly grounding including vessels dragging anchor from designated anchorages.

12.5 PILOTAGE SYSTEM

This section should be reviewed in conjunction with section 13.5.

- Review the system of pilotage management against the recommendations in section 13.5 and make recommendations to MNZ.
- Recommend to MNZ (in their role of Pilotage Regulatory Duty Holder) that the position of the Compulsory Pilotage Limit be reviewed and moved to a location one mile to seaward of the gazetted harbour limit. Turn this into a "Pilotage District" and use Pilotage Directions, approved by MNZ to define where a pilot boards, in what environmental circumstances and facilitate the use of Navigational Assistance for a vessel to proceed to Delta for boarding when necessary. Such a system would also empower Beacon Hill to provide a future Traffic Organisation Service (if deemed necessary in future iterations of the Safety Management System). Section 13.5 provides further information.
- Review procedures and interface with Beacon Hill for leading in/out of vessels.
- Beacon Hill to record pilot exemption holder and vessel name to monitor and confirm that ongoing PEC currency requirements are met.
- Review use of pilot disembarkation areas and procedural guidance given.
- Consider fitting TARAKENA and SPIRIT OF WELLINGTON with Class B AIS transponders to assist larger vessels to identify the pilot vessel location.
- Reference the combined GT of tugs and tows with respect to the point at which these become subject to pilotage.

Risks Mitigated : Grounding, Collision hazards

12.6 TUG CAPABILITY

- Procurement of more modern tugs with bollard pull rated to overcome hull windage of the larger slab-sided vessels now visiting Wellington.
- Provision of a replacement tug with a capability (both bollard pull and design) to assist a vessel in a near-port or entrance distress situation.
- Tugs move to meet inbound *tankers* near Steeple Light, thereby in a position to provide more rapid response in the event of steering or propulsive failure.
- Tug escort of outbound tankers carrying oil products to Steeple Light as above.
- Consider a tug with fire-fighting capability on short-callout standby to Seaview wharf during tanker operations handling volatile fuels. Review true call out and deployment capabilities and plan accordingly.

Risks Mitigated : Grounding, Fire, Contact Berthing hazards.

12.7 BERTH CAPACITY

- Consider the loading available to CentrePorts' wooden berth structures from the vessels now using the port.
- Provide ship displacement and size parameter limitations for all berths.
- Review fendering systems in use for ferry berthing in all areas.
- Consider integrating planned port development to include long term planning for berth usage and interface with use of the property portfolio.

Risks Mitigated: Frequency of berthing contact damage. Additional downtime, repair and safety cost benefits.

12.8 ENVIRONMENTAL DATA MONITORING

- Introduce a monitoring system for wind and wave data in key areas to augment information currently obtained through Beacon Hill staff and web cam, the outer Wave Rider Buoy and anemometers located on the container cranes.
  - Appropriate locations are: entrance channel, Seaview and Evans Bay oil terminals, Lambton Harbour and main harbour berths,
- Make data available for all harbour users, through either website and/or Beacon Hill.
- Introduce a wave measuring device at the front harbour entrance lead. Wave data obtained at the Front Lead should be correlated with the Baring Head Wave Rider Buoy to provide accurate advice about likely wave characteristics as a vessel transits the entrance.

Risks Mitigated : Contact berthing, Grounding hazards, entrance transit grounding hazards.

12.9 TRANSIT OF ENTRANCE OR BERTHING – LIMITING PARAMETERS

- Formalise wave height restrictions on passenger ferries intending transit of the harbour entrance. If so desired these could still be recommended.
- Provide max continuous windspeed guidance for tanker berthing by provision of wind measuring equipment at Burnham Wharf (these are available within procedures at present as maximums only and areas such as Evans Bay have gusty conditions).

Risks Mitigated : Grounding hazards

12.10 RECOMMENDED TRACKS FOR TRANSIT OF THE HARBOUR

- To be embodied in Bylaws or given generally clearer basis.
- Define the tracks in terms of a min/max distance off salient points or beacons to give vessels room to select a course which is appropriate to the prevailing circumstances and conditions, for example to overtake another vessel
- Define the application of the recommended tracks – to which vessels/craft do they apply and circumstances/procedures for diverting
- Minimum distance off pinch points such as Kau Point to provide a clearance for smaller craft to navigate e.g. Inshore fishing vessels
- Recommended tracks to be marked on Charts or referenced in the NP51 Pilot Book. If in NP51, Chart notes can reference this.

Risks Mitigated : Collision and Grounding hazards.

12.11 CERTIFICATE OF LOCAL KNOWLEDGE FOR <500GT

Require skippers and masters of commercial vessels of less than 500GT to demonstrate a level of local knowledge appropriate to their area and to show that safety management of their intended operational activity is appropriate. This to include knowledge of radio reporting procedures, recommended tracks for large vessels, operating requirements embodied in Bylaw. This would complement but not duplicate their Safe Ship Management requirements.

Risks Mitigated : Collision and Grounding hazards

12.12 USE OF CONSTRAINED BY DRAUGHT SIGNALS

Develop a pilotage procedure to ensure that 'Constrained by Draught' signals are shown and Beacon Hill is notified when a vessel intends to transit the harbour in this condition. Stakeholder feedback was received and such improvements are simple.

Risks Mitigated : Collision hazards and confusion by other vessels using the entrance channel.

12.13 RADIO REPORTING PROCEDURE - HARBOUR ENTRANCE

Define reporting vessels in Harbour Bylaws and use this term to assist the Beacon Hill information service manage traffic. The term can be used in Beacon Hill's Operating Procedures. Introduce formal requirement for reporting vessels to positively report any defects or limitations (e.g. the

status of propulsion, steering, manoeuvring and bridge systems) when intending to transit the harbour entrance. Although pilots in general are often sceptical of the value of this, posing the question does put the onus on the bridge team to advise of a problem; it also leaves the harbour management system able to remain on the right side of any due diligence test. Notification of significant defects or limitations allows the harbour system to deploy resources in advance and in support of the vessel. Positive reporting was implemented during the risk assessment.

Risks Mitigated : Grounding causation (due to equipment failure).

13 DISCUSSION

13.1 INTRODUCTION

This section of the report is intended to provide feedback from the Authors' professional observations and findings and to complement the previous section, which summarises risk control. It is partly opinion based and draws on Authors understanding of the harbour system from the considerable work and liaison needed to complete the Wellington risk assessment. The section aims to provide both constructive input into the strategic thinking\safety management in Wellington Harbour and provide explanation supporting some of the risk control options as summarised in section 12.

It is intended to be constructive instead of posing challenge.

13.2 CENTREPORT ORGANISATION

As part of this risk assessment we have considered the Port Company risk management system for pilot training and the movement of piloted vessels and found it to be comprehensive and effective. This is in part due to the long service of Pilots, Pilot Manager and the Harbourmaster. This partnership provides a well oiled safety management system, which only requires attention in traditional areas such as communication and common understanding of standards. However, the system is vulnerable to the classic situation of one or more key players retiring, whose knowledge base and capacity to deliver a safe system may presently be overlooked at a strategic decision-making level of the organisation[39]. This may be partly because of a diverse domain of personnel backgrounds within the organisation, but the same observation is perhaps also relevant to the management behind the Harbourmaster system.

13.2.1 Strategy of CentrePort

Fifteen years ago, ports in many parts of the world were regarded as passive links in the global supply chain, valued more for the property they owned than their commercial activities. In Europe they were better known for being hotbeds of labour unrest than industrial jewels. This has changed radically in Europe and this change is happening in many other parts of the world.

[39] It is noted that within 5 years 75% of the combined pilotage knowledge is likely to retire, exposing the port to a potentially severe shortage of institutional knowledge (i.e. see the position Timaru is in today)

Authors gently suggest that CentrePort is to ride this same wave in the future and like many, many ports worldwide has the traditional problem that its operations are situated on land with high value as a City waterfront. If the potential for land development outweighs the potential for the port business in the eyes of commercial stakeholders, Board and senior management, the attention will focus on quality decision-making for land asset development, with lesser quality decision-making for the old core business and waterbased assets. In such a system, when an incumbent, experienced and competent marine skillbase retires or moves on, vulnerability of the system increases significantly. The port has a large property development portfolio, something Authors have seen in a number of ports; this can lead to a new attention focus to the executive. However, curiously, the senior management system does not appear to have a clear split between property development and the business of running and developing the port. From past experience, Authors remain of the opinion that the organisational design would benefit from review against functional analysis of the needs of the port business and the needs of the property development business[40].

The large vessel marine expertise for CentrePort is found at a lower level of the management structure, yet this advice is vital for project cargo advice, fendering standards, safety management, operational advice, berth development and upgrading and vessel capacity at berths. The design of all organisations is difficult to get 100% right, but under present arrangements, Authors suggest it may help to look at how the large vessel experience can be better connected within the structure and the level at which it reports. Authors found a naivety about the true liability that could arise from a serious marine event (but found that the Regional Council was carrying appropriate Harbourmaster insurance cover). It is very relevant to the Marine Manager function.

Symptoms the Port Company Board should consider in association with this are whether or not it has direct access to appropriate marine expertise to assist with its strategic decision-making. If the Board has limited access to maritime advice, but has property development advice, then its structure to both develop an integrated marine logistics company and support a safety management system under the Port and Harbour Marine Safety Code needs to be reviewed. It is the intent of the P&HSC for the port company's designated person to have direct links to the highest levels of management in

[40] Authors have experience of a port experiencing a serious grounding (and 7 year legal battle) after key personnel retired. Senior management and Board were at the time involved in large scale development of the land portfolio.

terms of the operation of the Code and ensuing SMS. Similarly this should apply to the Harbourmaster within the structure of the Regional Council. From interview and surprisingly, senior management of the Port Company took a view maritime advice was a commodity to be bought in when necessary. Authors have not held discussions with Board members as part of this safety related project but opinion remains that this area should be considered further.

Authors see great strengths for future port business development in Wellington Harbour as it is one of a few locations in New Zealand where the next generation of deep draught container vessels could be accommodated without extensive development (recognising the present rail and road infrastructure limitations). It is puzzling however to see an infrastructure property development, where port interfaces such as an integrated ferry and cruise terminal do not appear to be on the horizon, yet the movement profile of the passenger trade dominates the movement record. The system could also consider radical long term development plans, such as a new terminal further along the harbour bay, to free up the increasingly valuable City waterfront.

13.2.2 CentrePort Proceduralised Movement Management System

The documentation system at CentrePort is considered to be advanced for the ports industry in general and has the strength that it has been compiled and developed in house. However this does not prevent slips and mistakes and Authors did note minor evidence of Pilots with different interpretations of procedures. To resolve this occasional liaison meetings are suggested. It is also worthwhile extracting key parameters and limitations associated with pilotage onto a high level summary. An Aid-Memoir could also be considered, perhaps available via hand held PDAs or similar.

As the P&HSC Safety Management System is introduced to Wellington, a higher level of documentation will need to be introduced, providing policies underpinning pilotage operations approved by the Board, with links to the senior management of CentrePort. Marine Policies are present in the Procedures Manual at present, but these are actually statements of action to be taken in set circumstances. Policy is written for the Policy Level of an organisation and thus almost become statements of intent. A common understanding of loss magnitudes created by a major shipping accident would be a benefit from improved linkage between the top of the organisation and the ship delivery function of CentrePort (i.e. by organisational design).

13.3 TUGS

The long service life obtained from the CentrePort tugs has been the result of a past level of investment. It is fair to also reference considerable annual maintenance expenditure. By today's standards, the capital expenditure for Voith Schenider tugs may be considered excessive in relation to the movement numbers, but the benefits from 35 years of towage service needs to be considered against the cost in the decision-making equation.

Section 4.4.1 references a 45% rise in the GT of tonnage using the facilities at Wellington, thus with constant Bollard Pull, the Bollard Pull to GT ratio has also been reducing by 45%, significant[41].

Tugs at Wellington were procured after an enquiry Judge[42] made appropriate recommendations about the ability to handle vessels in need of assistance at or near the harbour entrance (this recommendation was also partly made from consideration of Search and Rescue needs, which is a function partly satisfied by Wellington's Police patrol launch, LADY ELIZABETH. The risk assessment concludes that the case outlined in the Judge's recommendation today remains valid.

Strangely, all who contributed to the study happily agree that if a Harbour Board was in place today, Wellington would already have an ongoing tug procurement programme[43]. Perhaps decision-making information from the clarity of a risk assessment has not previously been available. The regulatory structure of the modern New Zealand harbour system has also fragmented responsibility towards navigation within harbour limits. A different perception of those having to fund such acquisitions and the true needs of a ship loading and unloading business may also be a factor. Authors are always cautious about recommendations associated with towage as cost is significant and a lower powered tug often results in only a longer berthing time. However, although Wellington can muster considerable Bollard Pull across its fleet, Authors cannot conclude that Wellington has what it needs against the climate it operates in and the tonnage it is handling, when conditions are at the margin of its operational limitations.

41 This factor is also relevant to vessel load applied to berths and the development of CentrePort.

42 WAHINE Enquiry: The judge Concluded "The fact that no salvage or deep water tug was available at the Port of Wellington is considered to be a matter for concern …. Wellington is not only a main port but its situation central to the whole country, and close to Cook Strait, is considered to render the availability of such a tug in Wellington necessary".

43 This is not to say that CentrePort is not planning this, it is, but this is in line after container crane and straddle carrier procurement.

CentrePort can argue its own case that it only needs tugs to berth vessels at its terminals to protect infrastructure and liability from vessel claims; it is strictly correct, but it also has the safety needs of a significant passenger trade to consider as well. Tanker operators will argue they need tugs that can escort from the entrance inbound to provide the inbound safety margin accepted as standard practice in many ports handling tankers worldwide, also correct. The Regional Council can consider the solution to be simply a matter of placing limits on transiting the harbour. However unworkable, it is an option. The risk assessment case will argue from a Harbour System perspective. Simply, the Wellington harbour system needs tugs with increased bollard pull:-

1. To continue berthing large vessels without increased restriction in the unique weather system that Wellington is exposed to;

2. To provide early but effective interface with inbound tankers[44];

3. To provide an ability to provide assistance to a vessel in the Wellington entrance or its approach;

4. To provide capability at short notice to a tanker alongside (especially at the Evans Bay and Seaview terminals).

The risk assessment can only make its case based on the Harbour System as a whole and Authors recognise that a weakness of the present NZ Harbourmaster system is the fragmentation of terminal interests and Harbourmaster interests. However in a wider picture, in the Harbour Board days, the underlying remit for navigational safety was delivery in the public interest as no-one actually owned what is now the Port Company. Ownership has passed into two Councils, but are Councils not there with a remit to act in the public interest anyway?

Questions and Answers always help (answers being Authors' opinion informed by the risk assessment):

- Does Wellington need a tug to go outside the entrance? Given the number of ferry movements and passenger capacity, at least one tug capable to proceeding outside and coupling up in adverse conditions. This will be a tug with greater capacity than the existing tugs and with a hull shape to suit the

[44] Authors are of the opinion there is not enough sea room through the Wellington entrance to provide an effective active escort service.

	environment. However this should not be construed to mean a Tug capable of deep sea towage. It means a hull form capable of handling conditions within harbour limits, which include a difficult entrance approach and significant swells within the entrance channel.
• Does Wellington need more bollard pull?	Yes it needs this today but not necessarily the same on each unit although equal units would allow a balanced power load to be applied.
• Does Wellington need three tugs?	In strict operational terms, no, it needs two, but significant risk of damaging movement delays would be taken without backup provision. On the basis that 80% of all ship-handling work involves two tugs, the port needs to guarantee two units. Two new units and retaining one existing unit would provide this requirement. Wellington has no docking or slipping facility so tugs on maintenance may be absent from the port for a significant period, not necessarily planned around ship movement requirements.
• Does Wellington Harbour System need Voith drive?	The Voith drive system is excellent, reliable, very controllable and has a long service life, improving through life cost significantly. The Voith system is not at its best in seas causing heavy rolling. Sterndrive has proven itself to be an effective but cheaper alternative and does have advantages in heavy seas. Training of tug skippers would be needed as handling is completely different. Authors note that CentrePort has evolved successful ship manoeuvring techniques around tractor-tug (Voith) operations.

• Would a mixed power tug fleet be effective?	Yes. A high powered tug can be too much for a smaller vessel. Wellington's existing tugs may still have considerable service life, given the high standard of maintenance achieved. However mixed unit operations (i.e. Voith and stern drive) cause significant operator issues, not the least being the longer training periods.
• What would be desirable Bollard Pulls for new tugs, given environmental conditions at Wellington?	If tractor tugs, then 50+ tonnes. If ASD tugs, then 65+ tonnes.

Procurement planning for replacement tugs should be a priority out of this risk assessment as the alternative option of introducing limiting environmental parameters would not appear to Authors to benefit the commercial need to manage ships in inclement conditions. Financially, planning for one at present to handle berthing is, at least in Authors' opinion, itself a priority (around 60 tonnes delivered is suggested (i.e. 65 recorded bollard)). Once this unit is in service a second with ability to handle heavy seas at and within the harbour entrance channel is recommended (all of the present tug fleet have this ability). Once a new tug is in service, one of Wellington's older tugs can be disposed of. Procurement of the second unit can be put off until the present fleet reaches 38-40 years of age. This is on the basis that the risk assessment highlights passenger RoRo's, which can still be handled by the present tug fleet. A tug with sea keeping ability is significantly more expensive than a harbour service tug[45]. Second hand units are an option, but with a disadvantage of lack of common equipment. Approaches for outside funding for this have been attempted in the past with MNZ, on the basis of the wider coastal emergency towage need. However the obvious risk (and the data that we can rely on) lies in Wellington's approaches; this being underpinned by the findings of a formal enquiry, albeit some 35 years ago. Authors' findings are that this remains the case today and urge the Wellington Harbour System to act accordingly.

13.3.1 Tug Emergency Call-Out

Tug call out is stated to be one hour when movements are not planned. However, it does appear to be the case that tug crews can arrive, if necessary, at a Wellington based tug from about 10 minutes after contact

[45] But this should be clearly differentiated from a tug capable of Deep-Sea Towage.

has been made with duty crewmembers. Although other ports around the world would have a tug manned on a 24-7 basis when, for example, tankers are working cargo, there does not appear to be a significant loss of actual deployment utility under the present arrangements.

Thus in an emergency, the declared one hour deployment time needs to be reconsidered for the different cases of emergency callout and abrupt commercial callout. What could be achievable needs to be stated, even if no guarantees are offered.

13.4 SEARCH AND RESCUE

The Wellington Search and Rescue (SAR) System has a wide variety of assets available to it, some of which are inevitably Port Company assets (e.g. secondary pilot launch). There are a significant number of incidents over a period of time involving small craft and the occasional potential for need for large vessel assistance. Wellington has a difficult harbour approach and entrance that has some subtle, but significant hazards. As a system overall, it appears well set up to respond, but Co-ordination of assets in a large SAR event would be a challenge.

Although this is outside the scope of this Harbour Navigational Risk study, recommendation is made to liaise with MNZ to consider the Wellington SAR needs under a Declared Asset approach. This indicates to SAR Co-ordinators what floating asset or assets are potentially available when and organisations can set their staff call out systems to provide a declared asset if they can. Given the findings of this risk assessment, the Wellington area would benefit from a SAR coverage assessment, using methodology derived by the UK MCA. There certainly appears to be the records available to provide the benefit. This recommendation is made to MNZ as the national SAR Authority.

13.5 PILOTAGE

Wellington's Pilotage system both in terms of jurisdiction limits and boarding has been introduced in section 8. It is a Maritime New Zealand area of responsibility and jurisdiction. The limit of compulsory pilotage, at the entrance to the harbour basin allows a vessel to proceed into the Delta boarding area to get a pilot onboard. But the vessel could do this by its own choice, or by accident within the legal design of the system. This anomaly allows a vessel without pilotage to proceed through the area of greatest hazard in conditions when the hazard could be the greatest (i.e. the entrance

and over the "Bar"). Its obligation to the harbour management system is only through VHF liaison yet reality remains that the vessel should be proceeding only under the guidance of an authorised pilot. In the event of a serious grounding the design of the regulatory system is open to claims that a damaged vessel was not adequately managed by the system (on the basis that there isn't actually a requirement in place for the vessel to be under the guidance of a pilot in some form).

Making changes to Pilotage can only be done by change to an MNZ Maritime Rule, which itself was introduced in response to incidents in other NZ ports involving Piloted vessels. However making a change via Maritime Rule is not a short term proposal. A system is needed to remove potential liability from the regulatory design, improve the system leading vessels into Delta, and connect the pilotage and Beacon Hill skill base into managing the occasions when leading a vessel is a necessary option.

Recommendations for change in this area are made as follows:

1. Recommend MNZ to change the Compulsory Pilotage Jurisdiction so it is moved further out; increasing it to a mile outside (i.e. to Seaward) of the existing Gazetted Harbour Limit. As pilotage jurisdiction is drawn from MNZs' Maritime Rules, it can have a jurisdiction outside the three mile limit of Bylaw jurisdiction available to the Harbourmaster system (the Pilotage district would in effect commence 4.85 miles from Outer Rock, the harbour limit being 3.85miles). This allows the pilotage jurisdiction to be used for future VTS requirements, which will be inevitable as Beacon Hill develops. It also allows a vessel subject to pilotage to be navigating under the pilotage risk control system as the vessel crosses the harbour limit (this is slightly outside the 3 mile limit of GWRC Bylaw jurisdiction). The GWRC may wish to align its Bylaw Jurisdiction with the Harbour Limit (0.85 miles difference, but this in effect is a minor point of detail).

2. Create a system of Pilotage Directions which can define the local requirements for vessels subject to pilotage. These should be subject to formal approval by MNZ, but be part of the local harbour requirements. They need to be approved by MNZ as Harbours appear to be legally advised they are no longer able to make Bylaws affecting pilotage; such Directions thus need to be made in accordance with a modified Maritime Rule 90, legislation provided under MNZ jurisdiction. A system of Pilotage Directions would allow the harbour to introduce local requirements for piloted vessels and retain the authorising link to MNZ

and Maritime Rules. The Pilotage limits could be retained in Maritime Rules, but the day to day requirements (which change from harbour to harbour) could be contained within Pilotage Directions. For example, Pilotage Directions can define where piloted vessels are boarded and under what conditions (much of which is already in CentrePort's Marine Procedures Manual). They can define the approvals process for leading a vessel into the Delta Boarding area; Beacon Hill procedures can then define the support needed by the traffic information service to maintain a clear channel. Reduced visibility procedures can then in future allow a pilot ashore (via Beacon Hill) with electronic chart and AIS data, to assist another onboard an inbound vessel. It would also improve the ability to lead a vessel to Delta in conditions that preclude boarding. This way of working is termed Navigation Assistance by the International IALS VTS guidelines and would bring Wellington back into the forefront of technology and pilotage procedures working in partnership.

13.5.1 Size of Vessel for Compulsory Pilotage

Vessels over 500GT are required to take a pilot (or have a licensed PEC holder on the bridge) to enter Wellington Harbour. Length is, in the opinion of Authors, a more practical measure for setting pilotage criteria for vessels as the need for a size limit is more reasonably attached to rate of swing, which itself is related to manoeuvring in tight topography. Although Wellington harbour has an entrance that is difficult in inclement weather, provided the Harbour Navigational Layout is followed, a vessel does not have to make any technically difficult manoeuvre to transit the harbour. Furthermore, lighting on Aids to Navigation at night in Wellington are better than in other harbours that Authors have assessed – a common problem of back lighting at night is present (see section 13.6.1) but that can be mitigated by advice from a trained Beacon Hill officer if needed (with VTS advisory policies in place). Authors have policy to recommend pilotage criteria related to length (sometimes length and draught) and would suggest from experience that vessels up to (but not including) 50m length would be appropriate, given the findings of the risk assessment. The reason for selection of such a length is that at night vessels which show only one mast head light can easily be identified as not having a PEC (or pilot) aboard - Colregs require vessels of 50m and over to have two masthead lights. The 500GT limit is the default requirement of Maritime Rule Part 90. In the case of most vessels, this is likely to be close to the 500GT limit already set under Maritime Rule Part 90.

However, MNZ is encouraged to consider making the setting of such criteria a matter for Pilotage Directions as referenced in Section 13.5 Note 2. That would remove the difficulty that is inherent in changing Maritime Rules. Pilotage criteria in general should be reviewed every three years against the traffic profile of the harbour. Pilotage Directions could also be used to require smaller vessels (e.g. fishing craft) to undertake a simpler demonstration of knowledge about the harbour navigational system – the aim being one of education.

13.5.2 Use of Delta as a Pilot Disembarkation Point

The reason to lead a vessel into Delta is fully understood by Authors and recommendations have been made to improve the safety margin available when doing this. However it is also relatively common for Pilots to disembark at Delta on outbound vessels. Most vessels are disembarked between the Pinnacles and the Entrance Buoy once the vessel is established on the line of leads and the Master and bridge team are confident of their position. This appears to be of little consequence in clear conditions, although an outbound vessel is then likely to remain on the leads. However, it needs to be regulated by better procedure and closer involvement of Beacon Hill to ensure that the entrance is clear of inbound traffic in the approaches. The recommended equipment upgrade and training of Beacon Hill staff where appropriate will facilitate Pilots and Beacon Hill staff working together to improve and tighten-up areas of procedural practice.

13.6 PASSAGE PLANNING AND RECOMMENDED TRACKS

Recommended Tracks are not embodied in any Bylaw provision or Direction, with the exception that Bylaws direct vessels to join leads at a distance of at least 2 miles off. Given the nature of Wellington with its large harbour basin, recommended tracks are perhaps a prudent item! The term "recommended" is used throughout the maritime world and those that avoid "recommendations" can find the legal defence of commercial liability difficult following a serious and expensive incident.

However, as they are not mandatory, recommended tracks are not marked on NZ 4633/4634 either. They are though reproduced on the CentrePort website [copy attached at **Annex C**] along with other navigational and port services information. Visiting vessels are unlikely to have accessed this information prior to entering harbour limits for the first time. Thus pilots will board to liaise with Masters having created passage plans without the benefit of this information. It hinders the master/pilot exchange and its dissemination to vessels via agents would be beneficial.

As the tracks have no legal status, it is not explicitly stated in any document which vessels they apply to. It is implied however that recommended tracks must be used by all vessels subject to Pilotage (candidates for the Pilotage Exemption Certificate are examined on their use). Compliance with the recommended tracks by large vessels should provide predictability of vessel movements, which in turn helps smaller vessels/craft to comply with the relevant provisions of the Bylaws and Collision Prevention Rules. Smaller vessels may use the recommended tracks and in practice some do[46].

Visiting vessels not subject to Pilotage are unlikely to be aware of recommended tracks until provided with an information pack by the Deputy Harbourmaster on arrival. Beacon Hill provides a traffic direction service through consultation and informs other traffic of the presence of vessels which are proceeding up the wrong side of the channel, but it does not advise traffic to use recommended tracks (it cannot).

It is recommended that Bylaws make formal reference to the use of recommended tracks and that these are made available via vessel agents, referenced in the NPSI pilot book and notes inserted into Chart NZ4633/4634.

13.6.1 Background Lighting

Background shore lighting can make detection of some aids to navigation difficult. In particular the lights at Falcon Shoals and Evans Bay were reported to be difficulty to detect against the backlighting. Difficulty in detecting the Evans Bay pile light was reported by stakeholders involved with small craft. The possibility of the pile light being struck by a small craft at night was also tabled. However, this has not been problem as craft are heading either towards the marina entrance, or the swing mooring area, as they proceed down the bay. Both these courses are away from the structure. It is true that the light is easier to detect from the higher bridge of a tanker or other large vessel proceeding down the bay for Burnham or Miramar wharves.

Background lighting is a problem in many harbours and placing of lit navigation aids needs to take their night vision into account.

[46] Generally, it appears that most inshore fishing vessels do not use recommended tracks, but small commercial vessels, such as cable protection vessels, do. Other vessels use the tracks where they expect to meet large vessels, or use the tracks for some sections of the harbour transit.

13.7 HARBOURMASTER SYSTEM

The Harbourmaster system in Wellington has been found to be effective. It manages with minimal resources to provide 24/7 coverage and like CentrePort, is reliant on the long term knowledge of the Harbourmaster and his staff. Its procedures are limited, but Bylaws are comprehensive, have been developed over time, and are effective. It already has communication links to many of the organised leisure activities ongoing in the harbour. The Harbourmaster system will need to be the lead organisation in the development of a Harbour-wide Safety Management System under the Port and Harbour Marine Safety Code and both Wellington Regional Council and CentrePort are recommended to work together to jointly complete this.

13.7.1 Beacon Hill Upgrade

Beacon Hill is ready for an upgrade, (see also 11.1.2) both of equipment and staff training. AIS based systems overlaid on electronic charts have brought the entry level cost for a vessel traffic service down significantly. When overlaid with radar data, management of marine traffic can be very effective. However to achieve this, radar coverage of the inner harbour needs to be installed and AIS data integrated into the operator displays. This should be supplemented with CCTV camera technology. **Figure 11** shows how clear information can be once sources of information are integrated into a chart overlay. Speed, position and rate of turn information is readily accessible. Many vessel tracks can also be analysed statistically, providing powerful risk based information to the Harbour Planning system.

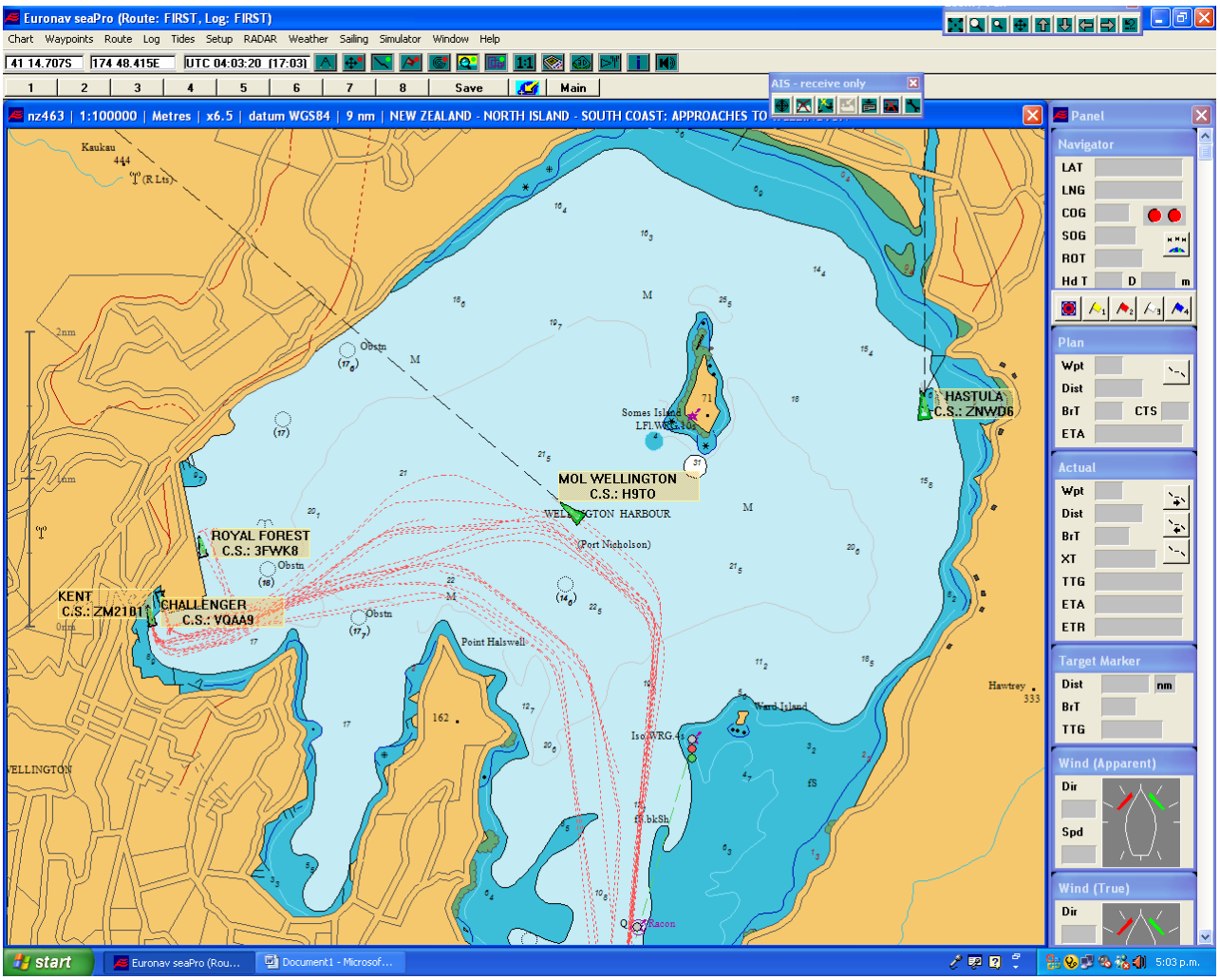

Figure 11 – Electronic Chart Record of Tracks of Large Vessels from AIS Recorded by Marico Marine (half day data).

13.7.1.1 Beacon Hill – Fog Procedure

Beacon Hill and the CentrePort Pilotage System, with appropriate equipment and training is recommended to consider the permanent deployment of AIS to allow a pilot at a shore station to assist another onboard a vessel during times of reduced visibility (a trial AIS system was fitted 9/2005). Wellington may suffer fog on more occasions during the reported La-Nina period of reversed of Pacific Ocean current[47]. AIS can provide a pilot ashore with the location, speed and rate of turn of a vessel. Fog can appear rapidly in Wellington and the technology is available to facilitate support of movements in extending conditions of reduced visibility. CentrePort and the Harbourmaster system are encouraged to develop a joint fog management procedure; once Beacon Hill signal station is upgraded.

[47] La Nina is reported to provide warmer seas in winter increasing the likelihood of seaborne fog, which is denser and clears more slowly than radiation fog.

13.7.2 Hydrographic Survey

Although the Harbour is thought to have low accretion rates, there does not appear to be recent data to substantiate this. Draught at the harbour entrance is a limiting factor in vessels using the port and this area was recently surveyed. However this is not the case for many parts of the harbour. The Harbourmaster is thus recommended to make requirement for regular hydrographic survey to provide the data required that can establish and monitor accretion rates. CentrePort is encouraged to develop a risk based system of survey, based on the monitoring of accretion rates.

If a new ferry service starts up at Petone Wharf, a need for survey and dredging is likely. Eastbourne Wharf is disused and now a recreational landing stage under the jurisdiction of Hutt City Council. If a service was ever considered from that location the available water depth would be an immediate factor to consider.

13.7.3 Entrance Channel Wave and Tide Height

Correlation of wave data offshore to conditions within the inner part of the entrance would provide risk mitigation to grounding and broaching hazards apparent in the entrance channel. The most restricted part of the entrance channel is the most crucial part for the transit into the harbour in adverse conditions (i.e. the point of highest risk). At present, a rule of thumb allowance for dynamic motion is made in the minimum UKC of 1.5 metres in the channel (in normal transits). Given the dangers of the entrance and the concentration of incidents, a more scientific approach based on measurement would be more appropriate in light of this risk assessment. Wave and tidal recording instrumentation is relatively simple to fit to the Front Lead Light beacon, and ideally located. It is not presently fitted and this is recommended.

By correlating the relationship between data from the Baring Head wave rider buoy and the entrance wave rider buoy through a range of conditions, interpolation would allow prediction of conditions anywhere in the entrance channel. This would be particularly useful during darkness when observations from Beacon Hill are not possible.

14 CONCLUSIONS AND RECOMMENDATIONS

1. The Wellington Risk Assessment has identified a total of 78 risks associated with vessel navigation. Risks have been ranked in order of magnitude.

2. The study has determined that risks overall remain within the As Low as Reasonably Practicable (ALARP) area of the risk matrix (Scores 4-7), given the risk criteria set for this risk assessment. However, a problem involving a passenger RoRo at the entrance is at the end of the ALARP range, with an assessed risk score of 6.8. It also scores highly within consequence categories. Given the nature of the entrance, there remains a valid case for attention by the Wellington Harbour Authority (the GWRC Harbourmaster system) and CentrePort. This affects traffic management from Beacon Hill Signal Station; tug capacity and availability and MNZ Search and Rescue response planning.

3. The risk profile at Wellington is dominated by RoRo ferry data. However, contact berthing incidents associated with this trade also appear high on the ranked hazard list. Fendering standards providing protection for RoRo berthing in marginal conditions are candidates for attention. Environmental parameter limitations or pilot advice are also options. Older Jetty structures need to be given attention with respect to remaining structural integrity. A list for Risk Control Options is presented in Section 12 and discussed\expanded further in Section 13.

4. The Wellington Harbourmaster System overall was found to be well managed, with availability, training and delivery providing effective movement risk management. It is however operating at minimum resource levels to provide 24-7 coverage. Recommendations have been made for the upgrading of Beacon Hill Signal Station equipment and the training of operators where necessary.

5. Search and Rescue (SAR) issues are referenced in this report (Section 13.4) and Maritime New Zealand are encouraged to consider undertaking a SAR assessment for the area, possibly resulting in the introduction of a “Declared Asset” system to support a large recovery operation.

6. There are many recommendations made in individual sections of this report, which should be reviewed against the reasoning presented. Key recommendations are as follows:-

   i) Tug power is due for upgrade in Wellington as available bollard pull is no longer sufficient without environmental limitations being considered.

   j) A strong conclusion by Authors from this risk assessment is that the future role of Beacon Hill Signal Station needs to be defined, its equipment improved, its skill base functionally described, trained where necessary and brought into the 21st Century. The capability of its role to assist pilots in poor visibility, manage entry transit, recommend sequencing when needed, as well as providing the focus of contact for those transiting towards Wellington, will remain immature until the future Safety Management System obtains stakeholder buy-in to its role and necessary upgrade.

      A Service Level Agreement between the two key organisations involved in running the harbour could be one way to facilitate a professional link between the pilotage service of CentrePort and movement management by the Harbourmaster system.

   k) CentrePort and the Beacon Hill traffic management system have a common purpose with respect to the movement of piloted vessels. Closer liaison between pilots and an upgraded Beacon Hill are recommended to both use new technology and commence a move towards Vessel Traffic Management by information service. Electronic integration of radar and AIS data between Beacon Hill and the pilotage service would provide benefit.

   l) The pilotage jurisdiction requires redesigning and a system of Pilotage Directions is strongly recommended to define requirements for the Wellington Harbour System. As Maritime Rule Part 90 is MNZ jurisdiction, such a system would need setting-up under Part 90 and Pilotage Directions therefore approved by MNZ. The approval link would retain the MNZ control link established following incidents involving vessels in other New Zealand pilotage waters. This represents a change to the approach being used by Maritime Rules and may be applicable to other harbours in New Zealand.

m) From Section 13.5.1, MNZ is encouraged to consider making the setting of Pilotage Criteria, including minimum size to take pilots a matter for Pilotage Directions as referenced in Section 13.5 Note 2. That would remove the difficulty that is inherent in changing Maritime Rules. Pilotage criteria in general should be reviewed every three years against the traffic profile of the harbour.

n) Recommended Tracks require formalising for use by all and referred in Harbour Bylaws.

o) Improvements in the present frequency of Hydrographic survey and the use of risk-based techniques to develop a dredge programme based on known accretion rates are recommended.

p) The implementation of wind, tide and wave measuring equipment on the Front Lead, measuring the environment at the most critical part of a deep draft vessel's transit is encouraged. With this in place data interpolation between this and measurements made by the offshore buoy would allow conditions anywhere in the entrance to be determined.

7. The Harbourmaster and those responsible for the CentrePort Pilotage Service are recommended to work closely together in the decision-making process for introduction of new risk control. This should form the basis of the harbour safety plan.

8. The Harbourmaster system and CentrePort already work would benefit from an integrated approach to the Harbour Safety Management System required under the Port and Harbour Marine Safety Code, with Navigational Policies reflected in the operating procedures of both organisations.

ANNEX A

RISK CRITERIA USED FOR THE ASSESSMENT

The risk assessment criteria used for this risk assessment is as follows:

Category	Description (AS/NZS 4360)	Definition	Operational Interpretation
F1	Frequent	An event occurring in the range once a week to once an operating year.	yearly
F2	Likely	An event occurring in the range once a year to once every 10 operating years.	1 - 9 years
F3	Possible	An event occurring in the range once every 10 operating years to once in 100 operating years.	10 – 99 years
F4	Unlikely	An event occurring in the range less than once in 100 operating years.	100 – 999 years
F5	Rare	Considered to occur less than once in 1000 operating years (e.g. it may have occurred at a similar port or harbour elsewhere in the world).	>1000 years

Frequency Matrix Scales Used to Score This Risk Assessment

Risk Matrix Used to Score This Risk Assessment

Scale	People	Property	Environment	Harbour Stakeholders
C0	**Insignificant** Possible very minor injury (e.g. bruise).	**Insignificant** (NZ$0-10,000).	**Insignificant** Negligible environmental impact. Tier 1 may be declared but criteria not necessarily met. (NZ$0-10,000).	**Insignificant** (NZ$0-10,000).
C1	**Minor** Single slight injury.	**Minor** (NZ$10K-100K).	**Minor** Tier 1 to Tier 2 criteria reached. (small operational spill). (NZ$10K-100K).	**Minor** Bad local publicity or short-term loss of revenue, etc. (NZ$10K-100K).
C2	**Moderate** multiple minor or single major injury.	**Moderate** (NZ$100K-1M).	**Moderate** Tier 2 Spill criteria Reached, capable of being limited to immediate area within harbour or port zone. (NZ$100K-1M).	**Moderate** Bad widespread publicity, temporary navigation closure or prolonged restriction of navigation (NZ$100K-1M).
C3	**Major** Multiple major injuries or single fatality.	**Major** (NZ$1M-10M).	**Major** Lower Tier 3 criteria reached, with pollution outside harbour or port zone expected. Chemical spillage or small gas release. Potential loss of environmental amenity. (NZ$1M-10M).	**Major** National Publicity Harbour faces temporary closure of a navigation channel affecting movements to a port or ports for several days. Ensuing loss of trade. (NZ$1M-10M).
C4	**Catastrophic** Multiple fatalities.	**Catastrophic** (NZ$10M+).	**Catastrophic** Tier 3 criteria oil spill reached with support from international clean up funds. Widespread beach contamination or serious chemical\gas release. Significant threat to environmental amenity. (NZ$10M+).	**Catastrophic** International media publicity. Port closes, navigation seriously disrupted for an extended period. Serious and long term loss of trade. (NZ$10M+).

Consequence Matrix Used to Score This Risk Assessment

ANNEX B

STAKEHOLDER CONSULTEES

The following is a representative list of those consulted as part of the risk Assessment. It does not include individuals who gave time to the study, for which the authors are grateful.

- Wellington Harbour-staff (Harbourmaster, Deputy and Rangers);
- Beacon Hill Communications Staff;
- CentrePort Senior Management;
- Pacifica;
- Holcim Cement;
- Strait Shipping;
- PEC masters (RoRo);
- Container Operators;
- Maritime New Zealand;
- Wellington Rowing Club;
- Wellington Regional Council;
- Tanker Operators (Silverfern);
- Seaworks – Marine Contractors;
- Interisland Ferries (including HSC);
- Harbour Ferry - Skippers and Crew;
- Wellington Pilots and Pilotage Service;
- Lowry bay Yacht Club (keel boat racing);
- Harbour Ferry Management (East by West);
- Wellington Coastguard (via Harbour Rangers);
- Foreign Fishing Vessel Interests (Ian Pharoah);
- Royal Port Nicholson Yacht Club (keel boat racing);
- Wellington Police - Maritime Unit (LADY ELIZABETH);
- Charter vessel operators (Sweet Georgia Cruising and MV WELLESLY).

ANNEX C

PASSAGE PLANNING CHARTLET FOR WELLINGTON

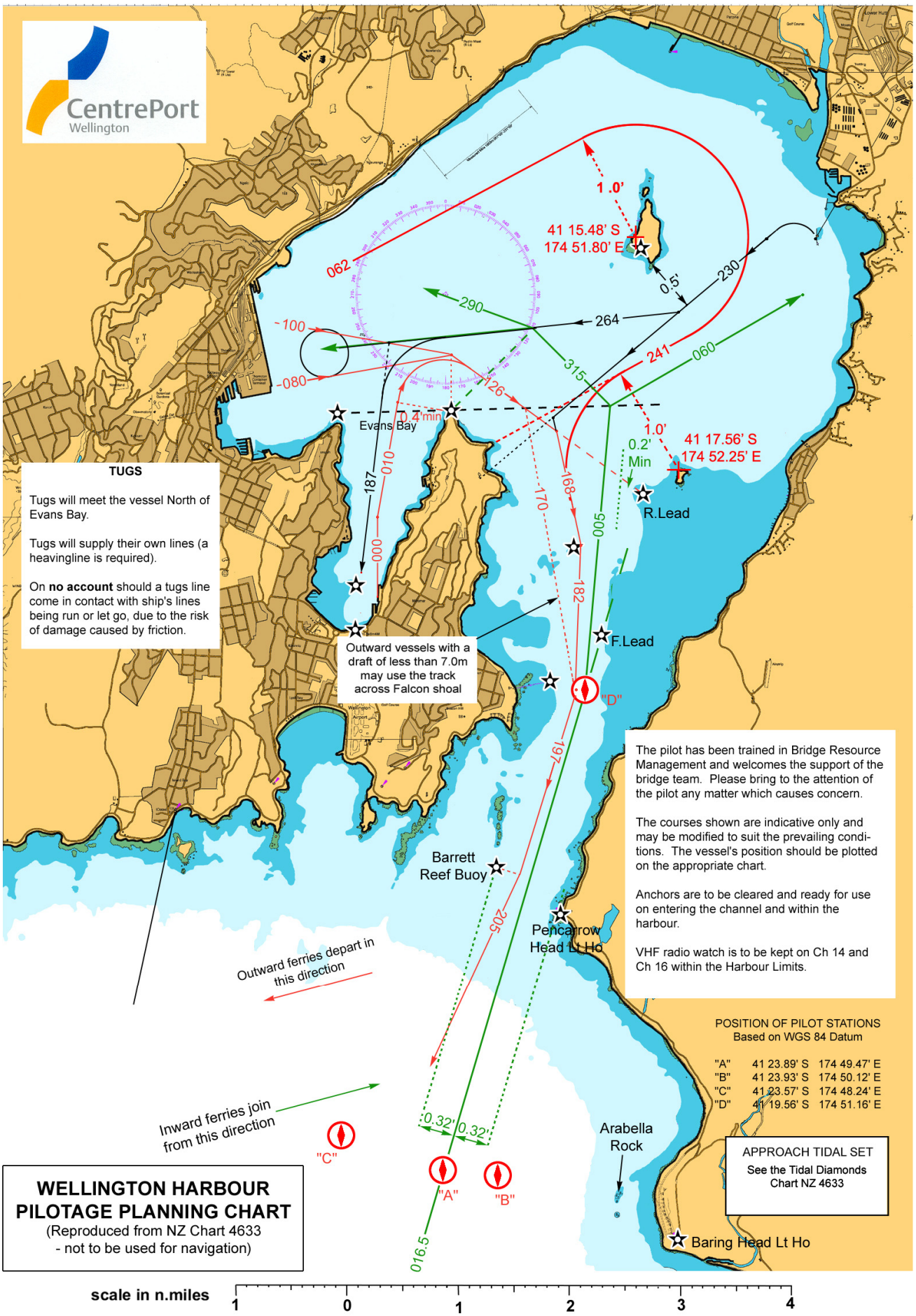

FIGURE B1 – PILOTAGE PLAN AND RECOMMENDED TRACKS FOR WELLINGTON HARBOUR

ANNEX D

WELLINGTON'S PINCHPOINTS BERTHS AND WHARVES

1 WELLINGTON'S PINCHPOINTS

This annex explores further the potential causes of the risk profile by considering the generic problems of the Harbour; this being related to geographical layout and traffic profile.

1.1 OUTER PILOT BOARDING AREAS TO HARBOUR ENTRANCE

Ferries provide the most frequent movement through this area and potential exists for collision between vessels proceeding with pilot in or outbound, or vessels which have disembarked the pilot at the inner boarding area. The potential is reduced by ferries and other Pilotage exempt vessels joining the leads at two miles off, while the Outer Boarding Areas are nearly three miles south of the entrance. Vessels embarking a pilot at position 'Charlie' to the west of the leads however, are likely to pass through the ferry transit area while gaining the leads after embarkation.

Risk mitigation is provided by Beacon Hill, which has both visual and radar surveillance of the area.

1.2 STEEPLE ROCK BEACON

This is a course alteration point for vessels both in and outbound. The channel is at its narrowest and at the 10 metre contour extends south of the beacon and bulges somewhat into the channel, providing restriction for deeper draught vessels (although those operating at minimum UKC are likely to proceed down the line of the leads from this point and have the option to navigate under privilege as a vessel 'Constrained by Draught').

The separation between the in and outbound tracks at this point is approximately one cable. Vessels which are not deep draught and inbound are able to navigate to the east of the leading line to increase this passing distance. Small craft are also known to navigate to the west of Steeple Beacon and in doing so keep clear of large vessels.

The presence of small vessels or leisure craft in this area, particularly sailing craft tacking across the channel, can further restrict manoeuvring options or add pressure to watch keepers of larger vessels. Small craft (in this case generally runabouts and launches) are known to navigate to the west of Steeple Beacon and in doing so keep clear of large vessels. Leisure craft are permitted through Bylaw to keep to either side of the main shipping channel.

Inshore fishing vessels (of less than 500 gross tons and therefore not subject to Pilotage) are reported to frequently proceed down the western side of the entrance inbound rather than coming down the line of the leads and following the Recommended Track. This can lead to a crossing situation or green-to green passing with any other traffic proceeding outbound. If following the intensified white sector of the Somes Light inbound, a vessel will naturally progress at an angle across and follow the western side of the channel, in contravention of Rule 9 of the Collision Prevention Rules and against the provisions of the Recommended Track.

1.3 MIRAMAR PENINSULA – NORTHERN SHORELINE

The three points Halswell, Kau and Gordon provide blind headlands with high potential for traffic conflict between commercial vessels of all sizes and also leisure craft. Room to manoeuvre on sighting another vessel or craft is limited with a rocky shore line close to on one side.

The outward track passes between 4-5 cables off these points, but due to the lack of uniformity in passage plans between large vessel operators, ferries routinely pass at a distance of 3 cables and reportedly less at times.

In conjunction with chartlets showing the Recommended Tracks in the Pilotage Exemption handbook, written Sailing Directions have been amended during the course of this Risk Assessment to direct vessels to navigate no closer than 3 cables from these pinch points.

Common users of the waterway off this shoreline are inshore fishing and charter vessels, pilot launches and many different types of leisure craft, including kayaks, whose occupants are particularly vulnerable to injury in the event of collision with another craft. From time to time a sail training vessel or approximately 40 metres has been known to anchor overnight off Kau Bay within 200 metres of the shore with an outbound ferry passing between the beach and the anchored vessel.

1.4 OTHER AREAS OF NOTE

Although not geographical pinch points, it has been noted that inbound vessels often find it difficult, due to background shore lighting, to detect the lights of a vessel outbound from Lambton Harbour, Thorndon Container Terminal, Aotea Quay or the Rail Ferry Terminal. Application of the Collision Prevention Rules is made more difficult for the inbound give way vessel if the

outbound vessel accelerates and therefore does not maintain its course and speed.

In practice, the following of correct radio reporting procedures allows for accurate movement information to be passed to the master or pilot of the inbound vessel, and safe passing is negotiated ship to ship. Occasions have been reported where outbound vessels have made late radio calls subsequent to leaving their berth which has led to confusion for the watchkeepers on inbound vessels.

The practice of leaving navigation lights on while alongside, or failing to switch them on when sailing, has also been reported as a source of confusion, but has not been reported to have caused a close quarters situation.

Background shore lighting is an issue affecting many harbours, and Wellington is no different. Many parts of the harbour have back light difficulties.

2 BERTHS AND WHARVES

2.1 COMMERCIAL BERTHS

Wharves are operated and maintained by either CentrePort or the local Authority of the area in which the wharf is located. Some are in occasional use or non-commercial use. Identifying lights are maintained by the body which administers the wharf.

2.2 CENTREPORT WHARFAGE

Berths operated by CentrePort in Area C are located at: Thorndon Container Wharf (TCW); Aotea Quay (AQ); Rail Ferry Terminal (RFT). Seaview tanker terminal is also in Area C. Point Howard wharf adjacent to Seaview is no longer in use and is administered by Hutt City Council.

Days Bay wharf is in regular use by the harbour ferry and occasional other users and is administered by the Hutt City Council. Hutt City Council also administers the (seldom used) Petone Wharf and (out of service) Eastbourne Wharf.

The length of berths varies between longest 293m (2 berths) at Thorndon Container Wharf (TCW 1 &2) to 145m at the Rail Ferry Terminal (RFT 1). In practice there is no set limit to the length of vessel that may lie alongside, except that pilots are instructed by SOP to consider the effect of any overhang in the prevailing or expected conditions, and that a minimum clearance between other vessels alongside must be maintained. The minimum clearance for any tanker is set at 30m through Bylaw, and normal practice for other vessels is a minimum of 20m.

Bunkers (LFO) are taken at Aotea and tankers discharge and occasionally backload white oil products. Product pipelines and bunker pipelines run along and underneath wharf structures and could be damaged by a heavy vessel contact.

The cruise/passenger vessel berth and terminal is located on Aotea Quay. There is also a facility in Lambton Harbour at the Oversea Passenger Terminal.

The maximum draught which can be accommodated at any berth is determined by the requirement to maintain a minimum UKC of 0.9 metres,

although this may be exceeded by the Marine Manager in consultation with the Harbourmaster. Accordingly, the maximum draught at Thorndon Container Wharf (TCW1) is 11.0 m, allowing for 0.9m under the vessel's keel at all times. There is room for deepening by dredging.

Wharves are in a north-south orientation, in line with prevailing wind although off the berth component exists during northwest/southwest winds. Approaches however may be across the wind resulting in the need for pilots to keep speed up to counteract excessive leeway. Downwind berthing is routinely carried out with certain vessel types, for example car carriers must berth starboard side to due to ramp configuration, while other types may be required to berth downwind (some have an operational gangway on one side only). Available tug resources, use of thrusters, main engine, anchors, plant redundancy, crew and pilot skill are significant factors should any one component fail or be unavailable.

The clearance between Aotea Quay and the Rail Ferry Terminal is a minimum of 72 metres. This is used mostly by cement carriers and RoRo ferries in that area.

Seaview has a lack of lack of reference points in the approach, making it a recommended approach by pilot only. Seaview is also affected in a southerly gale and the two metre seas which can form can affect tug ability to push on.

2.3 MINOR WHARVES AND DISUSED WHARVES

Days Bay Wharf – used for passenger ferry service to Wellington.

Petone Wharf – note silting, lack of recent survey, southerly swell causes surge alongside and loss of UKC, ferry operation planned in near future.

Somes Island two wharves for vessels up to approx 20 metres length, recently refurbished and strengthened main wharf, administered by DOC

Seatoun Wharf – transfer wharf for fishing and small commercial vessels, pilot launch. May have ferry service there in near future.

Eastbourne Wharf present disused due to shallowing and other factors. Hydrographic and dredging should be considered if a new ferry service ever re-commenced from this location.

Point Howard Wharf presently disused.

ANNEX E

RANKED HAZARD LIST

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
1	5	Approaches, Entrance	Grounding	Ferry Grounding, Entrance	Ferry in grounding at the harbour entrance	Passenger Vessel, All Vessels	Seafarers, Passengers, Vessel Owners Wellington Regional Council, Leisure Interests,	Propulsive, steering, electrical or instrumentation failure on lee shore in adverse weather. Tug assistance not immediately available or tug unable to assist due to severe weather conditions or lack of appropriate tow gear. Lack of limiting weather criteria for shipping movements through entrance. Vessel broaches during transit in heavy swell. Lack of real time wind/wave data at the harbour entrance narrows to base decisions on. Differing perception of safety margin between harbour authority and shipping operator. Sub-optimal BRM environment. Poor visibility. Vessel joins leads too late to get appreciation of vessel handling when on the line of leads in southerly weather. Not using or monitoring all nav aids to confirm position.	Ferry blackout occurs off entrance, power eventually regained and grounding averted.	Ferry grounds on Barrett Reef or Pencarrow Head in storm force southerly conditions with hull damage and rapid water ingress to hull and subsequent capsize. Potential for multiple fatalities and bunker spill. Entrance closed to other shipping while any wreckage recovered from channel.	6	0	0	9	7	7	7	7	6.81	Passenger ferry companies generally cease operations in adverse southerly weather for passenger comfort but cargo shipping services may continue to operate in all but the severest weather conditions. Ferries have been reported to have lost steerage and been broached while transiting the entrance in heavy seas. Larger ferries are planned for the inter-island run with the possibility that operating limits with regard to weather may be increased. In southerly weather the inward vessel should join the leads further out to check ship handling and allow time to abort entrance transit if required.
2	21	Approaches, Entrance, Main Harbour	Collision	Ferry and Ferry in Conflict	Two ferries in developing collision situation during an overtaking or passing manoeuvre near alter-course waypoints.	RoRo Ferry, RoRo Ferry	Seafarers, Passengers, Wellington Regional Council	Miscalculation by masters. Sub-optimal BRM environments operating. VHF communications between vessels leads to confusion or lack of communication leaves one vessel in doubt as to intention of other. Lack of positional monitoring support from bridge team. Passage plans not standardized between operators. Beacon Hill unable to monitor recommended track compliance in all parts of the harbour. Convergence of smaller craft near altercourse points. Interference by small craft at last minute.	Close quarters situation but collision averted.	Overtaking ferry attempts to cross ahead of other vessel resulting in fine angle collision. Potential for injuries to passengers/crew on impact and damage to hulls requiring vessels to be withdrawn from service for several weeks to repair.	0	0	0	7	7	7	6	7	5.75	Ferries are reported to regularly depart from the recommended track to save passage time in the past, although this practice appears to be declining . Some may cross Falcon Shoal. Close quarters situations between ferries have occurred in the harbour approaches and inner harbour areas. Beacon Hill currently only provides a passive communications role within the limitations of equipment and training provided to staff - for example, station operators have only been required to have a general knowledge of the recommended tracks for vessels transiting the harbour. Most inbound vessels shaping for a berth from Point Halswell cross the track of outbound accelerating ferries and this requires a departure from the rules but is always agreed between the respective vessels.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
3	18	Approaches	Collision	Ferry and Large Vessel Conflict, Approaches.	Passenger ferry and large vessel in developing collision situation, wider angle of approach.	Passenger Vessel, All Vessels	Seafarers, Passengers, Vessels Owners, Wellington Regional Council CentrePort	Either vessel diverts substantially from normal tracks without informing each other or Beacon Hill. Inadequate pilot/master/bridge team exchange or lack of bridge team communication. Sub-optimal BRM environments on both vessels. Late or ineffective VHF communications between vessels. Misunderstood intentions or disregard of Collision Prevention Rules or attempt to make alternative arrangement which is not understood or executed as intended by both vessels. Vessels not plotting to determine rate of closure and relative bearing changes. Poor visibility, nav lights not clear. Dark and situational awareness decreased. Third party interference with planned movements and multiple vessel convergence to leads causing last minute course alterations.	Close quarters situation but collision averted.	Collision with a wide angle of blow. Substantial loss of life and pollution through spilled bunkers and cargo.	0	0	0	7	7	7	6	7	5.75	This hazard covers all large vessel types. Pilot disembarks regularly in the channel or area of Front Lead (in southerly weather), vessel transits entrance traffic without pilot on board (although the pilot will escort from the pilot vsl) or shore based navigational support. Ferries approaching from the west are reported to regularly 'cut the corner' at the entrance or seek to make alternate starboard to starboard approach to save time. Vessels using pilot boarding station Alpha manoeuvring to pick up the pilot are likely to regain leads in the same area where an inbound ferry would join the leads. Pilots report that temporary loss of spatial awareness can occur between boarding a vessel and making their way to the bridge if Master is manoeuvring the vessel, but awareness is regained quickly.
4	20	Main Harbour	Collision	Ferry and large vessel in Conflict	Inbound passenger ferry in developing collision situation with outbound container or large vessel (or tanker departing Evans Bay by night).	RoRo Ferry, All Vessels	Seafarers, Passengers Vessel owners, Wellington Regional Council, Leisure Interests, CentrePort	Either vessel diverts substantially from recommended track without informing the other vessel or Beacon Hill. Sub-optimal BRM environments. Pilot not following SOPs. Inadequate pilot/master/bridge team exchange or lack of bridge team communication on pilot exempt vessel. Lack of effective or late VHF communications between vessels to confirm respective intentions. Navigation lights blended in with background shore lights. VHF departure message to Beacon Hill from ferry is not received by ship or tugs working on Channel 13 and is not repeated by Beacon Hill once Pilot is clear and back on Ch.14. Ferry bridge team not aware of the recommended tracks of other vessels. Reduced visibility in heavy rain or fog. Speed inappropriate for the conditions. Courses set by both vessels to pass too close to each other reducing margins for any error. Last minute avoiding action taken by either vessel as a result of interference by third party.	Close quarters situation but collision averted.	Large vessel and passenger ferry in collision with punctured shell plating to both vessels requiring return to berth and repair. Potential for injuries to passengers/crew. Potential for fire.	0	0	0	7	7	6	6	7	5.68	This scenario applies to all large vessels too. Possible for tankers departing Seaview or Evans Bay to conflict with inbound ferries/other vessels on recommended tracks. The situation is normally resolved through VHF communication and outbound ship under pilotage communicating with Beacon Hill once it clears VHF Ch.13. A ferry carrying >1000 passengers and a tanker in a collision is the worst case scenario and all efforts should be taken to keeping passing distances as wide as possible. Given the dangers a tanker provides there are no procedures to provide for a moving clearance zone (for example) around a tanker.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
5	54	Main Harbour, Lambton Harbour	Mooring Breakout	Mooring Breakout	A vessel with high windage breaks mooring lines in high offshore winds (other than a vessel berthed at a finger berth).	Container Vessel, All Vessels	Seafarers, Passengers, Vessel Interests, CentrePort	Vessel unaware of impending adverse weather which may arrive quickly on approach of a southerly front. Wind loading exceeds breaking strain of lines in use or lines being used are not equally set up or of same composition therefore different BS apply. One line parts loading up others. Tension winches not set on the brake. Not enough lines for the conditions. Not using bights to increase parts. Lines poorly set as bollards have been removed for RoRo ramp access. Inshore bollard not used or blocked by equipment at TCW1. Poor condition of lines. Moorings not tended on vessel (poor deck watch and insufficient crew on board). Interaction of large vessel passing close by causes ranging and excessive loading on lines. Tugs lacking capacity to take load off moorings or unavailable to assist due to commitments to other shipping.	Tugs push vessel alongside wharf while extra lines or storm lines rigged.	(1) Involves a container vessel berthed at TCW1, which parts lines in southwesterly gale and drifts off berth. Box stack or ship's shoulder or quarter fouls crane. Potential to damage crane leg, making crane unusable. Crane likely to collapse. Potential for multiple fatalities if persons are in vicinity. Vessel could break out at same time spreader is down slot causing crane/s to collapse. Vessel drifting off berth makes contact with other ship berthed at TCW 2 which also parts lines in the extra loading. Potential for this vessel to foul cranes also. Two vessels now adrift requiring tug assistance to get back alongside and storm lines rigged. All cranes lost. Severe financial and service impact on port trade. (2) Cruise liner or ferry parts mooring lines and drifts off berth. Gangways damaged or fall from wharf edge or high level landing platform with potential for fatality(ies). Vessel damages berth in process.	0	6	0	0	7	8	3	7	5.61	This scenario is targeted at high windage vessel such as a container vessel, cruise liner or rail ferry berthed at Aotea Quay, TCW, QW, OPT or the ferry terminal Dock Wharf. Risk occurs particularly in SW gales. Often cranes are unable to be long travelled to amidships position when ceasing for wind therefore they are very vulnerable to ship contact when a ship parts mooring lines. TCW1 is more exposed berth in SW gales but all TCW/AQ berths can be affected in very strong SW or broad NW (or rarely - Wly) winds. There is potential for grounding of the adrift vessel/s if attempts to anchor are unsuccessful due to inability of crew to use anchors or anchor drags when let go (engines perhaps not available to assist) and pilot/tug assistance not immediately available, or collision with other vessels transiting the area, particularly at night. In severe wind events where wind loads are >100 tonnes, tugs lack sufficient BP to hold some vessels alongside, for example car carriers, larger container vessels and passenger vessels with high windage. Tugs often have to push for many hours at a time to ease mooring loads. IN scenario, vessel drifting off berth could make contact with another ship creating a worst case scenario and loss of more than one crane.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
6	46	Main Harbour, Lambton Harbour	Contact Berthing	Contact Berthing, Pilot Exempt Vessel.	Ferry berthing without tug assistance in adverse weather in heavy contact with berth or adjacent vessel.	Pilot Exempt, All Vessels	Seafarers, Passengers Vessel Interests Wellington Regional Council, Leisure Interests	Vessel attempting to berth in a strong gale at a finger berth terminal without tug assistance. Adverse weather condition is gale SWly condition for both finger berths and RFT. Master outside his level of expertise or is fatigued, stressed or overloaded due to the weather condition. In wrong position to start approach. Misjudges approach angle and speed. Best use not made of anchors. Poor bridge BRM support. Bow thruster lacks capacity and is unable to hold bow up in the prevailing conditions. Single screw cuts severely when used astern and complicates manoeuvre. Lack of set limiting wind criteria for berthing. Propulsive, steering, electrical or instrumentation failure at critical time.	Contact with wharf sets plating in with damage to wharf structure.	Vessel punctures shell plating in heavy landing on wharf or other berthed vessel. Water ingress threatening loss of stability if damaged below waterline. Berth blocked or linkspan out of service. Delay to shipping movements while wreckage is cleared or berth repaired.	0	6	0	6	6	7	3	7	5.59	This is particularly applicable to a single a screw vessel. Lambton Harbour is used as the example however rail ferries at RFT have also suffered holed plating and have severely damaged smaller vessels berthed nearby. Potential for fatality exists if persons on board the berthed vessel are unable to evacuate the vessel or area of contact in time. Vessels are not required to report defects affecting unassisted berthing ability. There is no set weather criteria for compulsory use of tug assistance. Pilot exempt masters would probably benefit from simulator training in tug use and modelling of various conditions/situations which they may encounter. Owners need to recognise that a single screw vessel is not optimal for manoeuvring required. Provision of wind speed information at the berth in addition or instead of wind speed at Beacon Hill may benefit shiphandlers. A larger vessel will arrive to use the Interisland terminal. Less room available because of the larger hull form. Damage could increase from increased momentum. Setting of agreed limiting wind criteria is recommended.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
7	17	Approaches, Entrance	Collision	Ferry / Large Vessel and Fishing Vessel Conflict.	Ferry or large vessel and fishing vessel in developing collision situation on approach to or within harbour.	Large Vessels, RoRo Ferry, Fishing Vessel	Seafarers, Fishing Interests, Wellington Regional Council, Leisure Interests	Either vessel diverts substantially from normal track without informing each other or Beacon Hill. Failure to provide 10mins call to Beacon Hill prior to departure. Inadequate pilot/master/bridge team exchange or lack of bridge team communication. Sub-optimal BRM environment. Late or ineffective VHF communications between vessels. Fishing vessel not monitoring Ch.14. Disregard of Collision Prevention Rules and or Bylaws. Confusion on the application of a negotiated passage. Vessels not plotting to determine rate of closure and relative bearing change. Fishing vessel skipper unaware of recommended tracks for approaching and transiting harbour. Loss of spatial awareness in poor visibility. Either vessel not using all nav aids effectively so unsure of limits of navigable water when taking evasive action. Inattention to course keeping by fishing vessel and reliance on autopilot. Fishing vessel not aware of larger vessel overtaking and manoeuvres in front of ferry at last moment. Nav lights not clearly discernable. Fatigue on fishing vessel. Alcohol or drug influence.	Close quarters situation but collision averted.	Fishing vessel run down by other vessel and capsizes with potential for multiple fatalities and loss of marine diesel to sea.	3	3	0	3	8	7	6	7	5.44	Both ferries and fishing vessels are reported to disregard the recommended tracks for entering/leaving the harbour- this may increase the probability of conflict situations. Visiting fishing vessels may be unaware of the local routing system on their first entry. An incident related to this hazard has occurred involving a container vessel and a fishing vessel, which included loss of life.
8	27	Approaches, Entrance, Main Harbour, Lambton Harbour, Evans Bay	Collision	Yacht and ferry or large vessel in Conflict.	Yacht engaged in racing and ferry or large vessel in developing collision situation.	Leisure Craft, All Vessels	Seafarers, Passengers, Vessel Interests, Wellington Regional Council, Leisure Interests, CentrePort	Yacht race set across fairway to pass round a nav aid. Lack of liaison with harbour authority or poor management of start by race officers including decision to proceed in poor visibility. Poor lookout on yacht, impedes passage of vessel of more than 500GT. Misinterpretation of Collision Prevention Rules. Yachts unfamiliar with shipping tracks or lack appreciation for manoeuvring room required by larger vessel. Yachts taking unnecessary risks to maintain race positions. Lack of wind prevents yachts from making way to clear channels or track lines. Poor lookout or sub-optimal BRM on larger vessel.	Close quarters situation but collision averted.	Yacht tacks in front of ferry or larger ship and is run down with potential for fatalities.	0	0	0	6	8	6	0	7	5.29	Organization of yacht races so as to minimize conflict with shipping has reportedly improved in recent years with liaison between the harbour authority and clubs. Conflicts still occur with the majority of reported incidents appearing to be between ferries. Clubs have been sent track information to display on notice boards and to disseminate to members. This may also involve parts of the harbour being in differing visibilities i.e. the entrance to the Front Lead may be in thick fog but the inner harbour be clear with the limits of restricted visibility being unknown to the bridge team. Procedures should involve race setting to have turning marks clear of main nav aids and harbour tracks.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
9	1	Approaches, Entrance	Grounding	Large vessel grounding, Approaches	Inbound large vessel (> 500GT) in grounding situation in adverse southerly conditions through operational failure.	All Vessels, All Vessels	Seafarers, Passengers, Vessel Interests, Wellington Regional Council, CentrePort	Vessel stands in too close waiting for pilot. Late pilot boarding and lack of clearing room. Failure to monitor position and appreciate effect of wind and tidal stream, navigational error including incorrect scale of chart in use. Vessel being led in fails to follow pilot's instructions. Sub-optimal BRM environment. Restricted visibility in rain and or spume. Pilot does not follow procedures relating to leading in. Lack of nav support available from a shore based VTS system. Poor manoeuvring response from the low power-displacement ratio of bulk carrier. Propulsive, steering, electrical or instrumentation failure. Lack of set environmental limiting criteria for transit of entrance (with exception of under keel clearance). Lack of channel environmental data. Poor holding for attempted anchoring on lee shore. Anchors not cleared away before approaching port entrance. Tug assistance not immediately available and delay caused by tug crews having to be called in or working on another vessel. Bollard pull of the tug is too low for prevailing conditions. Coms difficulty due to mixed nationalities aboard vessel. Interference by other vessel.	Near grounding averted.	Large vessel suffers blackout while awaiting pilot at position Bravo in fresh SW and drags anchor to ground in Fitzroy Bay. Major salvage operation to refloat, potential loss of bunkers to sea.	0	0	0	6	6	7	7	7	5.28	This scenario could apply to any vessel approaching Wellington to pick up a pilot. In gale force S winds pilots are likely to lead vessels in by the pilot vessel and board in the channel or at the inner boarding area 'Delta'. The signal station is set up to provide port information and communication service to shipping and does not provide a VTS function. Signal station staff are required by SOP's to warn any vessel observed standing into danger but are not equipped or trained to provide navigational advice to vessels. Communication problems with ship's crews who do not have English as first language could minimise effectiveness of any directions given. Tug assistance may take up to two hours to reach a disabled vessel and may not have sufficient bollard pull or be equipped with suitable towing gear in severe sea conditions to tow a dead ship with high windage off a lee shore. In adverse Southerly weather, safe pilot transfer may not be possible outside. Vessels may be led in or instructed by the pilot from a position inside the harbour entrance. Beacon Hill has limited access to actual entrance or channel environmental data at night or in poor visibility and relies on experience supported by visual observations and again supported by the offshore wave rider buoy - conditions at 131m asl do not necessary reflect sealevel conditions.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
10	44	Main Harbour	Contact Berthing	Ferry Contact Berthing (Rail Ferry Terminal)	Ferry berthing at Rail Ferry Terminal (RFT) in heavy contact with berth or adjacent vessel.	RoRo Ferry, All Vessels	Seafarers, Passengers, Vessel Interests, Wellington Regional Council, CentrePort	Adverse weather condition is gale SWly condition for RFT but gale NWly and fresh Easterly causes difficulties. Master outside level of expertise or is fatigued, stressed or overloaded due to the existing and past weather condition. In wrong position to start approach. Misjudges approach angle and speed. Does not get stern to windward (by turning outward) Doing task by rote and unfamiliar with or makes wrong approach to berthing area and wind pressure slows turn, meanwhile sets to leeward. Anchor not used to hold bow once vessel is to windward. Poor BRM support. Lack of clearing distances. Poor berth lighting and marks. Bow thruster lacks capacity and is unable to hold bow up in the prevailing on berth conditions. Lack of set limiting wind criteria for berthing. Propulsive, steering, electrical or instrumentation failure at critical time. Berth wind indicator obscured or lighting is out. Visibility obscured due to heavy rain or fog condition.	Contact with wharf sets plating in with minor damage to wharf structure.	Vessel punctures shell plating in heavy landing on wharf or other berthed vessel. Berth blocked or there is delay to timetabled shipping movements while wreckage cleared. Impacts on cross Strait service.	0	6	0	6	6	6	0	7	5.28	RFT suffers constant damage from berthing contacts. Rail ferries at RFT have also suffered holed plating and have severely damaged smaller vessels berthed nearby. Potential for fatality exists if persons on board the berthed vessel are unable to evacuate the vessel or area of contact in time. Vessels are not required to report defects affecting unassisted berthing ability. There is no set weather criteria for compulsory use of tug assistance. Pilot exempt masters would probably benefit from simulator training in tug use and modelling of various conditions/situations which they may encounter. Larger vessels planned which will be required to berth on leeside berth in a SWly, adding to difficulties holding ship up to berth. Configuration of linkspan makes puncture of ferry transom more likely at RFT berth in contact situation compared to other berths.
11	59	Approaches, Entrance, Main Harbour, Lambton Harbour, Evans Bay	Foundering	Leisure Craft Foundering	Leisure craft founders in the harbour.	Leisure Craft, All Vessels	Wellington Regional Council, Leisure Interests	Craft unable to progress against wind and driven into rougher seas (low engine power, mechanical failure or rowed/sailed craft). Craft unsuited to sea conditions encountered. Lack of local or general boating knowledge including failure to consider and appreciate the weather forecast. Consumption of alcohol or misuse of drugs impairs judgement.	Dinghy attempting to recover fishing net capsized in choppy seas but occupants swim short distance to shore or rescued by police launch or coastguard vessel on patrol.	Small craft multiple occupants attempting to recover net off Pencarrow coastline capsizes. Potential for fatality through hypothermia or drowning.	6	0	0	6	7	3	0	7	5.22	Small leisure craft are prone to getting caught out in deteriorating conditions and suffer mechanical failure or have insufficient power to make headway against wind and sea. A number of fatalities have occurred in the harbour and at the entrance off the South Coast where there has been disregard or inattention to changes in weather. Most of these events have occurred in Lowry Bay to the Harbour entrance (East Coast).

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
12	15	Entrance	Collision	Ferry and Large or Deep Draught Vessel Collision	Ferry and deep draught ship in developing collision situation between the Pinnacles and Falcon Shoals.	RoRo Ferry, All Vessels	Seafarers, Passengers, Vessel Interests, Wellington Regional Council, CentrePort	Miscalculated overtaking manoeuvres by ferry master. Insufficient tripping experience of pilot exempt master, lack of currency and performance monitoring. Sub-optimal BRM environments. Deep draught bulk carrier navigating at extreme limit of channel to maximize CPA with other vessel. Pilot misjudges manoeuvrability of heavy vessel. Insufficient trained personnel on either bridge to provide continuity of the watch if it becomes necessary to take manual control of the helm. Poor or late communications between vessels to discuss and confirm respective intentions. Pilot does not request that other vessel remains out of channel until deep draft transit is clear. Restricted visibility. Nav lights not clearly discernable. Either vessel diverts substantially from their normal track without advising. No proactive movement information from Beacon Hill. Third party interference with planned movements and multiple vessel convergence to leads causing last minute course alterations. Propulsion or steering failures.	Close quarters situation but collision averted.	Ferry and bulk carrier in fine angle collision near Steeple Light in poor visibility. Potential for multiple injuries on impact. Punctured shell plating leads to flooding. low possibility of pollution.	0	0	0	6	6	6	4	7	5.05	This hazard covers (1) overtaking situation and (2) head on passing situation. Some ferry masters routinely move to the East of the leads inward bound to give deeper draft vessels more room through this area, however the practice is not uniformly followed between different masters and is not necessarily a requirement of ferry passage plans. Outward ferries move to west of channel. The Pilot has the option of requesting all traffic remain clear of channel while the deep draft vessel is in transit. Proximity of the 10 metres depth contour may restrict available sea room for deep draught outbound vessels in transit through this area. Constrained by Draught signals are not routinely shown by vessels transiting the harbour with small UKC. It is possible fro two deep draught log carriers to be departing at same time.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
13	63	Main Harbour, Lambton Harbour, Evans Bay	Personal Injury	Personal injury during arrival or sailing	Lines crew injured due to a mooring line accident.	All Vessels, All Vessels	Vessel Interests, CentrePort	Strain exceeds BS on mooring line during manoeuvre and line parts. Personnel in whiplash area. Manoeuvring in strong wind conditions causes intermittent loads. Not using trained linesmen under supervision. Lines crew not wearing PPE. Ship movement caused by another ship or wind gusts during singling up or arrival. Linesmen stands on wrong side of slack line. Gets fingers or hand caught in eye of line when strain comes on. Getting hands caught on wire snags. Pilot/Master not following standard procedures or best practice. Mooring or sailing plan not discussed with lines team. Tug not used correctly to ease strain on moorings. Lines caught on stringer or fender. Ship being manoeuvred by exempt Master unfamiliar with working tug/s. Working area not checked. Attempting to lift line without support causing strains. A tug line parting under strain may also impact directly (line hits wharf personnel) or indirectly (ship goes out of control) on wharf personnel. Open service plate causes a linesman to trip and cause harm or fall over the wharf edge.	Line/s part but without harming anyone.	Serious injury or fatality to personnel when line parts. Badly injured lines crew person thrown or pulled into water.	0	6	0	0	7	3	0	7	4.85	CentrePort has training process for lines crew which highlights safety risks. Following a fatality involving a broken tug line, when an exempt master was overloaded during a manoeuvre, a pilot is always employed when using two tugs. One staff member has been on long sick leave as a result of falling into an open service access at the wharf side. Lines crew have been pulled into the water onto at least one occasion.
14	76	Approaches, Entrance	Grounding	Deep Draught Vessel Grounding	Deep draught vessel (e.g. Tanker) in potential grounding situation while transiting harbour entrance	Tanker, All Vessels	Seafarers, Vessel Interests, Wellington Regional Council, CentrePort	Swell at entrance reduces under keel clearance. Unknown hydrodynamic behaviour of vessel. Vessel speed too high for available depth of water or maneouvre to avoid other vessel / craft leads to loss of under keel clearance through heel. Incorrect draught calculation or declaration prior to transit. Pilot error in calculating under keel clearance fr time of transit. Failure to monitor position or vessels progress. Propulsive, steering, electrical or instrumentation failure at critical time.	Glancing grounding resulting in scrape with minor damage, slight plating indentation.	Tanker has engine dificulties in the Narrows in adverse southerly conditions and grounds on reef or rocky shore. Hull ranges and works in heavy swell with loss of hull integrity and product spill.	0	2	0	6	3	6	6	6	4.81	The entrance channel was last surveyed by the Wellington Regional Council in 1996. There is a lack of accurate wave data for the entrance area.

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15	28	Main Harbour	Collision	Ferry and Tanker in conflict within harbour.	Inbound vessel or ferry in developing collision situation with tanker outbound from Seaview.	RoRo Ferry, Tanker	Seafarers, Passengers, Vessel Interests, Wellington Regional Council, CentrePort	Either vessel diverts from normal tracks without informing other shipping or Beacon Hill. Beacon Hill neglects to pass infomration on to other vessels. Inadequate pilot/master/bridge team exchange or lack of bridge team communication on either vessel. Sub-optimal BRM environments. Lack of effective or late VHF communications between vessels. VHF departure message to Beacon Hill not received by either the tanker or by tugs who may be working on Ch.13 for the departure manoeuvre. Pilot does not ask or Beacon Hill does not ensure vessels are informed about movements. Ferry bridge team not aware of outward tracks from Seaview. Ferry or tanker not monitoring other radar targets. Ferry, as giving way vessel alters to port across bow of tanker in contravention of Rules. Outward tanker not seen against background lighting. Poor visibility gives reduced visual appreciation.	Close quarters situation but collision averted.	Vessel and passenger ferry in collision with punctured shell plating to both vessels requiring return to berth and repair. High potential for injuries or even fatality to passengers/crew of ferry. Collision is most likely to be bow to bow or glancing blow.	0	0	0	4	6	6	6	7	4.68	Possible for tankers departing from Seaview or Evans Bay to conflict with inbound vessels or ferries using the recognised tracks. Any conflict situation is normally resolved through VHF communication and outbound ship under pilotage communicating with Beacon Hill once it clears VHF Ch.13. A ferry carrying >1000 passengers and a tanker in a collision is the worst case scenario and all efforts should be taken to keeping passing distances as wide as possible. Given the dangers a tanker provides there are no procedures to provide for a moving clearance zone (for example) around a tanker or to impose controls for vessels passing tankers. There is a particular risk at night when background shore lighting may make it difficult for vessels to detect one another visually.
16	70	Approaches, Entrance, Main Harbour, Lambton Harbour	Fire/Explosion	Fire on RoRo Ferry within Harbour Limits	RoRo ferry has shipboard fire while transiting the approaches or entrance.	RoRo Ferry, All Vessels	Seafarers, Passengers, Vessel Interests, Wellington Regional Council	Shipboard fire through maintenance failure/onboard procedures. Possible fire subsequent to grounding or collision. Dangerous Goods spill through cargo shift (inadequate lashing in adverse weather or for other heel experienced during transit). Inadeqate seperation in stowage of DG's . Incorrect identification or non-disclosure of DG's prior to loading. Ignition of fuels carried in vehicles. Reefer container fire.	Minor accomodation or galley fire controlled immediately with no external assistance necessary.	Fire on ferry involving DG's (possibly undeclared) during summer with full passenger complement. Vehicle deck isolated water curtain. Fumes given off may cause passenger injury. Possibility of inbound ferry making for Port of Refuge in Wellington with fire unable to be extinguished with onboard resources. Gas/fumes generated.	3	0	0	3	7	7	4	7	4.65	Emergency Response Plan for fire onboard a passenger vessel needs to incorporate the planned introduction of ferries carrying up to 1600 passengers and any increases in cruise liner trade. Circumstances other than fire may require the evacuation of a vessel, such as vapour release from spilled DG's. Fire on a passenger cruise vessel with the same Worst Credible outcome is a possibility, but probably of lower relative risk given the number of cruise vessels visiting the port and lack of DG's carried as cargo.

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17	74	Lambton Harbour	Collision	Leisure Craft in Conflict with Large Vessel	Leisure craft in potential collision situation with commercial vessel swinging or transiting Lambton Harbour.	Leisure Craft, All Vessels	Seafarers, Passengers, Vessel Interests, Wellington Regional Council, Leisure Interests, CentrePort	Leisure craft operating in close proximity to commercial wharf area while vessels are arriving or sailing. Large vessel committed to manoeuvre unable to take action to avoid craft. Poor lookout on leisure craft. Sound signal not used by vessel to alert craft. Incorrect or no lights shown by night on craft, or difficult to detect against background shore lights. Lack of general maritime knowledge of craft operator including poor perception of safe passing distance and effect of interaction. Inadequate safety briefing given to persons hiring craft. Craft operator under influence of alcohol or drugs.	Close quarters situation but collision averted.	Small craft with multiple occupants such as rowing boat, double-kayak or paddle craft run down by swinging vessel with potential for fatality.	0	0	0	6	7	0	0	7	4.63	Lambton Harbour is an area of high usage by leisure craft in the summer, including use of hire craft (kayaks and paddle boats) with potential for conflict between smaller craft and commercial vessel movements, particularly where ferries or vessels such as cruise ships are swinging on approach to their berth (on either side of the basin if the Overseas Passenger Terminal is in use). A larger vessel planned for the inter-island service will temporarily berth in Lambton Harbour. This vessel will require considerably more room to maneouvre than those currently in service, and is likely to use areas of the basin which may have previously been considered a relatively safe area for leisure craft to operate. Hire craft operators give safety briefings to persosn hiring their craft (this is monitored by the Harbours Department) and to date few problems have ben reported with these craft.

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18	47	Main Harbour, Lambton Harbour	Contact Berthing	Vessel in Contact Berthing	Large vessel such cruise vessel, car carrier, container or general cargo ship in contact berthing with wharf or container cranes in restricted visibility, strong onshore winds, berthing in very strong wind conditions.	Vessel >500GT, All Vessels	Seafarers, Vessel Interests, Wellington Regional Council, CentrePort	(1) Misjudged speed or angle in cross wind approach. Misjudged approach plan and ship does not turn down wind due to wind pressure and tugs or thruster unable to control vessel. Low power - displacement to windage ratio, downwind approach too fast. Blackout on ship at critical time, wind loading on ships hull too high for bollard pull of available tugs to check momentum. Tugs incapable of regaining control. Tug operational failure or towline breakage. Not using anchor/s. (2) In a stern board, pilot misjudges due to steep angle of approach, with stern tug unable to lift off, engine fails to fire ahead and lack of clear visibility aft, and no closing information from lines crews, vessel makes heavy contact with the vessel's quarter. (3) Disregards SOPs for berthing in restricted visibility. (4) misjudges roundup point or vessel refuses to put bow into the wind when berthing head to wind. (5)Container cranes not clear of berth. (6) Thruster failure when berthing with one tug. (7) Attempting to berth with only one tug (8) Pilot inexperience for ship type. (9) attempting to berth in adverse weather with minimum berthing clearances.	Minor damage to plating of hull and wharf fendering system.	Serious damage to hull plating and wharf. Wharf piles damaged and container cranes unable to be traversed past damage, berth out of action for considerable time with associated loss of port trade. Potential for breach of fuel line.	0	6	0	0	4	6	4	6	4.63	This applies to other vessels required to berth downwind or in adverse conditions. NZ car trade attracts lower quality PCC displaced from main world routes, thus they may be not so well equipped. Due to low BP of tugs there is no reserve capacity to provide for ship failures. Ships own bow thrust (where this unit is fitted) is not usually sufficient. An average sized PCC of 175m with a draft of 7m has a beam windage area of approx 4000m2. With a 28 knot beam wind the pressure due to a beam wind is 60 tonnes, at 40 knots it is 122 tonnes. PCCs are getting bigger with vessels now up to 200m loa, greatly increasing windage and wind forces over quoted examples. Most PCCs must berth starboard side to due to hull/ramp configuration with the result that downwind berthing for these vessel types becomes common. Downwind berthing may also be necessary for other ship types to fit with stevedores requirements (i.e. for container crane to fit over high box stack at HW) or siting of operational gangway on one side only. Ships are required to berth at least 30m from a tanker but berth clearances between other vessels may be 20m or less. If fuel pipeline (presently protected under the quay) along Aotea Quay is damaged, there is potential for a significant spill.

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19	67	Approaches, Entrance, Main Harbour, Lambton Harbour, Evans Bay	Fire/Explosion	Fire On Small Passenger Vessel	Fire on board a harbour ferry or passenger carrying charter vessel.	Passenger Vessel, All Vessels	Seafarers, Passengers, Vessel Interests, Wellington Regional Council	Engine room or galley fire through poor maintenance or operational failure (e.g. fractured fuel line sprays diesel mist or onto hot engine parts). Build up of combustible materials/spilled oil or fuel near ignition source. Lack of detection system in engine or other unmanned space. Electrical failure e.g. burnt wiring in any part of vessel. BBQ used on deck tips over with vessel motion. Gas build up in bilges through faulty LPG connections or storage of cylinder below decks.	Source of potential fire e.g. electrical fault in bridge wiring or fractured diesel line in engine room detected by crew at early stage, minor fire quickly controlled.	Fire in unmanned engine room not detected early on and space not serviced by CO2 or similar system. Wooden or composite hull vessel requires evacuation with potential for up to 100 persons in the water, potential for fatalities.	3	3	0	3	7	6	2	6	4.61	Several fires or incidents which could have led to fire have occurred on various small passenger vessels. To date these fires have either been averted or controlled with any evacuation of passengers safely carried out by emergency services vessels and craft in the immediate vicinity. Some passenger vessels are only required to carry Carley floats or lifejackets , rather than inflatable liferafts. Persons would have to enter the water and hold onto lifelines around the raft and await rescue which may be up to half and hour away. Fatalities are likely to occur through hypothermia and drowning. Harbour ferry capacity is set to increase in the near future on the harbour.
20	16	Approaches, Entrance, Main Harbour	Collision	Ferry and Leisure Craft Conflict	Ferry and leisure craft in developing collision situation.	RoRo Ferry, Small Vessel	Seafarers, Passengers, Vessel Interests, Wellington Regional Council, Leisure Interests, CentrePort	Lack of general maritime knowledge of leisure craft operator. Sea-sickness or fatigue impairs judgment of leisure craft operator. Leisure vessel impedes passage of ferry. Leisure craft loses situational awareness in poor visibility. Not using radar or radar set up incorrectly. Not plotting or taking relative bearings. Poor lookout and disregard of Collision Prevention Rules and relevant bylaws. Sub-optimal BRM environment on ferry and inability to rapidly provide manual control of the helm. Nav lights not shown or clearly discernable. Vessel and \or craft fail to detect each other in restricted visibility. Ferry speed inappropriate given impending situation. Third party interference with planned movements and multiple vessel convergence to leads causing last minute course alterations.	Close quarters situation but collision averted.	Leisure craft run down by larger vessel with potential for multiple fatalities. Ferry takes evasive action and grounds in shoal water causing hull damage.	0	0	0	6	7	2	0	6	4.56	Most leisure users are likely to be unaware of the recommended routes used by shipping transiting the harbour or they do not understand manoeuvring constraints of larger vessels. Many do not monitor Ch.14. This information could be useful to leisure users in assessing risk of collision with larger vessels but could also lead to faulty assumptions when vessels do not follow recommended tracks for whatever reason. Vessels not subject to pilotage, such as naval and smaller foreign fishing vessels may not have an awareness of the routing system in use or choose to deviate without informing Beacon Hill, presenting a heightened collision hazard for all harbour users.

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21	45	Main Harbour	Contact Berthing	Contact by tanker, ferry or cruise liner at Aotea Quay,	A vessel manoeuvring in the vicinity of a Tanker working cargo (discharging or backloading gas oi)l, or a vessel bunkering, contacts or interacts with the vessel alongside. This includes the same event involving a large cruise liner at Aotea Quay.	Vessel >500GT, All Vessels	Seafarers, Passengers, Vessel Interests, Wellington Regional Council, CentrePort	Vessel passing adjacent berth loses control in strong wind conditions. Tug BP not sufficient to regain control. Anchors not used. Misjudged approach line with track set too close to berthed vessel. Interaction effects. Distraction by large vessel or by bad weather environment. Sub optimal BRM environment. Poor berth planning or movement timing. Ship or tug has malfunction at critical time (manoeuvring equipment). Tug line parts at load lifting off. Ferry overruns approach to RFT and strikes berthed vessel. Miscalculation in berthing marks provided.	Close quarters situation but control regained and safe passing achieved.	Surge from manoeuvring vessel causes ranging of other vessel, with potential to part a discharge (if a tanker) or bunkering hose. Potential for a gangway alongside to move off edge of quay. Potential for major injuries or even a fatality. Alternatively a contact event with ship's side causes the same effects. Loss of hull integrity possible. Ship or tug crew injured by tug line if this parts.	0	0	0	3	6	6	6	7	4.52	Ships are required to berth at least 30m from a tanker but berth clearance for other vessels may be 20m or less. Cruise vessels may be up to 280m loa and >32m beam so are big structures in their own right. Although this hazard describes contact with a cruise liner or tanker it also applies to any large vessel berthing at TCW or AQ between vessels or adjacent to another ship. Wash from ferries departing RFT 1 has been reported as a cause of cement carriers ranging alongside while discharging cargo with potential for parting of dischage hoses.
22	52	Evans Bay	Mooring Breakout	Mooring Breakout, Laid up Fishing Vessel	Laid up fishing vessel parts mooring lines in heavy northerly gale.	Fishing Vessels	Fishing Interests, Wellington Regional Council.	Poor condition of moorings. Not regularly checked for chafing/tampering.	Poor condition of moorings noticed by member of the public or harbour ranger and caused to be made good by vessel's caretaker or Centreport staff. Alternatively, boat noticed drifting and recovered.	Vessel parts moorings in heavy northerly gale and grounds with punctured shell plating and possible loss of bunkers to sea. Swamped hull becomes liability. Difficult recovery operation in inclement conditions; real risk of serious injury to harbour personnel.	0	6	0	0	6	3	3	6	4.51	Some laid up FV owners are absentee and vessels appear to be effectively abandoned. A caretaker is normally available but often uncontactable. Major oil spill i.e. gas oil in strong northerly may close airport - although laid up vessels are usually bunker-free.
23	53	Lambton Harbour	Mooring Breakout	Mooring breakout from no.3 side of a finger berth	Vessel or ferry breaks lines or is unable to berth at no.3 berth, due to strong offshore south-westerly or broad north-westerly wind.	Vessel >500GT, All Vessels	Seafarers, Vessel Interests, Wellington Regional Council, CentrePort	Vessel unable to hold position within berth with high wind gust loads broad on vessel's bow or quarter. Not enough mooring lines. Limited capacity in thruster. Mooring lines at too acute vertical angle. Not using bights. Lines too light for loads. Winches render or brakes do not hold.	Additional lines run, vessel lays off the berth, thrusters operated and vessel remains secure. Possibility of bollard failure. Tug called to assist hold on during turnaround.	Lines gradually all part before vessel can be controlled or anchors dropped. Bow or stern swings across basin at about 40° angle and contacts adjacent berth or moored vessel causing damage to either berth or both vessels. Possible fatality to personnel on wharf if bollard fails or from parting lines.	0	3	0	3	7	3	3	6	4.43	The No.3 side of a finger berth is difficult in a gale southwesterly or northwesterly, especially with gusty winds. The wind can be about 30 degrees off the berth.

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24	61	Main Harbour, Lambton Harbour	Swamping	Swamping / Capsize - Rowing Skiff or Dragon Boat	Rowing skiff or dragon boat swamped or capsizes in Lambton Harbour. Hazard relates to organised events and associated practice activities.	Rowing Skiff, All Vessels	Wellington Regional Council, Leisure Interests, CentrePort	Wind produces choppy seas in area used for training or wake from passing vessel / craft creates adverse sea condition. Passing vessels or craft exceeding speed limit for area or proximity to shore causes wash. Low freeboard, minimal stability / reserve buoyancy of laden skiff. Sheltered area of harbour not used. Poor judgement of capability of skiff and prevailing or developing conditions. Lack of safety boat / club officer to prevent rowers proceeding into unsuitable conditions or marshall skiffs into smooth water.	Water ingress occurs and craft is evacuated by safety craft.	More than one craft capsizes with persons in the water. Insufficient SAR capacity to recover all crews at once: potential for hypothermia and fatalities.	3	0	0	3	8	0	0	7	4.38	Skiffs generally use the sheltered area available in Lambton Harbour. Coaching boats are usually in attendance. These boats should be crewed by suitably experienced persons and carry Personal Flotation Devices for the number of rowers on the water. Coaching boats should also be of adequate design to embark persons safely or support those in the water. Sufficient coaching boats are required in attendance to provide for number of rowing skiff crew on the water at any one time.
25	2	Approaches, Entrance	Grounding	Foreign flagged FV	Foreign flagged fishing vessel of less than 500GT in grounding situation in the harbour approaches.	Fishing vessel, All Vessels	Seafarers, Fishing Interests, Wellington Regional Council,	Lack of local knowledge and vessel of less than 500GT not subject to pilotage. Attempting to enter port in poor or restricted visibility. Navigational error with lack of appropriate scaled information. Mistakes AtoN and the port approaches. Not communicating with harbour control. Communicating on Agents channel only in foreign language. Anchors not cleared away prior to approach to the port. Anchors until daylight but anchor does not hold. Failure to appreciate affect of wind and tidal stream . Lack of navigational support from a shore based VTS system. Propulsive or steering failure on lee shore. Reliance on autopilot. Not using a plotter or radar on appropriate scales. Not in receipt of or using port information. Small vessel interference with planned movement and multiple vessel convergence to leads.	Near grounding averted.	Vessel proceeds into Lyall Bay (or adjacent bays) through navigational error and trying to find main leads and grounds with water ingress and capsize, potential for fatalities and loss of bunkers to sea.	0	0	0	3	7	6	4	6	4.3	Foreign flagged fishing vessels have grounded or narrowly avoided grounding through navigational error in Owhiro Bay and Lyall Bay as well as other inner harbour areas. They may lack appropriate charts and the ability to communicate effectively in English with other vessels or signal station. Part 90 does not provide for pilotage for such vessels despite these vessels not being able to communicate with other port users.

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26	78	Main Harbour	Contact Berthing	Tanker Contact Berthing - Seaview Wharf	Tanker in contact berthing situation at Seaview Wharf	Tanker, All Vessels	Seafarers, Vessel Interests, Wellington Regional Council, CentrePort	Wind limiting criteria exceeded for manoeuvre including berthing downwind in adverse wind. Lack of shore based reference marks for PIlot to judge approach angle and hull speed. Inexperienced pilot misjudges stopping distance required or maneouvring characteristics of vessel. Blackout on tanker combined with tug operational failure, line failure or insufficient bollard pull for wind load. Pilot or tug master error including communications failure between pilot and tug master. Poor exchange of information between pilot and master or key bridge personnel (including poor level of spoken English ability in foreign crew) giving a sub-optimal BRM environment. Pilot , missed engine start when required. Late connection of tugs or tugs not connected at optimum position. Anchors not prepared for use or used incorrectly. Lack of accurate closing information from lines crew.	Berthing contact with minor damageto hull plating but some repar required to wharf fendering or structure.	Severe damage to tanker hull and wharf structure in heavy contact. Hull damaged and product spilt - (possibility of ignition). Mooring rope subsequently parts with mooring crew in vicinity. Tanker delayed for repairs to frames and plating. Port and region affected by delay to tanker operations while survey and repairs to berth completed.	0	3	0	0	4	7	6	6	4.3	Pilots report that Seaview wharf lacks shore based reference marks making it difficult to estimate approach rates, particularly by night. Seaview is also particularly exposed during strong southerly winds. Working conditions are made more difficult for tugs by the rougher seas likely to be encountered in comparison to other tanker berths where fetch is more limited.
27	9	Approaches, Entrance	Grounding	Charter Vessel Grounding	Charter fishing vessel in grounding situation eg. Chaffers Passage.	Small Vessel, All Vessels	Seafarers, Fishing Interests, Wellington Regional Council, Leisure Interests	Lack of sufficient local knowledge. Vessel operated by non-certificated launch master. Mechanical or steering failure. Loss of situations awareness in restricted visibility, in heavy rain or by night. Navigational support unavailable from Beacon Hill. Not monitoring radio VHF Ch.14. Inattention to course keeping. Reliance on autopilot. Rock-hopping rather than staying in clear water. Radar not being used or set up incorrectly. Not using sounder or nav aids such as plotter. Misuse of alcohol or drugs. Watching TV.	Vessel suffers glancing grounding on Chaffers Rock, West Ledge or Barrett Reef, pumps cope with water ingress.	Vessel inbound in deteriorating southerly conditions runs over submerged rock and floods engine room. Vessel drifts into area of breaking seas with capsize and persons in the water, potential for multiple fatalities.	3	3	0	0	7	4	2	6	4.3	Vessels without a valid survey certificate or qualified skipper are reportedly offered for charter in the Wellington area. There are no AtoN for vessels using Chaffers Passage.

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28	49	Main Harbour, Lambton Harbour	Contact Berthing	Small Harbour Ferry in Contact Berthing	Harbour ferry in contact berthing situation at any berth.	Passenger Vessel, All Vessels	Seafarers, Passengers, Vessel Interests, Wellington Regional Council	Adverse weather, mechanical malfunction at critical time. Rate of approach to berth is too fast. Skipper tired or fatigued or stressed by bad weather and task in hand. Attention distracted by bad weather. Sunglare affects vision.	Heavy landing but no damage	Ferry in heavy contact with wharf resulting in significant damage to hull and injuries to passengers and crew. Ferry out of service until repairs made.	0	6	0	0	6	3	0	6	4.29	Injuries to passengers through berthing contact have occurred within the past 15 years and damage has occurred to a ferry hull more recently, resulting in loss of service for several days (hull puncture above the water line). Expansion of the ferry service is planned with another vessel expected to commence a service in 2005, potentially doubling the number of passengers carried. At Queens Wharf the ferry berths at a wharf with a low deck. Passengers waiting on this deck may be involved in a heavy contact if the ferry mounts the wharf, particularly at high water.
29	48	Main Harbour	Contact Berthing	Contact with Container Crane On Departure.	Vessel at container berth in contact berthing with container cranes during departure.	Vessel >500GT, All Vessels	Seafarers, Vessel Interests, Wellington Regional Council, CentrePort	Cranes not amidships or clear of the berth. Strong onshore winds coupled with tug low bollard pull and high airdraft or deep draft and low UKC prevents tugs lifting off in unison. With a strong wind off the wharf on bow or quarter the ship comes off the berth at an angle during singling up and touches crane leg. Tugs not positioned to hold vessel on during singling up in offshore wind scenario. Crew singling up before Pilot is on board and tugs are in position to assist. Winch failure at one end during singling up or letting go in strong off shore winds and ships cants one end onto wharf with tugs incapable of regaining control. Tug operational failure or towline breakage during departure. Pilot or Master not obtaining permission from Marine Manager to sail with cranes over vessel. Pressure from Stevedores or Agent to move vessel regardless of safety issues Sub-optimal BRM environment. Tug let go too early and one end drops back onto wharf. Only one tug available or sailing with only one tug and thruster and then thruster fails.	Cranes missed but minor damage to plating of hull and wharf fendering system.	Crane/s toppled. Serious damage to hull plating and wharf. Potential for fatality to personnel on ship under crane or linesmen. Remaining container cranes unable to be traversed passed damage, berth out of action for considerable time.	0	3	0	0	6	7	2	7	4.24	Sometimes cranes cannot be long travelled due to wind exceeding limits and a vessel may need to be sailed. A conventional or other ship may be berthed adjacent and there is stevedore opposition to stopping that vessel to temporarily move cranes. Normal procedure allows a vessel to sail with the permission of the Marine Manager providing the cranes are amidships (at a position of least risk). Marine Manager will look at risk factors involved before providing permission. Cranes positioned at either end of the vessel are high risk.

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30	60	Entrance, Main Harbour	Swamping	Wash Swamping & Capsizes Leisure Craft	Recreational fishing craft swamped or capsized by wash of passing large vessel.	Leisure Craft, All Vessels	Vessel Interests, Fishing Interests, Wellington Regional Council, Leisure Interests, CentrePort	Insufficient time on sighting vessel for fishers to recover anchor and bring craft onto safer heading to negotiate wash. Fishers not complying with Collision Rules/bylaws, nor aware of tracks used by larger vessels. Poor lookout by fisher and unaware of larger vessels approach. Lack of local knowledge including tracks used by shipping. Larger vessel sets course to pass too close to fisher.	Recreational fishing craft rolls heavily, potential for occupants to fall overboard.	Small older fibreglass or aluminium craft swamped in wash. Insufficient reserve buoyancy and craft sinks or capsizes, persons in water with potential for fatalities.	6	0	0	0	6	2	0	6	4.22	Kau Pt to Falcon Shoal is an area commonly used by anchored recreational fishers, however they may be found anywhere in fine weather. The outbound track for shallow draft vessels (
31	22	Main Harbour	Collision	Ferry / Large Vessel and Small FV Conflict	Outbound ferry or other large vessel in developing collision situation with inbound fishing vessel on rounding Kau Point or other headland.	RoRo Ferry, Fishing vessel	Seafarers, Vessel Interests, Fishing Interests, Wellington Regional Council, CentrePort	Either vessel navigating off appropriate track while transiting harbour. Beacon Hill unable to monitor all harbour areas and pass positive movement information to vessels. Misjudgement of CPA by either vessel, lack of systematic plotting. Lack of, late or misunderstood communication by VHF between vessels to resolve any conflict situation. Sub-optimal BRM environment on ferry. Speed inappropriate given the traffic in proximity. Smaller target not seen in reduced visibility, at night or in reflected glare. Smaller vessel not showing any nav light or nav lights not clearly discernable due to working lights being too intense. Last minute course alteration to avoid a third party compounds situation.	Close quarters situation but collision averted.	Fishing vessel run down and capsized, persons in the water with potential for fatality of fishing vessel crew. Small loss of marine diesel to sea.	0	0	0	3	7	6	2	6	4.17	Applies to other large vessels as well. No monitoring of harbour outside visual and radar range of Beacon Hill. Smaller vessels commonly navigate between the outbound track and shore to save passage time and avoid outbound traffic. Outbound vessels are reported to navigate inside the recommended track to save passage time especially when crossing Falcon Shoal or occasionally to avoid anchored vessels off Kau Bay. In fine weather small vessels also fish at night.
32	57	Approaches, Entrance	Foundering	Fishing Vessel Foundering	Fishing vessel founders at harbour entrance in adverse southerly conditions.	Fishing vessel, All Vessels	Seafarers, Fishing Interests, Wellington Regional Council, CentrePort	Inadequate stability or freeboard for prevailing conditions including free surface effect of water ingress, ice or cargo shift. Vessel overladen. Steering or propulsive failure results in inability to maintain safe heading. Hull structural integrity inadequate for stress imposed by sea state. Vessel not monitoring Ch.14 or responding to calls from Beacon Hill. Inattention, possibly due to fatigue, to course keeping and handling vessel in following sea condition. Inexperienced person on the helm or reliance on autopilot.	Fishing vessel suffers water ingress through unsecured hatch. Vessel makes the harbour with residual stability.	Foundering at the entrance results in loss of vessel. Multiple fatalities possible. Diesel spill.	3	0	0	0	7	6	2	6	4.17	Fishing vessels often catch large catches especially in hoki season and catch may be fluid. Hazard also applies to other weather conditions but there is higher risk in southerly conditions.

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33	23	Main Harbour	Collision	Harbour Ferry in Conflict with Larger Vessel	Harbour ferry in developing collision situation with another larger ferry or other larger vessel transiting harbour.	Passenger Vessel, RoRo Ferry	Seafarers, Passengers, Vessel Interests, Wellington Regional Council, CentrePort	Poor lookout on either vessel. Misjudgement of CPA by either vessel, lack of systematic plotting. Loss of situational awareness in restricted visibility. Propulsive failure on harbour ferry while crossing track of other vessel. Lack of, late or misunderstood communication by VHF between vessels to arrange passing/crossing or resolution of conflict situation. Larger vessel navigating off usual track. Harbour ferry increasing risk by attempting to or by passing too close. Late interference by other vessels in planned manoeuvres.	Close quarters situation but collision averted.	Harbour ferry run down by ferry or other larger vessel, sustaining severe damage. Potential for multiple fatalities and small diesel spill.	0	0	0	3	7	4	2	7	4.14	The harbour ferry crosses the inward and outward tracks and may have up to approximately 90 passengers per trip. An additional larger ferry is planned for the harbour service which will at least double passenger capacity. Historically the ferry safety record is good with few close quarters situations with larger vessels reported.
34	34	Lambton Harbour	Collision	Rowing skiff and larger vessel in conflict.	Rowing skiff in potential collision situation with power driven vessel in Lambton Harbour	Rowing Skiff, All Vessels	Seafarers	Poor lookout on craft or vessel (Skiff rowers without Cox and facing backwards). Bow-up trim of power driven craft obscures rowing skiff or other low-profile craft from view. Lack of general boating knowledge or experience. Consumption of alcohol impairs judgment of leisure craft operator. Inattention to skipper's responsibilities. Small vessel not seen in glare off water. Not show lights as required by Collision Rules at night.	Close quarters situation but collision averted. Water taken onboard skiff is bailed out. Harbourmaster receives complaint.	Rowing skiff and large leisure craft driven at high speed in collision. Potential for capsize of skiff and fatality.	0	0	0	3	7	3	0	7	4.09	Organized rowing events including dragon-boat racing are generally well managed by the harbour authority and organisers and conflicts with commercial shipping are not likely. Rowing clubs are safety conscious and generally have a safety boat in attendance with rowers, although individuals may exercise without safety craft support. Rowers also practice in the northern area of the harbour, however few conflict situations are reported in this area which generally has a lower level of leisure activity (although a water-ski club is active in the same general area). Activity occurs at anytime between dawn and dusk and sometimes at night.

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35	69	Main Harbour, Evans Bay	Fire/Explosion	Fire -Tanker operations	Fire on tanker alongside or at anchor.	Tanker, All Vessels	Seafarers	Vapour cloud formation on tanker or wharf deck through hold or hose string/manifold leak, or during product sampling. Source of ignition provided by personnel not following SOP's i.e. use of non-intrsinically safe electrical equipment, smoking out of designated areas or inappropriate clothing/footwear provides static build up. Inadequate precautions to prevent build-up of static electricity during discharge operations. Emergency shut-down delayed when required through poor state of equipment or lack of training/ procedural awareness of involved personnel. Shipboard fire i.e. accommodation, engine room, pump room, not immediately detected and contained.	Minor spill without source of ignition, fire averted.	Fire on tanker not immediately contained or extinguished. Limited fire-fighting response from terminal, delay in arrival of Fire Service appliances sufficient for fire to take control. Tug not immediately available to assist fire fighting and move tanker from wharf. Explosion with multiple fatalities and possible source of fire to bush / residences in vicinity of terminal. Tanker sunk at wharf and loss of port trade.	0	0	2	4	5	5	5	5	4.08	Tug response to provide fire fighting assistance or to tow tanker from berth may be up to 1 1/4 hrs away from Seaview Wharf, probably 30-45 minutes from other tanker berths. Limited fire fighting capability is provided at terminals with reliance on local fire brigades to assist, if available without delay. Wharf structures are not protected with foam or water systems and may suffer loss of structural integrity in a major fire, reducing accessibility of fire appliances and personnel to the scene.

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36	65	Approaches, Entrance	Personal Injury	Personal Injury, Pilot Operations	Personal injury to pilot during transfer at one of the boarding grounds.	Pilot Boat, All Vessels	Seafarers	Ladder incorrectly rigged. Misjudged approach or loss of situational awareness in poor visibility/night or weather/sea conditions, aided by radar or floodlighting failure. L/Master does not appreciate effects of cross swell or wake/wash from own approach or passing vessel and comes off vessel. Inexperienced L/Master. Best lee not made or speed inappropriate for conditions and ship does not achieve the requested heading (through getting into irons or misjudgement of helm and engine speed required to affect turn) or alters speed/course substantially during the launches approach. Steering or propulsive failure on launch. Sea-sickness or fatigue impairs judgment of launchmaster. L/Master misjudges effects of interaction between vessels causing heavy landing which knocks pilot off his feet. Pilot misjudges timing of transfer to/from launch in adverse sea conditions. Pilot not secured during transfer to foredeck or the tether parts. Pilot disconnects too early and does not maintain a handgrip when on foredeck. Pilot launch comes away from ships side through adverse sea conditions or launch master misjudgement. Pilot ladder parts through becoming caught under launch belting during rise and fall of launch (ladder may be in poor condition).	Pilot misjudges transfer from launch to or from ladder resulting in minor injury (strain/sprain). Pilot trips and falls overboard or is knocked off his feet and falls overboard.	Pilot falls into water or back onto launch during transfer operation with potential for severe injury (unconsciousness, back injury, crushing, laceration and fractures) or fatality.	6	0	0	0	6	0	0	4	3.98	Pilots are required to conform to STCW-95 medical requirements for seafarers. Historically Wellington pilots safety record has been good. Lighter displacement pilot launches are in use which provide a less stable platform than those previously in service but techniques are used to pin launch alongside during transfers. Pilots are trained to adopt best lee during transfers and personally arrange this rather than leave it to other party. Pilots wear LSA at all times in transfer. Hazard may also apply to official passengers such as MAF personnel boarding special ships - transfer is always on basis of prior safety briefing and utmost safety but risk still applies.

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37	64	Approaches, Entrance	Personal Injury	Personal Injury, Pilot Operations, Approaches	Personal injury to launch crew during pilot transfer.	Pilot Boat, All Vessels	Seafarers	Misjudgement in approach or loss of spatial awareness in poor visibility/night or weather/sea conditions, aided by radar or floodlighting failure. L/master does not appreciate effects of cross swell or wake/wash from own approach or passing vessel. vessel. Inexperienced L/Master. Best lee not made or speed inappropriate for conditions. Ship does not achieve the requested heading or alters speed/course substantially during approach. Steering or propulsive failure on launch at critical time. Sea-sickness or fatigue impairs judgment of launchmaster. L/master misjudges approach to the vessel and misjudges interaction effects between vessels causing heavy landing which knocks crew person off his feet. Crew person not secured during transfer to foredeck from cabin. Proceeds to the foredeck too early and sea comes aboard washing crewperson off his feet. Disconnects safety tether too early and does not maintain a handgrip when on foredeck. Tether parts. Launch comes away from ships side through adverse sea conditions or misjudgement.	Crew person misjudges timing to proceed to foredeck and is knocked off his feet resulting in minor injury (strain/sprain). Having disconnected from tether, trips and falls or is knocked off his feet but is retained onboard.	Crew person falls into water or is washed against accommodation during transfer operation with potential for severe injury (unconsciousness, back injury, crushing, laceration and fractures) or fatality. Launchmaster unable to manoeuvre launch for a pickup with only one person on board.	6	0	0	0	6	0	0	4	3.98	Historically safety record has been good. Lighter displacement pilot launches are in use which provide a less stable platform than those previously in service but techniques are used to pin launch alongside during transfers. Launch crews are trained to adopt best lee during transfers and be responsible for safety. All launch staff wear LSA during transfers.

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38	41	Main Harbour	Contact Navigation	Contact with vessels at anchor, Harbour	A vessel makes contact with a vessel either at the explosives anchorage or in the inner anchorage.	Vessel >500GT, All Vessels	Seafarers	Poor lookout. Inattention to track setting and course keeping. Setting a course too close to anchored vessel. Failure to appreciate effect of wind and leeway when passing. Loss of situational awareness in dark, fog or restricted visibility. Sub optimal BRM environment. Beacon Hill not monitoring inner harbour or had not given advice of anchored vessel. Vessel had anchored without informing Beacon Hill. Ship anchored lights not seen against city lights. Ship has dragged so was not in position given or expected. Fatigue, or consumption of drugs/alcohol impairs watchkeeping ability. Steering or mechanical failure. Poor visibility from wheelhouse (i.e. positioning of fishing equipment obscures line of sight). Not using radar or radar incorrectly set up. No remote monitoring. Vessel anchored to obstruct approach to Lambton Harbour or Aotea Quay by larger vessel, including a departure from these areas. Vessel anchored at charted Explosives anchorage obstructs vessel making out of normal approach to RFt or Aotea Quay. Sunglare distracts lookout.	Close quarters situation but safe passing achieved.	(1) Vessel in region of Health Anchorage struck by departing or arriving vessel causing damage to both vessels. Both vessels require considerable repair work (2) Vessel anchored at explosives anchorage contacted by ferry or vessel over-running 315° track at speed with severe damage to both vessel including loss of product, fire and explosion. Severe injuries to personnel.	0	0	0	2	6	7	4	6	3.96	Risk is comparatively low as not many vessels anchor but when they anchor either close in or when a tanker is at the explosives anchorage the risk as described is obvious, particularly with amount of large ferry traffic now using Lambton Harbour. Pilots comment on risk of a vessel over-running the 315° track.

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39	43	Evans Bay	Contact Berthing	Tanker Contact Berthing	Tanker in contact berthing at Burnham Wharf.	Tanker, All Vessels	Seafarers	Wind limiting criteria exceeded for manoeuvre. Berthing downwind when head to wind should have been chosen. Blackout on tanker combined with tug operational failure, line failure or insufficient bollard pull for wind load. Pilot or tug master error including communications failure between pilot and tug master. Poor exchange of information between pilot and master or key bridge personnel (including poor level of spoken English ability in foreign crew) giving a sub-optimal BRM environment. Pilot inexperienced for conditions and ship type and not following standard practice. Pilot underestimates vessel displacement when calculating stopping distances. Misjudged approach speed or angle, missed engine start when required. Late connection of tugs or tugs not connected at optimum position. Anchors not prepared for use or used incorrectly. Misjudged turning point or speed of approach. Pilot loses situational awareness on approach due to lack of shore based references Lack of accurate closing information from lines crew.	Contact with superficial damage to fendering and hull.	Severe damage to tanker hull and wharf structure in heavy contact. Hull damaged and product spilt. Possible parting of a mooring line in vicinity of berthing crew. Tanker delayed for repairs to frames and plating. Port and region affected by delay to tanker operations while survey and repairs to berth completed.	0	3	0	0	4	6	6	6	3.96	The quality of closing information given by line crews to pilots is reported to be of variable quality and non standard. Most, but not all tankers trading to Wellington are double hulled. A Safety Audit carried out on tanker berths in the port (1999) identified that fendering was least developed on Burnham wharf, requiring 'particular attention to approach angle and speed while mooring, in order to avoid structural damage to wharf or hull of tanker'. Special weather and other limiting parameters are established in CentrePorts pilotage procedures for tanker operations in Evans Bay.

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40	11	Evans Bay	Grounding	Tanker Grounding Harbour (Evans Bay)	Tanker with high freeboard in grounding situation in Evans Bay.	Tanker, All Vessels	Seafarers	Not following procedures. Manoeuvre exceeds wind limiting criteria. Blackout or mechanical failure on tanker combined with tug operational failure, line parting or insufficient bollard pull available for the wind load. Pilot or tug master error. Pilot inexperienced for conditions and ship type. Misjudged approach at night or in restricted visibility or shore based nav aids required for manoeuvre inoperative contributing to loss of situational awareness. Anchors not prepared for use or used incorrectly. Misjudged (late) turning point and vessel drifts to leeward during turn in a northerly and lands on end of Miramar wharf. Other craft interfere with planned movement at last minute.	Grounding by stern in soft bottom by Shoal Pile light, vessel relocated by tugs and continues manoeuvre to berth with no significant damage.	(1) Forward tug failure in rising Northerly winds, tanker drifts to head of bay to ground by stern on rocky shore before anchors hold with fractured shell plating and damage to stern gear, loss of shaft lubricating oil. Potential for loss of bunkers/hull failure if tanker ground (2) Vessel takes a sheer to starboard in strong NWly conditions and vessel runs onto western shore or shoal before control is regained with resultant effects as described above.	0	0	0	3	2	6	6	6	3.84	There is no wind measuring instrumentation giving real-time wind speeds at Burnham Wharf and make it possible to accurately measure increase of wind speed while the vessel in is transit from AQ or Seaview to Evans Bay. Pilots use wind speed measured at Beacon Hill, the ships own anemometer (if in working order) and local knowledge of wind acceleration in the bay to judge when wind speed is likely to exceed set operating criteria. Operation of the sector light should be confirmed before entering the bay if the light is required as a reference for the intended swinging direction. Tug masters also report that it is not uncommon for ships crews to have difficulty passing a heaving line or securing the towline onboard in an efficient manner due to the wind, thus delaying effective use of the tug. Major oil spill in strong N conditions may close airport with product on runway from wind blown spray. Resultant could also be a contact at Miramar. Possibility of affecting operations at the airport.
41	14	Main Harbour	Grounding	Container Ship in Grounding Situation, Main Harbor	Container ship or other vessel in grounding situation through dragging anchor.	All Vessels, All Vessels	Seafarers	Vessel fails to monitor position at anchor or shift in wind direction or deteriorating conditions. Not plotting position and engines not on short notice and readily available. No inner harbour position monitoring by Beacon Hill due to lack of radar coverage and thus unable to alert vessel and Duty Pilot. Vessel anchored in inappropriate position given forecast or not anchored with enough cable. Vessel not anchored correctly with anchor cable laid out in proper manner. Vessel with two cables out not monitoring weather conditions, fouled hawse in wind change.	Vessel dragging anchor reported by other vessels or member of the public overlooking harbour, grounding averted.	Drag is undetected and container ship grounds beam on to Oriental Bay shoreline in strong northerly gale or drifts up Evans Bay or onto the Kaiwarra shoreline in a southerly. Potential for puncture of double bottom and bunker spill. Vessel remains aground for up to one and a half hours as tug crews are summoned. Ship may not be able to dragged free. Damage to propeller/rudder, dry dock repair required and requires tow overseas.	0	0	0	3	2	6	6	6	3.84	Applies to a vessel anchored at any position within the harbour. The scenario has occurred in the Harbour. Radar coverage by Beacon Hill of anchorages and inner harbour could provide for monitoring of anchored vessels and provide early warning of vessels dragging anchor. Existing low BP tugs may not be able to pull a larger vessel into deeper water until abatement in weather or wind shift. Other shipping movements may be delayed while tugs are involved with refloating the grounded vessel. There is no docking or repair facility in the port for rudder/propeller damage and local tugs lack bollard pull and range to tow a large vessel to nearest drydock (possibly Australia). Vessels with two anchors out have been caught with a wind change and suffered fouled cables, remaining cast until tugs are available to assist.

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42	24	Approaches, Entrance, Main Harbour, Lambton Harbour	Collision	Large Vessel or Ferry and Naval Vessel in Conflict	Ferry or other larger vessel in developing collision situation with naval vessel (especially on rounding Kau Point).	RoRo Ferry, All Vessels	Seafarers	Either vessel navigating off appropriate track while transiting harbour without informing Beacon Hill. Beacon Hill not passing on such information. Naval vessels are not subject to pilotage. Beacon Hill unable to monitor all harbour areas and pass positive movement information to vessels. Misunderstood intentions by both vessel. Not plotting other vessel to determine if close quarters situation is pending. Sub-optimal BRM environment. Naval vessel not monitoring Ch.14. Failure to make 10 minute call to Beacon Hill prior to departure. Poor or late communications VHF to resolve situation. Speed inappropriate given a conflict situation may arise. Reduced visibility.	Close quarters situation but collision averted.	Collision between ferry and naval vessel. Naval vessel's shell plating punctured and water ingress. Possible loss of stability and potential for capsize with military personnel in water. Loss of bunkers to sea (kerosene or gasoil).	0	0	0	3	5	5	3	6	3.77	Naval vessels are not subject to pilotage and may be transiting the harbour or exercising in areas where other shipping normally navigate. Most foreign navy ships however always request a pilot but are not obligated to do so unless using two tugs for berthing in which case a pilot may board in the inner harbour only. Communications difficulties may arise with vessels of foreign navies where vessels seek to communicate through VHF with either Beacon Hill or another vessel.
43	3	Approaches, Entrance, Main Harbour	Grounding	Small Fishing Vessel Grounding, Approaches	Inshore fishing vessel in grounding situation in harbour approaches (including Island Bay and Chaffers Passage)	Fishing vessel, All Vessels	Seafarers	Failure to monitor position and appreciate effect of wind and tidal stream, navigational error. Fatigue impairs watchkeeping ability. Inattention to track keeping. Reliance on autopilot. Not monitoring port operating VHF channels. Propulsive, steering, electrical or instrumentation failure. Using Chaffers Passage without local knowledge. Not using nav aids such as chart plotter or radar on appropriate scales. Making entrance in restricted visibility. Mistakes AtoN.	Fishing vessel in glancing grounding on submerged rock in entrance to Island Bay or in Chaffers Passage. Bilge pumps cope with water ingress, vessel makes mooring safely and temporary repairs effected.	Fishing vessel attempting to enter Island Bay or Chaffers Passage by night grounds heavily on submerged rock with rapid water ingress leading to capsize. Persons in the water with potential for fatalities and small diesel spill to sea.	3	0	0	0	6	4	2	6	3.74	Small commercial vessel groundings could also be considered within this hazard. There are relatively few small commercial vessels operating out of Wellington and most are local vessels with good knowledge of the harbour and approaches. Non-local vessels may use Wellington for shelter or visit during Hoki season. Fishing charter vessels also operate around the South Coast. Small vessels use Chaffers Passage. Leisure craft and charter vessel activity may increase around and in Island Bay with the sinking of HMNZS Wellington as a dive attraction, AtoN in this area may need to be reviewed.
44	33	Lambton Harbour	Collision	Small Commercial Vessel /Ferry in Conflict	Small commercial, fishing or passenger vessel in collision situation with ferry or other large vessel sailing or approaching the berth.	Small Vessel, Vessel >500GT	Seafarers	Poor lookout by small commercial vessel. Incomplete or late traffic reporting procedure followed by vessel intending to sail or upon sailing. Beacon Hill unable to provide positive traffic information through inability to monitor all harbour areas. Larger vessel not monitoring radar or distracted through arrival or departure process. Sub-optimal BRM on larger vessel. Not show lights as required by Collision Rules at night.	Close quarters situation but collision averted.	Harbour ferry runs into side of berthing ferry by night in adverse weather. Both forepeaks holed and flooded. Potential for multiple serious injury or fatalities to passengers and crew.	0	0	0	3	6	4	2	6	3.74	Some staff at Beacon Hill are reported to provide a less detailed traffic report to small commercial vessels (in some cases this may be because the vessel operator has indicated to Beacon Hill that they do not require a traffic report), indicating a need for consistent operating procedures to be applied. Conflict may also occur between smaller commercial vessels though inadequate information flow between relevant parties. Worst credible event was narrowly averted in the last 10 years.

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45	58	Approaches, Entrance	Foundering	Pilot Vessel Foundering	Pilot vessel in potential capsize situation in heavy seas at the harbour entrance.	Pilot Boat, All Vessels	Seafarers	Pilot vessel exceeding operational envelope. Pilot vessel required to attempt transfer of pilot from beyond harbour entrance in unsuitable conditions. Pilot vessel required to lead other vessel in from outside the harbour entrance during adverse sea conditions. Fatigue or inexperience of launchmaster impairs judgement or operational ability. Inattention to course keeping. Using autopilot in inappropriate conditions. Division of command of pilot launch between pilot and launchmaster. Misjudged assessment of sea conditions by pilot and/or launchmaster (particularly at night). Propulsive or steering failure, launch unable to maintain safe heading. Loss of inflatable pontoon from RHIB hull (structural failure). Deflation of compartment (s) through heavy landing on ship's hull during transfer reduces stability of launch for inward transit.	Launch broaches in heavy following sea but is recovered by actions of launchmaster.	Launch is broached in heavy following sea and subsequently capsized by successive seas with persons in water and potential for fatalities. Vessel may end for end and breakup.	3	0	0	0	6	6	0	6	3.68	Equally applies to all small vessels required to transit entrance in very marginal conditions i.e. Police and Coastguard. Standard safe practice regarding the leading in of vessels provides for the launch to stay to the north of the extreme sea conditions to offer a lead in to a vessel. The pilot vessels in use are designed for offshore work, are well found and twin engined with experienced crews. The safety record is historically good and a training programme in place for replacement crews. The entrance section of the channel is notoriously bad for steep sea condition when outgoing tide is against southerly wind. Conditions moderate further out when clear of direct tide stream and when tide changes.
46	50	Main Harbour	Contact Berthing	Container vessel Heels Abruptly Alongside	Low freeboard container vessel gets caught under berth fenders as tide rises at TCW1. Vessel suddenly comes free, causing sudden rolling of vessel. List resulting if loading had continued on one side whilst vessel trapped. Damage to container crane/s likely.	Container Vessel, All Vessels	Seafarers	Not tending moorings or watching tide. Planners or Duty Pilot consider stevedores requirements only and do not consider freeboard and fender fouling aspects when choosing a berthed position. Ship is using an automatic heeling system without considering that main deck lip may be catching under fenders against tight moorings preventing the vessel coming back upright, pumping system continues to transfer ballast until ballasted weights force vessel to come quickly clear. (2) Low initial GM and takes excessive heel during cargo operations. Poor cargo planning on ship or shoreside. Incorrect shipboard action taken to correct angle of loll.	Crane and container is clear of ship and is not caught. Gangway at risk of dropping into the water.	(1) Crane is just being positioned in the slot on inboard or outboard side with a 40' box on the spreader. Relative motion of the vessel compared to the slung box in the abrupt heel causes box to swing relative to the slot and crushes hatchman with potential of a fatality. (2) Lifting box from bottom of an outboard slot when change of heel takes place, box is caught and lifting wire parts. Falling components seriously injure stevedores working on deck below. Potential to pull crane over. (3) During change in heel unlashed boxes fall overside and ship touches crane.	3	0	0	0	6	6	0	6	3.68	A relatively rare event but has happened recently. The potential is real when using a small laden container vessel berthed on the horizontal rubber fenders at TCW 1. It can only happen at this berth as TCW2 is fendered with wooden vertical fendering. TCW1 was built for Generation 1 container ships and bigger and not small low freeboard vessels. Modern ships are fitted with an auto heel system designed to keep ship within certain heel tolerances during cargo work and complacency in their reliability and use may cause ship's crews not to consider the aspect of the ship being temporarily fouled on a shore side obstruction. Consequences of a worst case situation have high commercial risk to the port. More rapid cargo operations possible with higher-rate cranes planned for port reduces time available for cargo planners to take action to keep vesel within stability limits.

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47	77	Approaches, Entrance, Main Harbour, Lambton Harbour, Evans Bay	Collision	Leisure Craft and Small Commercial Vessel Conflict	Leisure craft and small commercial vessel in developing collision situation in any harbour area.	Leisure Craft, Small Commercial	Seafarers	Poor lookout by either vessel or craft. Not using radar or craft poor radar target with no efficient radar reflector. Vessel and craft not visible to each other in rain or reduced visibility or flying spray. Vessel / craft navigating at speed inappropriate for the conditions including proximity to shore, point or headland or in area of relatively high traffic density. Nav lights not shown by craft / vessel or difficult to detect against shore lights or backscatter from own lights. Lack of maritime knowledge or experience of craft operator. Craft operating around commercial wharf area. Maneouvring sound signal not used by vessel approaching or departing berth. Drugs, alcohol or fatigue affect judgement and ability of craft or vessel operator. Commercial vessel not follwing recommended route for transiting harbour.	Close quarters situation but collision averted.	Lightly constructed harbour passenger vessel (ferry or charter) in collision at speed with medium sized launch or yacht. Potential for injuries on impact and craft sinks with persons in the water and fatalities.	0	0	0	0	8	6	3	7	3.66	'Small Commercial Vessel' includes various passenger type, local and visiting survey, tug, cable protection and miscellaneous vessels as well as harbour craft ie. harbour tugs and pilot vesels. Collisions have ocurred in the past between small commercial vessels and leisure craft in the harbour within the past 10 years, to date without fatality or serious injury. Proability of the Worst Credible outcome is likely to be highest during special events where there is a high density of leisure craft and commercial spectator vessels operating on the harbour, particularly during night events. Navigation lights from vessels or craft of any size may be particularly difficult to detect from a vessel/craft approaching from the eastern harbour areas, against the background shore lights. The harbour ferry routinely transits this route by night, where proper use of radar is critical in the early detection of leisure craft. Small commercial vessels may also be encountered by leisure craft at pinch points such as Kau Point if the larger vessel is not following the recommended route.

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48	6	Approaches, Entrance	Grounding	Tug and tow grounding, Entrance	Tug under 500GT with large tow and no local assistance grounds tow during transit (inwards or outwards).	Tug & Tow, All Vessels	Seafarers	Lack of local knowledge and pilotage support. Towing vessel of less than 500GT not subject to pilotage (regardless of tow size or combined size of tow). Attempting to enter or leave in adverse weather or restricted visibility. While attempting to keep clear of ferry traffic misjudges limits of safe water. Navigational error from not using appropriately scaled information. Mistakes AtoN and the port approaches. Not communicating with harbour control. Not monitoring Ch.14. Unable to control tow in following wind, seas or swell. Tow too long and short tow parts. Tow not manned and unable to use anchors. Local tugs unable to connect up. Remains in the offing to wait favourable conditions but is set ashore. Failure to appreciate affect of wind and tidal stream. Lack of navigational support from a shore based VTS system. Propulsive or steering failure on lee shore. Reliance on autopilot. Not using a plotter or radar on appropriate scales. Not in receipt of or using port navigational information. Pressure to complete task (from tow contract). Interference by third party and convergence by other vessels on leads.	Near grounding averted.	Tow yaws, catches wind beam on or on quarter, line parts during tug efforts to regain control and drives ashore. Tug fouls propeller in urgency to pick up emergency towline and is unable to assist further. Minor pollution from towed vessel's ruptured tanks.	2	0	0	0	6	4	4	6	3.53	Pilotage requirements for described units are not covered by Part 90 and Bylaws do not cover a situation to encompass total size of tug and tow (but ref to Marlborough Bylaws which also considers the towed vessel's GT) in assessing pilotage needs. Tug may only be 250GT and therefore exempt but may be towing a large unit i.e. a ship with a tow length of up to 300m. Small vessel skippers are not subject to any requirement to obtain or use locally derived port information but they may be in charge of a very large unit.

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49	26	Approaches, Entrance, Main Harbour, Evans Bay	Collision	Leisure Craft and Vessel in Conflict	Leisure craft and large ship in developing collision situation (over 500GT).	Leisure Craft, All Vessels	Seafarers	Launch fails to detect approaching large ship by night against background shore lights. Smaller craft not showing nav lights or working lights obscure nav lights. Poor lookout on craft or vessel and neither vessel monitoring radar. Radar incorrectly set up or not being monitored. Launch is a poor radar target. Either vessel/craft fails to detect other in restricted visibility. Launch not monitoring VHF Ch.14. Laden vessel has an extensive obscured area ahead caused by deck cargo or cranes. Inadequate pilot/master/bridge team exchange and sub-optimal BRM environment exists. Insufficient trained personnel on vessels bridge for harbour transit, continuity of watch broken in order to take manual control of helm. Leisure craft impedes passage of larger vessel by disregard of 500GT rule. Leisure craft lacks appreciation of manoeuvring area required by larger vessel and lacks appreciation of harbour tracks and limitations caused by deep draught. Either vessel not monitoring position of other. Convergence of small craft around a course alteration point.	Close quarters situation but collision averted,	Launch run down by ship with potential for fatality. Ship runs aground correcting from taking last minute evasive action	0	0	0	0	8	3	3	7	3.51	Leisure users are presently unlikely to be aware of recommended tracks used by shipping unless they belong to a harbour boating or yacht club (track information has been sent to all local clubs).
50	31	Approaches, Entrance, Main Harbour, Lambton Harbour, Evans Bay	Collision	Leisure Craft in Conflict	Leisure craft in conflict in high leisure use area.	Leisure Craft, Leisure Craft	Seafarers	Poor lookout. Multi-use of area by variety of craft. By-law disregard including excessive speed in close proximity to other vessels, structures or the shore and operation of high speed craft by person under 15 years of age without supervision. Not showing lights as required by Collision Prevention Rules at night. Low powered nav lights obscured by background lighting. Consumption of alcohol or misuse of drugs. Lack of boating knowledge.	Close quarters situation but collision averted.	Two power driven craft in high speed collision with potential for serious injury on impact. Possible loss of one craft.	0	0	0	0	7	6	3	7	3.37	The mix of leisure craft includes water jet skis, steam driven pinnances, small pleasure launches, row boats and small power craft. Concentrations of leisure craft are highest in Oriental, Evans and Kau Bay, but leisure activity occurs throughout the harbour. Education and enforcement is carried out by water-borne patrols by Harbour Rangers and Wharf Police. Honorary Enforcement Officers (Launchwardens) are also in use. 200 metre / 5 knot buoys, signage and other markers are in place (Reserved Area and Water - ski access lanes) in several harbour areas.

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51	7	Approaches, Entrance	Grounding	Grounding - High Windage Vsl Approaches	Light draught or high windage vessel is overwhelmed by conditions just after leaving port (and within port limits).	All Vessels, All Vessels	Seafarers	Underpowered light vessel is unable to clear the port after being led clear by the pilot. Vessel is underpowered for the conditions and propeller is not gripping water due to excessive pitching or poor trim. Tide is adverse. Gale to storm force winds with high seas and swell. Master has refused to accept advice from pilot to remain in port until weather abates or tide changes. Harbourmaster system without Directions supporting pilot.	Vessel remains hove to but making no or little headway until weather abates and vessel gradually makes an offing.	Vessel is hove to but conditions prevent vessel making headway and vessel actually loses ground. On top of a swell the wind blows the vessel about. Master selects course for harbour entrance but has difficulty keeping course and is unable to make entrance. Vessel refuses to maintain course and goes aground near entrance. Hull punctured in many places with loss of bunkers and possible fatalities during grounding situation.	0	0	0	0	7	7	6	6	3.36	This scenario is infrequent but has happened during winter gales with light draft and underpowered vessels unable to make a sufficient offing. Vessel becomes uncontrollable or master elects to attempt to turn vessel about and return for shelter but looses control. Vessels have got into difficulty, and have been spun around. Ferries have aborted off the entrance and returned. Environmental information at entrance is of relevance. Car carriers of 200m in length are programmed to visit the port from end of 2005. Pilot advice may not be accepted by Harbourmaster.
52	51	Evans Bay	Contact Berthing	Tanker Contact Berthing - Aotea Quay	Tanker in contact berthing at Aotea Quay.	Tanker, All Vessels	Seafarers	Wind limiting criteria exceeded for manoeuvre. Berthing downwind when head to wind should have been chosen. Blackout on tanker combined with tug operational failure, line failure or insufficient bollard pull for wind load. Pilot or tug master error including communications failure between pilot and tug master. Poor exchange of information between pilot and master or key bridge personnel (including poor level of spoken English ability in foreign crew) giving a sub-optimal BRM environment. Pilot inexperienced for conditions and ship type and not following standard practice. Pilot underestimates vessel displacement when calculating stopping distances. Misjudged approach speed or angle, missed engine start when required. Late connection of tugs or tugs not connected at optimum position. Anchors not prepared for use or used incorrectly. Misjudged turning point or speed of approach. Lack of accurate closing information from lines crew.	Contact with superficial damage to fendering and hull.	Severe damage to tanker hull and wharf structure in heavy contact. Hull damaged and product spilt. Possible parting of a mooring line in vicinity of berthing crew. Tanker delayed for repairs to frames and plating. Port and region affected by delay to tanker operations while survey and repairs to berth completed.	0	0	0	0	6	7	6	6	3.3	The quality of closing information given by line crews to pilots is reported to be of variable quality and non standard. Most, but not all tankers trading to Wellington are double hulled. A Safety Audit carried out on tanker berths in the port (1999) identified that fendering was least developed on Burnham wharf, requiring 'particular attention to approach angle and speed while mooring, in order to avoid structural damage to wharf or hull of tanker'. Special weather and other limiting parameters are established in CentrePorts pilotage procedures for tanker operations in Evans Bay.

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53	66	Main Harbour	Personal Injury	Personal injury to civil engineering workers.	Passing ship wash causes personnel working on port structures, or construction divers to be affected.	All Vessels, All Vessels	Seafarers	Vessel unaware of personnel on a punt, boat or divers working in vicinity. Engineering or diving staff did not give information to Beacon Hill. Beacon Hill did not pass on information. Rate of approach to berth is too fast. Master tired or fatigued or stressed by bad weather and task in hand. Attention distracted by bad weather. Sub-optimal BRM environment on bridge. Divers not exhibiting 'A' flag.	Construction stage, punt or boat knocked about in wash. Or near miss between vessel and divers.	Wash does serious damage to stage, boat and personnel are knocked into the water with potential for serious injury.	3	0	0	0	6	0	0	4	3.22	The risk as described is always there and is mitigated by constant use of same skilled contractors but contractors less familiar with the port environment and various diving companies also frequent the port environment.
54	68	Main Harbour, Lambton Harbour, Evans Bay	Fire/Explosion	Fire - Vessel Alongside	Fire aboard vessel alongside wharf carrying out maintenance involving hot work	All Vessels, All Vessels	Seafarers	Failure to comply with conditions of or obtain hot work permit.	Fire quickly extinguished with no significant damage or injury.	Major fire with potential for fatalities and severe damage to vessel. Salvage operation required with suspension of wharf use.	0	0	0	0	7	6	4	6	3.2	It is estimated that between 500-600 Hot Work Permits are issued by the Harbours Department annually. Fires have occurred in the past, with virtually all thought to have been caused by failure to comply with permit conditions.
55	42	Main Harbour	Contact Berthing	Contact with vessel berthed at container berth	Container ship with all gear swung outboard and crane/s over vessel, contacted by vessel manoeuvring in vicinity.	Vessel >500GT, All Vessels	Seafarers	Vessel berthing or sailing in close proximity to vessels alongside loses control in strong wind conditions. Tug BP not sufficient to regain control. Anchors not used. Misjudged approach line with track set too close to berthed vessel. Interaction effects. Distraction by bad weather environment. Sub optimal BRM environment. Poor berth planning. Ship or tug has malfunction at critical time. Tug line parts at load lifting off. Error made in calculating or placing bridge mark, Linesmen or crew not giving correct clearing information. Pilot unable to see either end.	Close quarters situation but control regained and safe passing achieved.	Interaction pulls vessel off berth and gangway falls with stevedores on it at the time, potential for major injuries and fatalities. Ship's side struck with loss of hull integrity and spaces flooded. Possibility of oil spillage due to damaged container. Ship or tug crew injured by tug line. Ship movement causes ship to strike container leg which collapses crane over ship with major damage and fatalities amongst crew and stevedores.	0	0	0	0	6	7	2	6	3.08	Ships berth as close as 20m from each other and gap between adjacent ships may only be ship length plus 40m or less in total. Pilot would normally make a steeper approach head to wind in such tight circumstances but sometimes stevedore's requirements require other options to be made. Cranes further obstruct passing area (Container crane boom end is approx 38m from wharf face and ship's cranes may extend 30m from the ship's side). In Port Chalmers container cranes are required to be boomed up temporarily when a ship manoeuvres past.
56	39	Approaches, Entrance, Main Harbour, Lambton Harbour, Evans Bay	Contact Navigation	Leisure Craft Contact Navigation	Leisure craft in contact with floating debris.	Leisure Craft, All Vessels	Seafarers	Poor lookout. Debris difficult to detect particularly by night or in restricted visibility.	Glancing contact with debris, superficial damage to craft hull.	Heavy contact at speed with large log, hull punctured with rapid water ingress. Craft sinks with persons in the water and potential for injury or fatality.	0	0	0	0	7	3	0	7	3	Large logs are frequently washed into the harbour through the Hutt River following high rainfall events. Logs are occasionally lost off Aotea Quay during log-ship loading. This hazard may occur in other parts of the harbour.

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57	71	Main Harbour, Lambton Harbour, Evans Bay	Seismic Event	Tsunami	Tsunami from locally generated event affects harbour with insufficient time for promulgation of warning to users. Seiching effect also possible.	All Vessels, All Vessels	Seafarers	Local earthquake immediately generates seiche in harbour. Distant significant earthquake generates tsunami which enters harbour some hours after event. Underwater landslide offshore generates large waves which enter harbour shortly after event.	Insignificant effect from a distant event and shipping not adversely affected.	Local event causes seiching in harbour. Berthed ships part moorings and damage cranes in surge. Cranes toppled with multiple fatalities. Product spill from tanker discharging. Grounding of ships in transit. Small craft washed ashore and broken up.	0	0	0	0	6	6	5	6	2.89	Wellington may be affected by either locally generated tsunami type waves, for which there may be little time available to notify shipping, For those generated by distant events, such as in the Pacific or Indian Ocean (causing waves which refract off the Antarctic ice shelf), a national warning system is in place to receive early warning of approaching tsunami. Centreport has an Incident Action Plan covering tsunami. Section 11 of the NZ Nautical Almanac contains information on procedure in the event of earthquake. Although a distant earthquake event may not cause tsunami of damaging magnitude to reach NZ, long waves may still affect predicted tide times and heights to a degree which may be significant for the transit of deep draught vessels through Wellington and other harbours. Does the NZ warning system warn of any size tsunami approaching the coast to enable movement planning to take possible effects of even small amplitude but long waves into consideration? For example recent Indonesian event
58	73	Main Harbour	Collision	Small Commercial and Lesiure Craft Conflict	Small harbour ferry or other commercial vessel in potential collision situation with leisure craft in approaches to Days Bay wharf.	Small Commercial, All Vessels	Seafarers	Craft difficult to see from ferry in sunglare ,choppy conditions or poor visibility on approach. Craft unaware of ferry approach or departure, poor look out. No sound signal from ferry on apporach / departure. Ferry exceeds 5 knots within 200 metres of structure or shoreline. Ferry maneouvres off wharf while craft crossing stern or alongside. Kayak or small craft enter between hulls of catamaran ferry while alongside, ferry crew unable to detect presence prior to operating propulsion. Persons disregard warning signs on wharf or signage vandalised or otherwise missing / obscured. Inadequate safety briefing given to persons hiring small craft. Craft operated by person under influence of alcohol or drugs.	Near miss between ferry and craft but collision averted.	Small craft crossing southern end of the wharf is run down by departing ferry with fatality.	0	0	0	0	7	0	0	7	2.78	Rowing boats and kayaks are hired during summer months and launched from the beach adjacent to the wharf. Days Bay beach and nearby bays are popular areas for a range of acquatic activity, particularly kayaking. Generally few problems are reported but potential for Worst Credible outcome exists if the ferry accelerates away from wharf on departure and is unable to stop on meeting a small craft emerging from under or around the end of the wharf.

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59	32	Lambton Harbour	Collision	Kayak and other vessel in Conflict	Kayak in collision with vessel sailing from a commercial wharf area.	Kayak, All Vessels	Seafarers	Kayak paddling around and under wharves not visible to vessel crew. Kayak paddling in prohibited area, kayaker not aware of this area or lacks general maritime knowledge. Poor safety briefing given to hired kayak. Kayak not seen in glare off water.	Member of crew notices kayak around wharf area and departure delayed until clear.	Kayak directly in path of ferry coming out of berth and is run down with likely fatality.	0	0	0	0	7	0	0	7	2.78	The Harbours Department regularly audits the safety briefing given to kayak hirers to ensure that necessary safety information is given. There is less control of independent kayakers where general lack of maritime knowledge amongst leisure users is an issue. Kayaking activity is rapidly increasing in NZ.
60	25	Approaches, Entrance, Main Harbour, Evans Bay	Collision	Leisure Craft and Kayak in Conflict	Power driven leisure craft and kayaker in developing collision other than Lambton Harbour.	Leisure Craft, Leisure Craft	Seafarers	Power driven vessel navigating at speed within 200 meters of shore, bylaw disregard. Poor lookout on power driven vessel, particularly if excessively trimmed by stern. Kayaks difficult to detect in reflected sunlight or choppy conditions.	Close quarters situation but collision averted.	Power driven vessel navigating at speed close to shore runs down two-seater kayak with potential for fatality.	0	0	0	0	7	0	0	7	2.78	Kayaks also need to be aware of the requirements of existence of water ski lanes and areas reserved for PWC's and avoid crossing these areas while in use. Kayakers may not be aware of the low-visibility of their craft to other vessels. Kayaks may be encountered in any part of the harbour but particularly close to shore in Oriental and Evans Bay, the eastern bays and around Somes Island. Conflict between other craft and kayaks is also covered specifically in Hazard 32, 'Kayak and other vessel conflict, Lambton Harbour'.
61	37	Evans Bay	Collision	Windsurfer and Other Vessel or Craft Conflict	Windsurfer and other vessel or craft in developing collision situation in Evans Bay	Windsurfer, Leisure Craft	Seafarers	Poor lookout, made more difficult by spray. High relative speed of approach in crossing situation. Heavy concentration of windsurfers from both directions. Windsurfer falls off in path of leisure craft or vessel. Leisure craft operator or windsurfer lacks general maritime knowledge and is inattentive. Sunglare impedes lookout.	Close quarters situation through manoeuvrability of windsurfer, collision averted.	Power driven craft runs down windsurfer in water (falls in front of power craft) with potential for fatality.	0	0	0	0	7	0	0	7	2.78	In fresh Northerly conditions Evans Bay is a popular windsurfing area, particularly between Shelly Bay and Snapper Point. Other leisure users need to be especially vigilant navigating through this area as windsurfers approach at high speed from both sides. Conflicts between commercial movements such as tankers and windsurfers are also possible although of lower probability given the low frequency of tanker movements through Evans Bay.

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62	8	Main Harbour	Personal Injury	Personal Injury to Swimmer - Days Bay	Persons swimming near Days Bays Wharf while ferry or other vessel is approaching or sailing with potential personal injury to swimmer.	Small Commercial, All Vessels	Seafarers	Swimmers difficult to see from ferry in sunglare ,choppy conditions or poor visibility on approach. Swimmers unaware of ferry approach or departure, no sound signal from ferry. Ferry exceeds 5 knots within 200 metres of structure or shoreline. Ferry operates propulsion without confirming area clear of swimmers. Persons swim between hulls of catamaran ferry while alongside, ferry crew unable to detect presence. Persons disregard warning signs on wharf or signage vandalised or otherwise missing / obscured. Persons deliberately obstruct ferry.	Swimmers in water near ferry berth detected by crew, ferry delayed while swimmers clear area required for berthing.	Swimmer rounds the southern end of the wharf as ferry departs and accelerates onto plane and is run down with fatality.	0	0	0	0	7	0	0	7	2.78	Days Bay is a highly popular swimming beach during summer with the wharf in common use as a diving platform. Police action has been undertaken in the past to prevent persons deliberately diving into teh water as the ferry approachs or departs. Signage warns swimmers of the danger presented by ferry operations. Swimmers also occur in a line between Eastbourne and Days Bay Wharf with people training for competitive events.
63	35	Approaches, Main Harbour, Lambton Harbour, Evans Bay	Collision	Leisure Craft and Water-ski in Conflict	Leisure craft and water-skier or Personal Water Craft in developing collision situation, i.e. in Oriental Bay or Kau Bay, near or in the water-ski lane.	Leisure Craft, Leisure Craft	Seafarers	Conflict in usage of limited area. Disregard of Bylaw relating to conduct in access lanes. Lack of boating knowledge by either craft operator. Poor lookout including failure of craft towing water-skier to carry required observer. Consumption of alcohol impairs judgment. Sun glare impedes vision.	Close quarters situation but collision averted.	Power driven vessel crosses water-ski access lane and is in collision with water-ski vessel or skier with fatality.	0	0	0	0	7	0	0	7	2.78	Kau Bay is a popular area is summer and is one of the sites for a water-ski access lane in the harbour. Lack of general boating knowledge is a significant factor in this scenario where a leisure vessel operator may be unaware of the significance of water-ski lane markings onshore and bylaws regulating their use. The same applies to Reserved Areas used by PWC's
64	72	Entrance	Collision	Windsurfer and Large Vessel Conflict	Large vessel transiting area between the Pinnacles and Falcon Shoals.	Windsurfer, Vessel >500GT	Seafarers	Poor lookout, made more difficult by spray. Insufficient trained personnel on larger vessel bridge to provide adequate lookout during harbour transit. High relative speed of approach in crossing situation. Heavy concentration of windsurfers from both directions. Windsurfer falls off in path of vessel. Windsurfer lacks general maritime knowledge and is inattentive. Sunglare impedes lookout. Presence of windsurfers in fairway not reported by Beacon Hill to shipping.	Close quarters situation through manoeuvrability of windsurfer, collision averted.	Large vessel runs down windsurfer in water (falls in front of power craft) with potential for fatality.	0	0	0	0	7	0	0	7	2.78	Ferry masters and pilots have reported potential for collision between larger vessels and windsurfers sailing between Seatoun and the eastern harbour coast. Windsurfers used to be hired from Seatoun beach - this has now ceased and limitations would be placed on any commercial operator by the Harbourmaster's department.

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65	19	Approaches, Entrance	Collision	Pilot Launch Collision During Transfer Operations,	Pilot launch in collision with large vessel while approaching to embark disembark pilot	Pilot Boat, All Vessels	Seafarers	Misjudgement in approach by launch master or loss of spatial awareness in poor visibility/night or weather/sea conditions, aided by radar or floodlighting failure at critical time. Launchmaster does not appreciate effects of cross swell or wake/wash from own approach or passing vessel. Inexperienced launch master. Best lee not made or speed inappropriate for conditions and ship does not achieve the requested heading (through getting into irons or misjudgement of helm and engine speed required to affect turn) or alters speed substantially during the launches approach. Steering or propulsive failure on launch at critical time. Sea-sickness or fatigue impairs judgment of launchmaster. Launchmaster misjudges line of approach to the vessel, timing and misjudges effects of interaction between vessels. Launch gets caught in negative water flow of vessel i.e. sucked into the vessels quarter. Launch comes too far ahead of midship position with a ship turning inwards towards launch. Launch pinned alongside due to vessel drifting to leeward.	Pilot launch lands heavily on ships side with minor damage to launch belting.	(1) Pilot launch approaching from astern is caught in ships wake and surfs under counter with damage to wheelhouse structure and hull plating. (2) Launch lands very heavily in a solid bodily contact rupturing hull integrity and harming crew. Water ingress leads to loss of stability and capsize with persons in the water and potential for fatalities. (3) When pinned alongside launch and ship movement seriously damages launch causing loss of hull integrity, fenders ripped off.	0	0	0	0	6	6	2	6	2.74	Contact damage is an everyday fact of life with pilot launches going alongside moving vessels in a seaway. A similar incident occurred in another NZ port resulting in damage to the pilot vessel but watertight bulkheads prevented foundering of the vessel. Previous Wellington pilot vessels in service have sustained wheelhouse damage through being caught under the flare. Hazard may also apply to official passengers such as MAF personnel boarding special ships - transfer is always on basis of safety briefing and utmost safety but risk still applies.
66	10	Main Harbour	Grounding	Grounding High Windage Vessel	Light draught or high windage vessel is unable to safely manoeuvre.	All Vessels, All Vessels	Seafarers	(1) Underpowered vessel with light draft, wind broad on the bow and pivot point further aft, draft particularly light forward, refuses to put bow further into the wind during gale southerly conditions to take a new course during outward passage. Harbour revs may only be available and vessel is underpowered for the conditions. Pilot requests sea revs but they are unavailable at short notice or without sufficient way. (2) In gale NWly conditions when outward bound, wind pressure on vessel's quarter prevents vessel from coming onto new course. 3 Twin screw vessel with single rudder configuration attempting to leave on one engine.	Pilot assesses problem early and holds vessel in a safe part of the harbour pending a reduction in wind strength or a changed angle of approach to new course.	Vessel refuses to alter course and goes aground at full speed whilst bridge team attempting to maintain control. Hull punctured with loss of bunkers likely.	0	0	0	0	2	6	6	6	2.74	(1) This scenario is infrequent but has happened with a light draft log vessel type refusing to come onto the leads and after finally starting to turn went right through the wind to put wind on other bow. Pilot recommended to master that it would be desirable to remain in port pending weather abatement but master insisted pilot sail the vessel. This situation now addressed in new port Standard Terms of doing business which provide for a pilot not to sail a ship in a similar situation. (2) High airdraft vessel such as PCCs will have so much wind pressure on their quarter and can only be manoeuvred by taking a round turn out of the vessel in the direction of lesser pressure.

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											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
67	36	Main Harbour, Lambton Harbour, Evans Bay	Collision	Leisure Craft and Waka in Conflict	Waka and leisure craft in developing collision situation.	Leisure Craft, Waka/Dragon Boat	Seafarers	Poor lookout on leisure craft which is travelling at an excessive speed and disregarding Bylaws or Maritime Rule 91. Lack of maritime knowledge by leisure vessel operator. Possible consumption of alcohol impairs judgment. Sunglare impedes vision.	Close quarters situation but collision averted.	Runabout navigating at speed runs over Waka with potential for multiple fatalities on impact and persons in water.	0	0	0	0	7	2	0	6	2.71	Attendant safety boats may be used to alert other craft to presence of wakas. Wakas may be operating without safety boats in attendance. General education level of leisure user is an issue, particularly the availability of high power-displacement ratio of many power driven leisure craft.
68	62	Approaches, Entrance, Main Harbour, Lambton Harbour, Evans Bay	Personal Injury	Personal Injury to Swimmer.	Craft or vessel in conflict with swimmer or diver close to shore in the vicinity of popular bathing areas (includes rowing skifs).	All Vessels, All Vessels	Seafarers	Craft navigating at speed within 200 metres of shore including rowing skiffs and coaching craft. Skipper unaware of Regulations or bylaws covering this situation. Charter vessel cruising close to shore, swimmer difficult to detect at dusk, by night or in reduced visibility. Swimmers proceeding beyond 200 metre buoys. Swimmers not seen in glare off water. Swimmers using areas designated as Access Lanes or Reserved Area at the same time as craft. Lane markers or signage not present in established lane or area.	Swimmer hit on head by windsurfer or rowing skiff (minor injury or near miss).	Swimmer run over by power driven craft with fatality. Alternatively, the same outcome involves a racing straight 8 rowing skiff practicing for race.	0	0	0	0	7	0	0	6	2.69	The 200 metres zone off the Oriental Bay shoreline is well marked with buoys. Some leisure vessel users may not have any form of boating knowledge and may be unaware of the significance of these buoys. The presence of the harbour authority workboat and Harbour Rangers enhances safety and awareness of the hazards. Waterborne Wharf Police patrols also provide an education and enforcement resource. Swimmers may be encountered in other harbour areas such as Days Bay, Kau Bay and Scorching Bay and are reportedly encountered beyond the 200 metre zone occasionally. Charter vessels may navigate within 200 metres of shore at slow speed. Access lane markers have been taken down during road works or similar shore based maintenance works. Signage may be vandalized or defaced.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
69	38	Entrance	Contact Navigation	Fishing Vessel Contact Navigation	Fishing vessel in contact with navigational beacon	Fishing vessel, All Vessels	Seafarers	Poor lookout. Inattention to track setting and course keeping. Failure to appreciate effect of wind and tidal stream. Loss of situational awareness in dark, fog or restricted visibility. Fatigue, or consumption of drugs/alcohol impairs watchkeeping ability. Steering or mechanical failure. Poor visibility from wheelhouse (positioning of fishing equipment obscures line of sight). Not using radar or radar incorrectly set up. Not using all available nav aids such as plotter. Not being actively monitored by Beacon Hill.	Vessel sights structure at close range and contact averted with near miss.	Wooden hulled inshore trawler contacts Steeple Rock beacon at speed causing rapid water ingress to hull. Potential for fatality from the contact event. Possible loss of marine diesel to sea. Beacon structure requires repair and light temporarily inoperative.	0	0	0	0	6	4	4	4	2.68	Fishing vessels have struck Steeple Light (there was one relatively serious event resulting in a large hole above the waterline). To date no vessels have sunk as a result. Vessels navigating in this area are under radar observation from Beacon Hill and operating procedures require these vessels to be acquired and plotted by ARPA while in radar sight. Signal station operators are tasked with observing the safe transit of vessels within sight and particularly radar sight. Procedure is set for the alerting of a vessel observed standing into danger. However, some situations are more clearly apparent than others - as vessels routinely pass close to navigational marks such as Steeple Beacon, it is difficult for signal operators to detect with any certainty whether a vessel will contact the structure or pass it closely. A small alteration of course by the vessel concerned at a late stage may either result in a contact or averted contact. Operators are less likely to intervene in these cases but have done so in the past where no ambiguity has existed, for example in the case of a foreign fishing vessel shaping to pass to the East of Ward Island.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
70	12	Entrance, Main Harbour, Lambton Harbour, Evans Bay	Grounding	Small Passenger Vessel Grounding	Harbour passenger vessel in grounding situation on passage or near berth.	Passenger Vessel, All Vessels	Seafarers	Propulsive failure on lee shore in approach to berth during adverse conditions, insufficient time to anchor or it drags. Navigating at speed in close proximity to shore to save passage time or close inshore for lee in strong Northerly. Poor positional awareness in restricted visibility or by night, radar not used effectively to monitor position. Insufficient depth of water at infrequently used berths at low water, particularly in conjunction with high pressure system or swell. Debris on seafloor reduces usually acceptable UKC on approach or at berth. Depth sounder not used or operational. Lack of recent hydrographic data for berths in use or proposed for use. Launchmaster misjudges approach to berth and makes leeway into shallows on swinging. Line parts or bitts pull from deck while ferry is using engine power to stay close alongside, crew unable to reach engine control in time to prevent grounding.	Vessel's keel touches seafloor off Petone beach during slow speed harbour cruise. Able to back off without damage.	Harbour ferry or other passenger vessel surges heavily on lines during adverse Southerly conditions at exposed wharf. Line or lines part with persons falling from gangway into water, potential for major injuries or fatality. Ferry grounds on beach with damage to hull and propellers/rudders, out of service for two weeks to repair.	0	0	0	0	6	4	2	6	2.65	Petone Wharf may be used in the future for ferry or other passenger services and has been the site of groundings leading to shaft damage and water ingress in the past. Sounding information is dated. Grounding hazard applies to any small passenger or charter service but the harbour ferry provides the most frequent service.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
71	29	Main Harbour, Lambton Harbour, Evans Bay	Collision	Tug in collision with vessel being assisted	Tug has contact and a collision with a vessel being assisted to berth or sail.	Tug, All Vessels	Seafarers	Higher risk at the bow position due to interaction effects, bulbous bow and ships flare. The tugmaster misjudges the speed and angle of approach when making fast at the bow. The tugmaster loses situational awareness at night or is distracted by extreme or adverse weather including limited visibility and fatigue. Loss of tug control systems, engine power or engine/s at the critical approach phase. Insufficient engine revs selected. The pilot or exempt master does not monitor the tug position, misjudges speed or orders engine movement or a change in heading at the critical time. Tug use plan not provided or discussed. Loss of communications. Winch does not release under emergency conditions. Tugmaster temporarily incapacitated and control lost before Tug Operator takes over. Lesser damage caused by misjudgement when making contact during a push situation. Pilot uses engines astern without communication when tug is not clear aft. Tug is overrun when pulling on the bow and swept alongside flat.	Tug has glancing blow with hull and pushed off before regaining control with nil or minimal damage.	Tug caught under bow flare doing considerable damage to mast, top house and flybridge. Operating personnel suffer severe lacerations and possible fatality. Tug holed and disabled and takes water in engine room with loss of diesel in one main deep tank (up to 30 tonnes). Towline parts and ship assisted loses control and makes contact with berth or another vessel before control of ship is regained. Main deck side doors not closed and vessel downfloods on the resultant heel and sinks. Tug struck by propeller when close into stern. Tug pinned alongside when assisting ship into a finger berth, pilot misjudges and tug unable to escape causing considerable hull damage.	0	0	0	0	6	6	2	4	2.65	Tugs make fast at the bow up to about 6 knots. Basic design of Voith tugs considerably reduces risks at the bow and on the towline compared with ASD type tugs as the lever between staple and propeller units is long and as units are forward they can pull the tug away from effects of bow interaction. Contact or collision risk is historically very low. In 84 tug years using Voith tugs and over 95,000 movements significant damage due a collision to the value of $60k has happened only once. Training regime for Tugmasters and Pilots covers the risks and consequences illustrated. In covering contact in a push situation new fenders provide for high compressibility and loads with less likelihood of damage to tug as a result of misjudgement during this manoeuvre.
72	30	Entrance, Main Harbour, Evans Bay	Collision	Small Commercial Vessels in Conflict	Small commercial, fishing or passenger vessel in collision situation with similar vessel navigating in opposite direction.	All Vessels, All Vessels	Seafarers	Poor lookout by both vessels. Not using radar. Not monitoring other movements (including radio watch). Incomplete traffic reporting procedure followed by vessel intending to sail or upon sailing. Beacon Hill unable to provide positive traffic information through inability to monitor all harbour areas. Vessel's track too close to points, not providing room for other vessel to manoeuvre. Vessels not visible to each other in rain or reduced visibility. Going at speed inappropriate for the conditions. Nav lights not visible or obscured against working lights. Convergence of smaller craft around course alteration points.	Close quarters situation but collision averted.	Vessels collide. Both vessels holed and flooded. Potential for serious injury and possible passenger fatality.	0	0	0	0	6	4	2	4	2.56	Some staff at Beacon Hill are reported to provide a less detailed traffic report to small commercial vessels. This in itself is not a cause of any collision but may indicate different procedures followed by different signal station staff and highlights performance monitoring issues. Familiarity may lead to complacency amongst frequent port users.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
73	4	Approaches, Entrance	Grounding	Leisure Craft Grounding, Approaches / Entrance	Leisure craft in grounding situation along the south coast for example at Island Bay, Barrett Reef, West Ledge or Chaffers Passage.	All Vessels, All Vessels	Seafarers	Leisure craft operating in adverse weather or poor visibility (fails to detect leads or lead lights inoperative). Lack of local knowledge/experience. Weed blocks propulsion or cooling system. Other propulsive or steering failure, including propulsion or steering gear fouled on craypot line. Inattention to weather forecasting and local weather. Inattention to track keeping. Getting too close to dangers. Not using plotter or nav aids. Mistakes AtoN. Alcohol or Drugs.	Disabled craft receives tow from other craft, Coastguard or Police launch and grounding averted.	Runabout grounds on Taputeranga Island or other section of rocky coast in adverse southerly weather and sinks/is broken up with persons in water and potential fatalities.	0	0	0	0	6	2	2	6	2.52	Education of leisure craft users particularly with regard to use of weather forecasts is a national issue involving a multi-agency approach. Craypots are set within the 50 metre depth countour along the south coast and may present a fouling hazard to small craft.
74	13	Main Harbour, Lambton Harbour, Evans Bay	Grounding	Leisure Craft Grounding	Leisure craft grounds within an inner harbour area.	Leisure Craft, All Vessels	Seafarers	Lack of local knowledge or chartwork ability, rock not visible at high water. Misjudgement of safe distance off by experienced local without radar or chartplotter. Lack of positional awareness in restricted visibility or fog. Rock not marked with buoy or beacon. Alcohol or drugs impair judgement of leisure craft operator. Propulsive or steering failure, including running out of fuel and fouling fishing nets or pots.	Leisure vessel strikes rock at slow speed with damage but slow rate of water ingress, craft makes marina without assistance.	Power driven craft strikes rock at speed by night with potential for major injuries to occupants and potential for fatality on impact. Craft drifts off rock to sink or capsize.	0	0	0	0	6	2	0	6	2.37	Several craft are reported to have struck the rock off the reef to the North of Somes Island, often by night. Set nets or craypots may present a fouling hazard to small craft which may subsequently ground after losing ropulsion or steering.
75	56	Approaches, Evans Bay	Mooring Failure	Swing Mooring Failure - Fishing Vessel	Fishing vessel drags or parts swing mooring in adverse weather in Island Bay.	Fishing vessel, All Vessels	Seafarers	Poor condition of swing mooring tackle. Poorly secured bridle on vessel. infrequent inspection. Illegally placed mooring. Extreme weather conditions.	Fishing vessel breaks loose and grounds with rapid recovery.	Fishing vessel drags ashore in heavy Southerly gale and becomes total loss, potential for small diesel spill.	0	0	0	0	0	6	3	3	2.29	Swing Mooring failure or dragging has occurred at Island Bay in the past, which is predominantly populated with fishing vessels. Although this is specific to Island Bay, it also refers to fishing boats in the harbour generally.
76	55	Main Harbour, Evans Bay	Mooring Failure	Swing Mooring Failure Leisure Craft	Leisure craft drag or part swing moorings in adverse weather.	Leisure Craft, All Vessels	Seafarers	Poor condition of swing mooring tackle. Poorly secured on craft. Infrequent inspection. Illegally placed swing mooring. Extreme weather conditions.	Owners, Coastguard or Police remove vessel to wharf or otherwise safely secure craft.	Yacht drags ashore and becomes total loss. Alternatively, owner sets off in small craft to retrieve yacht in adverse conditions.	0	0	0	0	0	3	0	6	2.07	Some owners do not appreciate wind forces created on their craft in a gale and the need to put out extra swing mooring tackle to cater for Wellington conditions generally.
77	75	Main Harbour	Loss of Stability (Cargo Operations)	Vessel Capsizes at Berth During Cargo Operations	Vessel takes excessive list during cargo operations with potential for shift of cargo, possible contact with container cranes or capsize at berth	Container Vessel, All Vessels	Seafarers	Poor cargo planning on ship or shoreside. Low initial stability of vessel. Automatic heeling tanks fail to function as expected or in manual mode and incorrectly used (or inappropriate ballasting to rectify list).	Vesel takes angle of loll at berth but capsize averted by mooring lines, stability subsequently recovered.	Vessel takes angle of loll and incorrect action taken on board to correct leads to vessel rolling quickly to opposite side. Unsecured deck cargo shifts with possible loss over the side or major injury / fatality to person in vicinity on deck.	0	0	0	0	5	3	0	5	2.04	More rapid cargo operations will be possible with higher-rate cranes planned for port in the near future. This is likely to reduce the time available for cargo planners (both on ship and ashore) to take action to keep vesel within design stability limits. Capsize at the berth has been considered a 'worst case' scenario rather than Worst Credible.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category								Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	M L				W C					
											People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
78	40	Lambton Harbour	Contact Navigation	Contact with structures in Lambton Harbour	A vessel makes contact with pile beacons off Container Terminal or Kings Wharf.	All Vessels, All Vessels	Seafarers	Poor lookout. Inattention to track setting and course keeping. Setting a course too close to Terminal. Failure to appreciate effect of wind. Loss of situational awareness in dark, fog or restricted visibility. Pile lights not seen against city lights. Fatigue, or consumption of drugs/alcohol impairs watchkeeping ability. Steering or mechanical failure. Poor visibility from wheelhouse (i.e. positioning of fishing equipment obscures line of sight). Not using radar or radar incorrectly set up. Not using all available nav aids such as plotter. No remote monitoring. Sunglare distracts.	Contact with pile, pile damaged but not needing replacement.	Pile damaged by vessel manoeuvring into berth, requiring replacement.	0	0	0	0	0	3	0	3	1.31	Pile Beacons at Kings Wharf have been struck 3 times in 10 years (fishing and ferry related). The middle wooden pile is not lit.

ANNEX F

MAPPED RISK CONTROL - EXISTING

Wellington Harbour Risk Assessment - Existing Risk Control Description

This risk control annex contains two tables, **G1** and **G2**. **Table G1** is a mapping of the risk control against the first 30 ranked hazards in **Annex F**. **Table G2** provides details of the available risk control as referenced in **Table G1**. The risk Control mapping is prioritised by Accident Category, followed by the hazard ranking in the risk profile.

Table G1 – Risk Control Mapped to Existing Risks – Top 30 Hazards

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
1	**5**	**Grounding**	**Ferry Grounding** **A, B**	1.0 Harbour Organization 1.6 Information Notes on Charts 1.7 Wave Rider Buoy 1.9 Recommended tracks 2.1 Beacon Hill Weather and Traffic Service 2.3 Incident Communications Facility 2.4 Leading Lights Manual Control 2.5 Webcam Covering Entrance 3.4 Directions for Navigating 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 6.1 Application of Maritime Rule 90 to pilotage 6.2 PEC examination process 6.3 PEC handbook 7.1 Police SAR resources 7.2 Local SAR organization		Ferry passage plans should incorporate bylaw provisions which require large vessels to join the leads at a minimum of 2 miles off the entrance. Beacon Hill can provide real time weather observations and readings from the wave buoy in addition to visual observations. The web cam provides further information. Tugs may be able to assist drifting or distressed vessels and prevent grounding at the entrance, although this is weather dependent, and tugs may take over an hour to reach the entrance from their Lambton Harbour berths. Heavy towing gear is not normally carried on tugs, but can be taken on board and made ready as the tug steams for the entrance.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
9	**1**	**Grounding**	**Large Vessel Grounding** **A, B**	1.0 Harbour organization 1.4 Hydrographical survey 1.5 Tide gauge 1.6 Information notes on chart 1.7 Wave Rider Buoy 2.1 Weather and traffic information service 2.3 Incident communications facility 2.4 Leading light manual control 2.5 Webcam covering entrance 3.4 Directions for harbour navigation 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 6.1 Application of Maritime Rule 90 to Pilotage 7.1 Police SAR resources 7.2 Local SAR organization	2.2 Pilot/master exchange 2.3 Recommended track compliance 2.5 Leading to/from Inner Boarding Area 2.6 Use of Outer Boarding Areas 3.1 Marine personnel experience and expertise 3.2 Training systems for marine personnel 3.3 Personnel management practice	Pilots are embarked at outer boarding areas except in the case of severe weather or other circumstance where the pilot is unable to safely board outside. Leading in procedures are embodied in port company SOP's.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
14	**76**	**Grounding**	**Deep Draught Grounding Tanker** **A,B**	1.0 Harbour organization 1.4 Hydrographical survey 1.5 Tide gauge 1.6 Information notes on chart 1.7 Wave Rider Buoy 2.1 Weather and traffic information service 2.3 Incident communications facility 2.4 Leading light manual control 2.5 Webcam covering entrance 3.4 Directions for harbour navigation 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 6.1 Application of Maritime Rule 90 to Pilotage 7.1 Police SAR resources 7.2 Local SAR organization	2.2 Pilot/master exchange 2.3 Recommended track compliance 2.5 Leading to/from Inner Boarding Area 2.6 Use of Outer Boarding Areas 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice	Coastal tankers generally plan their ETA Wellington to coincide with optimum conditions for entry. Pilot exemptions are not available for tankers.
27	**9**	**Grounding**	**Charter Vessel Grounding** **A, B**	1. Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility 2.5 Webcam covering entrance 7.1 Police SAR resources 7.2 Local SAR organization		Maritime New Zealand certifies the operation of small commercial vessels under the Safe Ship Management System which defines operating limits, crew qualifications, life saving gear carried and other conditions under which a vessel may operate commercially. The Harbourmaster no longer issues licenses to either the vessel or its skipper/master.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
25	**2**	**Grounding**	**Foreign Fishing Vessel Grounding** **A, B**	1.0 Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 7.1 Police SAR resources 7.2 Local SAR organization	4.1 Tugs 4.2 Liaison with agent	If required to carry a pilot then the risk controls are the same as those in 8/1
3	**18**	**Collision**	**Ferry and Large Vessel** **A**	1.0 Harbour organization 1.6 Information notes on charts 1.9 Recommended tracks 2.1 Weather and traffic information service 2.3 Incident communications facility 2.4 Leading light manual control 3.4 Directions for harbour navigation 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 6.1 Application of Maritime Rule 90 6.2 Exemption process 6.3 PEC handbook 7.1 Police resources 7.2 SAR organization	2.2 Pilot/master exchange 2.3 Recommended track compliance 2.5 Leading vessels to/from Area Delta 2.6 Use of outer boarding areas 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 4.1 Tugs 4.2 Pilot launches	Traffic management is currently conducted by the individual vessels concerned i.e. intership negotiation

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
4	**20**	**Collision**	**Ferry and Large Vessel** **C**	1.0 Harbour organization 1.9 Recommended tracks 2.1 Weather and traffic information service 2.3 Incident communications facility 3.4 Directions for harbour navigation 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 6.1 Application of Maritime Rule 90 6.2 Exemption process 6.3 PEC handbook 7.1 Police resources 7.2 SAR organization	2.2 Pilot/master exchange 2.3 Recommended track compliance 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 4.1 Tugs	Constrained by Draught (CBD) signals are occasionally used, but it appears more usual for pilots will report status of vessel as CBD to Beacon Hill for advising other traffic. Vessels routinely transit the harbour with UKC approaching the minimum 1.5 metres but there is no set UKC value for display of signal within pilot Standard Operating Procedures.
7	**17**	**Collision**	**Ferry /Large vs FV** **A, B**	1.0 Harbour organization 1.6 Information notes on charts 1.9 Recommended tracks 2.1 Weather and traffic information service 2.3 Incident communications facility 2.4 Leading light manual control 3.4 Directions for harbour navigation 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 6.1 Application of Maritime Rule 90 6.2 Exemption process 6.3 PEC handbook 7.1 Police resources 7.2 SAR organization	2.2 Pilot/master exchange 2.3 Recommended track compliance 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 4.1 Tugs	See 4/20

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
8	**27**	**Collision**	**Yacht (Racing) and Ferry / Large Vessel** **A, B, C, D, E**	1.0 Harbour organization 1.1 Event notification 1.2 Leisure user education 1.6 Information notes on charts 1.9 Recommended tracks 2.1 Weather and traffic information service 2.3 Incident communications facility 2.4 Leading light manual control 3.1 500 ton rule 3.2 Event management 3.3 Enforcement officers 3.4 Directions for harbour navigation 3.5 Restricted areas 3.8 Operating requirements 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 5.1 Marina signage 6.1 Application of Maritime Rule 90 6.2 Exemption process 7.1 Police resources 7.2 SAR organization	2.2 Pilot/master exchange 2.3 Recommended track compliance 2.5 Leading vessels to/from Area Delta 2.6 Use of outer boarding areas 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 3.4 Interface with yacht clubs 4.1 Tugs 4.2 Pilot launches	Pilots and ferry masters have visited yacht clubs and given lectures on safety issues involving large vessel movements and small craft. Yacht clubs appear to be encouraging members towards an understanding of these safety issues. Several agencies are involved with education on the harbour including the Harbours Department, Wharf Police and Coastguard. Pilot launches may be used to go ahead of a large vessel and clear small craft away.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
12	**15**	**Collision**	**Ferry /Large or Deep Draught Vessel** **B**	1.0 Harbour organization 1.6 Information notes on charts 1.9 Recommended tracks 2.1 Weather and traffic information service 2.3 Incident communications facility 2.4 Leading light manual control 3.4 Directions for harbour navigation 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 6.1 Application of Maritime Rule 90 6.2 Exemption process 6.3 PEC handbook 7.1 Police resources 7.2 SAR organization	2.2 Pilot/master exchange 2.3 Recommended track compliance 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 4.1 Tugs	See 4/20
15	**28**	**Collision**	**Ferry / Tanker** **C**	1.0 Harbour organization 1.9 Recommended tracks 2.1 Weather and traffic information service 2.3 Incident communications facility 3.4 Directions for harbour navigation 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 6.1 Application of Maritime Rule 90 6.2 Exemption process 6.3 PEC handbook 7.1 Police resources 7.2 SAR organization	2.2 Pilot/master exchange 2.3 Recommended track compliance 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 4.1 Tugs	Silver Fern Shipping tankers specifically include discussion of ferry movements in their pilot/master exchanges. Approaches to and from the oil terminals in Evans Bay and Seaview are included in the Recommended Tracks used by pilots and examined during the PEC process, and published in the WRC/CentrePort booklet Port and Navigational Information for Candidates Sitting the Pilot Exemption Examination'.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
17	**74**	**Collision**	**Leisure / Large** **D**	1.0 Harbour organization 1.1 Event notification 1.2 Leisure user education 2.1 Weather and traffic information service 2.3 Incident communications facility 3.1 500 ton rule 3.2 Event management 3.3 Enforcement officers 3.5 Restricted areas 3.8 Operating requirements 5.1 Marina signage 7.1 Police resources 7.2 SAR organization	2.2 Pilot/master exchange 2.3 Recommended track compliance 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice	Education of the leisure user is a core function of both the local Coastguard and Wharf Police. Funding has been provided to the local Coastguard to assist with distribution of WRC educational material.
2	**21**	**Collision**	**Ferry vs Ferry** **A, B, C**	1.0 Harbour organization 1.6 Information notes on charts 1.9 Recommended tracks 2.1 Weather and traffic information service 2.3 Incident communications facility 2.4 Leading light manual control 3.4 Directions for harbour navigation 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 6.1 Application of Maritime Rule 90 6.2 Exemption process 6.3 PEC handbook 7.1 Police resources 7.2 SAR organization	4.1 Tugs	Passage plans are currently not necessarily the same between different operators.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
20	**16**	**Collision**	**Ferry vs Leisure** **A,B,C**	1.0 Harbour organization 1.1 Event notification 1.2 Leisure user education 1.6 Information notes on charts 1.9 Recommended tracks 2.1 Weather and traffic information service 2.3 Incident communications facility 2.4 Leading light manual control 3.1 500 ton rule 3.2 Event management 3.3 Enforcement officers 3.4 Directions for harbour navigation 3.8 Operating requirements 4.1 Aids to Navigation provide position reference in approach, channel and harbour transit 5.1 Marina signage 6.1 Application of Maritime Rule 90 6.2 Exemption process 7.1 Police resources 7.2 SAR organization		Leisure education is a primary RCM including signage at marinas and boat ramps. There is also an enforcement element with Harbour Rangers and Wharf Police on water presence.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
21	**45**	**Contact Berthing**	**Contact with Cruise Liner / Tanker, Aotea Quay** **C**	1.0 Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility 3.14 Tanker proximity	2.1 Key port limiting parameters 2.2 Pilot/master exchange 2.4 Pilot allocation/movement planning 2.7 Berthing planning 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 4.1 Tugs 4.3 Fendering	
26	**78**	**Contact Berthing**	**Tanker Contact Seaview** **C**	1.0 Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility	2.1 Key port limiting parameters 2.2 Pilot/master exchange 2.4 Pilot allocation/movement planning 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 4.1 Tugs 4.3 Fendering	Wind speed recording equipment is planned for Seaview and other sites as part of a harbour wide monitoring system.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
29	**48**	**Contact Berthing**	**Contact with Crane on Departure** **C**	1.0 Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility	2.1 Key port limiting parameters 2.2 Pilot/master exchange 2.4 Pilot allocation/movement planning 2.7 Berthing planning 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 4.1 Tugs	
10	**44**	**Contact Berthing**	**Ferry Contact RFT** **C**	1.0 Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility	4.1 Tugs 4.3 Fendering	Tugs are seldom used at RFT unless a ferry has a propulsive or steering defect. Tugs must be pre-ordered and cannot be called between 2300 and 0600 unless pre-ordered. A pilot is always supplied for two tug operations.
6	**46**	**Contact Berthing**	**Contact Berthing PEC** **C, D**	1.0 Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility 6.2 Exemption process 7.1 Police resources 7.2 SAR organization	4.1 Tugs 4.3 Fendering	Tugs must be pre-ordered and cannot be called between 2300 and 0600 unless pre-ordered. A pilot is always supplied for two tug operations.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
28	**49**	**Contact Berthing**	**Small Harbour Ferry Contact C, D**	1.0 Harbour organisation 2.1 Weather and traffic information service 2.3 Incident communications facility		Vessels should not normally be approaching a wharf at a speed greater than 5 knots due to Bylaw restrictions on speed within 200 metres of the shore or structure. Wharf structures used by RoRo ferries are of wooden construction, dating back a considerable time and susceptible to heavy landing damage.
18	**47**	**Contact Berthing**	**Vessel in Contact Berthing** **C,D**	1.0 Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility 6.2 Exemption process	2.1 Key port limiting parameters 2.2 Pilot/master exchange 2.4 Pilot allocation/movement planning 2.7 Berthing planning 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice 4.1 Tugs	Wharf structures in many areas are of wooden construction, dating back a considerable time and susceptible to heavy landing damage. There are no berth limiting parameters in terms of displacement or length.
5	**54**	**Mooring Breakout**	**Mooring Breakout – Container** **C**	1.0 Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility	2.2 Pilot/master exchange 2.8 Mooring guidelines 3.1 Marine personnel experience and expertise 4.1 Tugs 4.4 Storm lines 4.5 Bollard provision	The pilot/.master exchange includes passing of information to the master regarding contact details of Beacon Hill and other agencies in the event of emergency.

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
22	**52**	**Mooring Breakout**	**Mooring Breakout FV Laid Up** **E**	1.0 Harbour system 2.3 Incident communications facility 3.12 Security of vessel moorings	3.1 Marine personnel experience and expertise 4.1 Tugs	Harbour Rangers may inspect mooring lines of laid up vessels as part of their function. If involved in their movement, Pilots ensure that moorings are secure and adequate before leaving the vessel.
23	**53**	**Mooring Breakout**	**Mooring Breakout from No.3 Side of a Finger Berth**	1.0 Harbour organization 2.1 Weather and traffic information service 2.3 Incident communications facility	2.2 Pilot/master exchange 2.8 Mooring guidelines 3.1 Marine personnel experience and expertise 4.1 Tugs 4.4 Storm lines 4.5 Bollard provision 5.1 Berth refusal in adverse weather	
16	**70**	**Fire**	**Fire – RoRo** **A, B, C, D**	1.0 Harbour organisation 1.8 Dangerous goods notification 2.3 Incident communications facility 7.1 Police resources 7.2 SAR organization	4.1 Tugs	

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
19	**67**	**Fire**	**Fire on Small Passenger Vessel** **A,B,C,D,E**	1.0 Harbour organization 1.8 Dangerous goods notification 2.3 Incident communications facility 7.1 Police resources 7.2 SAR organization	4.1 Tugs	
13	**63**	**Personal Injury**	**Personal Injury – Lines Crew** **C, D, E**		2.1 Pilot/master exchange 2.9 Procedures for shore based personnel 3.1 Marine personnel experience and expertise 3.2 Marine personnel training systems 3.3 Marine personnel management practice	
30	**60**	**Swamping**	**Wash Swamping and Capsizes Leisure Craft** **B,C**	1.0 Harbour organization 1.2 Leisure user education 1.9 Recommended tracks 2.1 Weather and traffic information service 2.3 Incident communications facility 3.1 500 ton rule 3.3 Enforcement officers 3.4 Directions for harbour navigation 3.8 Operating requirements 3.9 Carriage of lifejackets	2.1 Pilot/master exchange 2.3 Recommended track compliance	

Rank	Hazard Reference	Accident Category	Hazard Title & Area Affected	Existing Risk Control Harbour Regulator	Existing Risk Control CentrePort	*Notes*
24	**61**	**Swamping**	**Swamping / Capsize Rowing Skiff /Dragon Boat** **C, D**	1.0 Harbour organization 1.1 Event notification 1.2 Leisure user education 2.1 Weather and traffic information service 2.3 Incident communications facility 3.2 Event management 3.5 Restricted areas 3.7 Speed restrictions 3.8 Operating requirements 3.9 Lifejackets 7.1 Police resources 7.2 SAR organization		No set limiting parameters for skiff or other paddled craft operation– decision based on experience made by club. Officials or individuals on the day although generally it is only experienced club members who make these decisions.
11	**59**	**Foundering**	**Leisure Craft Foundering** **A,B,C,D,E**	1.2 Leisure user education 2.3 Incident communications facility 3.9 Lifejackets 7.1 Police resources 7.2 SAR organization		

Table G2 – Existing Risk Control - Detailed Description

Risk Control	Risk Control Title	Risk Control Description
1.0	**Regional Council, Overall Harbour Management System.**	The Harbourmaster and staff regularly interface with navigational users in the discharge of their duties i.e. Through the 24 hour function of Beacon Hill Communications Station and presence of two full time Harbour Rangers to complement the Harbourmaster and Deputy. The Harbour System has the ability to enforce Bylaws through the Communications Station. Harbour Rangers and additional Enforcement Officers (Honorary and Police Maritime Unit). The Harbourmaster or Deputy, backed up by a duty Harbour Ranger are on call at all times and leave/attendance at training and conferences outside the region are structured in such a way that this availability is maintained.
1.1	Event management	See also 3.2, wide promulgation of information pertaining to marine events to other harbour users.
1.2	Education	Safe Boating Packs distribution by Harbours Department, Police Maritime Unit and Coastguard
1.3	Tanker cargo plan submission	In addition to the requirements of Maritime Protection Rule 103, tankers are also requested to supply tank plans to the Harbours Department. This information is available immediately to the Fire Service in the event of a tanker incident through Beacon Hill
1.4	Hydrographical survey	Channel bathymetric surveys have been carried out recently (1996)
1.5	Tide Gauge	Automated Tide Gauge Reading available through Beacon Hill to navigational users
1.6	Information notes on charts	Warn of set across the entrance and ferry traffic
1.7	Wave rider buoy	Located off Baring Head provides wave data online or through Beacon Hill 24 hrs
1.8	Dangerous Goods Notification	When DG (Explosives are handled in the Port, the Harbours Department inform the fire service by Fax before cargo operations commence. The DG manifest of any vessel is held by Agents, Ferry Companies or Port Company.
1.9	Recommended Tracks	Examined as a requirement for Pilot Exempt vessel masters and skippers, applying to vessels of more than 500GT. See also CP 2.3
2	**Beacon Hill Communications Station**	24 hr communications station located overlooking the harbour entrance with visual and radar surveillance of the entrance and approaches. Harbourmaster's communications centre and interface with commercial shipping, organized recreational events and local SAR communications where appropriate.
2.1	Weather and traffic information service	Weather observations, forecasts and wave buoy data available 24 hours. Receives and advises traffic movements.
2.2	Recording PEC master name	Monitoring currency of PEC holders is now an MNZ responsibility under Rule 90, however exempt master names are still recorded on every transit at Beacon Hill
2.3	Incident communications facility	Wide range of links to emergency services and Coastguard, capable of instigating an emergency response on the basis of received information and/or acting as a communications centre during

Risk Control	Risk Control Title	Risk Control Description
		incidents in harbour limits
2.4	Leading light manual control	The white sector of the leads may be switched on manually at a vessels request in low visibility
2.5	Webcam covering entrance	By day and in good visibility provides an additional source of information of conditions at the entrance for vessels intending transit with online capability
3	**Navigation and Safety Bylaws**	
3.1	500 ton rule Section 6.3	Vessels and craft of less than 500 GT are required to navigate such that a risk of collision does not develop between themselves and a vessel of more than 500GT
3.2	Event management	Temporary reservation of areas possible for organized events and suspension of relevant operating restrictions, public notice given
3.3	Enforcement officers	Harbour Rangers and the Police Maritime Unit are water-borne and have the capability to directly enforce the Navigation and Safety Bylaws. Approximately 30 Honorary Enforcement Officers may assist this function from their own private craft.
3.4	Directions for harbour navigation	Includes procedures for radio reporting prior to entering harbour limits and giving notice of sailing, a minimum distance off or joining the leads and minimum requirements for use of onboard aids to navigation and bridge personnel during harbour transit. By night/restricted visibility all vessels/craft must report intention to transit the entrance, by day only commercial vessels are required to do so. Vessels of less than 20 metres other than commercial vessels are not required to report their intention to depart a harbour berth, but in practice most commercial or fishing vessels do so regardless of length.
3.5	Restricted areas	Non commercial craft are excluded from areas of Lambton Harbour which provides a means of preventing craft such as rowing skiffs from routinely training in close proximity to working wharves in Lambton Harbour.
3.6	Hot work permits	Most are issued by the Deputy Harbour Master and operate as a check list for compliance with safe working practice. Permits are generally issued on site which provides a regular interface between the Harbours Department and navigational users (ships personnel).
3.7	Speed restrictions	Within Lambton Harbour , no more than 12 knots in addition to the 200 metre/5 knot rule
3.8	Operating Requirements	Covers the requirements for showing of lights on small craft, also look outs during water skiing and other matters relevant to the safe operation of leisure craft.
3.9	Carriage of lifejackets	Every leisure craft must carry an appropriate lifejacket for every person on board and these must be worn in adverse weather or in restricted visibility
3.11	Small commercial vessel licensing	Those not subject to Maritime Rules (i.e. under 6 metres length) are subject to inspection and

Risk Control	Risk Control Title	Risk Control Description
		operational approval by the Harbours Department, providing the opportunity for Harbour system – navigational user interface and conditions relating to the safe operation of the craft, for example provision of rescue boats for hired craft, weather limits and defining area of operation.
3.12	Security of vessel moorings	Vessel owners re required to maintain the security of vessel moorings, of particular relevance in the case of laid up vessels with no watchman aboard.
3.13	Tanker Cargo Plan	A tanker cargo plan is lodged at Beacon Hill for provision to the Fire Service in the event of a major incident involving a tanker.
3.14	Tanker proximity	Other vessels may not generally berth within 30 metres of a tanker, reducing the possibility of contact damage. This is incorporated into berth planning by CentrePort.
4	**Aids to Navigation**	All nav aids other than those identifying wharves have back up facilities, such as solar power or emergency generators. The harbour entrance and channels are generally well marked and unambiguous although background lighting can reduce detection particularly for smaller vessels. Manual control of some lights is also possible in periods of low visibility.
5	**Signage ,Shore Markings and Buoys**	5 knot /200 metre buoys are laid in high use areas. Marina and ramp signage informs leisure craft of safety issues and Bylaw requirements such as carriage of lifejackets and the 500 ton rule.
6	**Pilotage and PEC system**	
6.1	Maritime Rule 90	National Pilotage Requirements.
6.2	Exemption process	Both the Harbourmaster and Pilots have a role in the preparation and examination of Pilot Exemption Certificate candidates.
6.3	PEC handbook	Document forming a comprehensive onboard resource for Pilot Exempt masters and bridge teams
7	**Police Maritime Unit**	Responsible for SAR operations within harbour limits (wider responsibility currently under review nationally) including tasking of other SAR organizations
7.1	Police on-water capability and control	Maritime Unit has an all weather launch capable of operating as the on scene command vessel and is supported by a smaller RIB. A 12 metre RIB also operates during summer months. The police maintain an on water capability for SAR and an educational/preventative role

Risk Control	Risk Control Title	Risk Control Description
7.2	Other local SAR resources	Police maintain the ability to call on a wide range of local SAR resources to assist in operations. Other major SAR units are two craft operated by the Airport Fire Service and Wellington Volunteer Coastguard which also operates 2 dedicated rescue vessels. Both units may be tasked by Police at any time to assist with SAR operations. Coastguard vessels also patrol the harbour or maintain a VHF watch during weekend and public holiday during 0900-1800 approximately. Many other resources may be brought into use by Police including Surf Clubs, yacht club safety boats and local fishing vessels. Tugs and the pilot vessel have also been used in the past.
CP1	**Personnel availability**	A Duty Pilot is available at all times to assist in port related incidents, or other agency e.g. Harbours Department or Police Maritime Unit in event of an incident. Marine Manager available to support duty pilot 24 hours.
CP 2	**Standard Operating Procedures**	
CP2.1	Limiting Parameters	UKC, wind limiting, crane position
CP2.2	Pilot/Master exchange	Passage Plan discussed prior to harbour transit, plans marked clearly on colour chartlets. Master left with port safety information card and contacts in emergency
CP2.3	Recommended track compliance	Pilots trained in Recommended Tracks and follow as matter of procedure
CP2.4	Pilot allocation/movement planning	Pilots allocated to vessels in accordance with qualification and experience e.g. criteria for Evans Bay tanker movements
CP2.5	Leading vessels to/from Area Delta	Heavy weather procedure if pilot unable to safely board outside
CP2.6	Use of outer boarding areas	Outer boarding areas generally used, seaward of area where ferries and PEC vessels join the leads in good weather
CP2.7	Berthing planning	20 metre clearance between vessels or 30 metres for tankers (Bylaw compliance)
CP2.8	Mooring guidelines	Developed for Wellington wind environment
CP2.9	Procedures for shore based operatives	Lines crew have safety culture and only take instruction from the Pilot regarding working lines

Risk Control	Risk Control Title	Risk Control Description
CP3	**Established practice and expertise**	
3.1	Marine Personnel experience and expertise	Pilots trained to national standards and progress through gradings as experience and competence gained. Tugmasters and launch masters also trained through comprehensive system. Lines crew trained and refreshers given in safe working practice
3.2	Management practice	Pilots have contractual out to avoid fatigue. An Employment Assistance Program operates to provide a form of welfare support for employees.
3.3	Interface with yacht clubs	Pilots have given talks on leisure vs large traffic situations and recently Pilot passage plans have been provided to clubs.
4	**Floating Plant and Shore Based Infrastructure**	
4.1	Tugs	Up to 3 berthing tugs available, normally 2. Fire fighting and salvage capability on 2 (limited pumping capability on 3rd tug)
4.2	Pilot launches	Well found high speed launches
4.3	Fendering	Various types in use at different berths, varying shock absorbing capability
5	Berth Refusal	In adverse weather or other extreme circumstance the port company may refuse berthage at a particular berth to a vessel

ANNEX G

KEY AREAS OF BYLAWS AND MNZ RULES MANAGING COLLISION RISK

1 MANAGEMENT OF COLLISION RISK BY BYLAW

The Navigation and Safety Bylaws 2003 Section 6.3 (Duties of persons in charge of motor boats, yachts, launches etc in Wellington Harbour) provided some key areas of collision risk mitigation worth recording.

As required by Maritime Rule Part 22, vessels of less than 20 metres in length or a sailing vessel must not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway. Vessels and craft of less than 500 gross tons are also obliged by Byelaw 6.3 to avoid impeding the passage of vessels over 500 gross tons. This applies to vessels at anchor as well as under way, meaning that a smaller vessel must not anchor where doing so would impede the larger vessel. This provision applies throughout Wellington Harbour Limits and stakeholder feedback suggests that it is not well understood by the majority of leisure users, especially the implication that a smaller vessel must navigate in such a way that risk of collision does not develop with the larger vessel. It therefore places a greater responsibility on the smaller vessel than simply 'giving way'.

Other parts of the Bylaws, also require all vessels to observe good navigational practice, such as the requirement to ensure bridge teams are adequately manned and that all aids to navigation on board are used to monitor execution of the passage plan. Vessels are also directed to join the leads inbound at least 2 miles off and follow radio reporting procedures which are designed to provide vessel movement information to other navigational users through Beacon Hill and general monitoring of the harbour working frequency, VHF channel 14. Bylaws therefore have considerable influence on traffic management.

1.1 MARITIME RULE PART 22, COLLISION PREVENTION

The Collision Prevention Rules apply to Wellington Harbour Limits in conjunction with the Navigation and Safety Bylaws. In particular Rule 9 'Narrow Channels' applies to the area from Makaro/Ward Island to the Entrance, recognizing that it is a relatively restricted channel width. The rule requires all vessels to keep as far to the starboard side of the channel as practicable. In practice it is practical for relatively shallow draught vessels, such as ferries, to normally proceed slightly to the east of the leading line when inbound, until abeam of Steeple Light. This practice is designed to allow a greater clearance between inbound and outbound vessels, but is not possible in the event of adverse southerly weather or if a deep draught vessel is present. Local Bylaw allows leisure craft to proceed down either side of the main shipping channel in parallel with it, crossing only when safe to do so.