



# **MARLBOROUGH SOUNDS HARBOUR NAVIGATIONAL RISK ASSESSMENT**

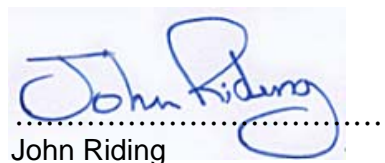
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**MARICO MARINE NZ LIMITED**

## MARLBOROUGH SOUNDS HARBOUR NAVIGATIONAL RISK ASSESSMENT

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## EXECUTIVE SUMMARY

This document reports a navigational risk assessment for the sea and Marlborough Sounds within Harbour Limits under the jurisdiction of Marlborough District Council in its role as Harbour Authority. The work comprises the first stage of introducing the changes required for compliance with the NZ Port and harbour Marine Safety Code. The scope was wide ranging, considering ferry transits in the relatively busy parts of Tory Channel and Queen Charlotte Sound, through to marine farm operations in Pelorus and Kenepuru.

A total of 84 hazards were identified at overview level. These were ranked according to risk using expert judgement underpinned by incident records maintained by the Marlborough Harbourmaster. Some risks at the significant level are present in the Sounds and risk control criteria recommend management be introduced within two years. Highest scored risks involve ferry transits past Tory Channel Entrance. It is estimated that the source of risk is 65% commercial and 35% leisure.

There are a large number of individual recommendations arising from this risk assessment, which are contained in the main body of the report. Section 7 of this document references key risk control packages, but the full list of Risk Control Measures derived is attached at **Annex C**. In order to prioritise and summarise the tasks ahead, the Authors have made the following conclusions and recommendations, which are not presented in any order of priority:-

1. This risk assessment has been wide-ranging and for the first time has evaluated relative risks associated with navigation on The Marlborough Sounds. These have been ranked in order of priority. The result leaves the Harbour Authority in a position where standing still is not an option.
2. Fundamentally, the Marlborough Sounds harbour system has some risks that have ranked as significant. Risk Control should be introduced within two years in accordance with the MSA Risk Assessment and Safety Management Guidelines. The prime sources of risk are associated with the passenger and freight services on the route to Wellington and the realisation of hazards involving themselves or caused by other vessels or craft.
3. In the order of 1.2 million people transit the Sounds on the ferry service to Wellington and it is in the public interest to introduce measures to reduce the frequency of incident reports involving ferry operations. Accordingly, recommendations are made for the Harbour Regulator to participate more in the management of navigational risk.

4. Marlborough District Council is recommended to commence the introduction of vessel monitoring within the Sounds. A strategy to achieve this in a cost effective manner has been presented at section 7.2. It commences with deployment of an automatic Ship Transponder at Tory Channel entrance, which will interact with equipment already fitted to ferries and other eligible vessels over 300gross tons.
5. In order to achieve effective vessel monitoring in the Sounds, Marlborough District Council is recommended to make changes to improve the organisational and external status and role of the Harbourmaster's department. This will involve moving it to a location providing direct interface with harbour users. A strategy to achieve this has been presented at section 7.1.
6. Marlborough District Council is recommended to introduce a Harbour wide communication system, primarily aimed at providing a Vessel Information Service for all commercial vessels transiting the Sounds. This would take over the present arrangements at Port Marlborough, Picton, and allow the terminal to concentrate on the shore based security role. Reasons for this recommendation are presented at section 6.5 and section 7.1.1.2.
7. Marlborough District Council is recommended to introduce a "ring fenced" harbour account and to budget and fund the system of Harbour Regulation from this. A regulatory charge should be introduced using the principle of "the risk imposer pays".
8. Pilotage succession planning needs to be considered in the near future. The Marlborough Sounds Pilotage System is presently independent of all harbour interests and this needs to change. It is recommended that consideration be given to either the Port Company or Harbourmaster system providing the contract for pilotage; this having no effect on the deployment of pilotage resources.
9. A package of further issues and recommendations for Pilotage is referenced at section 6.6. Some of these require taking forward to the MSA for consideration as they reflect the present status of Maritime Rules.
10. A review of the disposition and nature of Navigation Aids on the Sounds in general is recommended, given the findings of this risk assessment.
11. Improved signage and navigation channel markers are recommended at Havelock, targeted at the navigational education needs of the predominant end user, as opposed to terminology readily understood by competent mariners.
12. Introduction of an eight knot speed limit over the ground for Havelock entrance channel is recommended. This should be introduced after tidal flow rate in the Havelock entrance channel is confirmed.
13. A programme of hydrographic survey updating needs to be introduced in targeted areas of the Sounds. In the first instance, the Pilot Boarding area at the Northern Entrance needs to be surveyed.

Centralising information and survey records into a GIS package would be advantageous.

14. Marlborough District Council is recommended to proceed to introduce a Harbour Safety Management system and Harbour Safety Plan on the basis of the Risk Control Measures presented within this report.



## 1 INTRODUCTION

This document provides the initiating report for change to the Marlborough Harbour System 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 Marlborough District Council and Port Marlborough New Zealand Limited. This document should be used as a basis to develop a joint Harbour Safety Plan and ongoing harbour Safety Management System (SMS).

### 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 Marlborough Sounds Harbour Limits and rank these in order of relative risk. Measures for risk management of higher levels of risk were then derived from the findings.

The scope of this risk assessment included waters out to Harbour Limits for both the Queen Charlotte Sound Pilotage District and the Pelorus Sound Pilotage District as defined in the Marlborough Sounds Bylaws<sup>1</sup>. This implicitly includes operations to berths and marinas operated by Port Marlborough at Picton and Havelock. A diagram of the harbour extents is shown in **Figure 1**, Section 4.

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 routes and commercial activities ongoing in the Sounds.
- The varying environmental conditions at specific locations in the Sounds.
- The organisational structure available to manage any identified risks of significance.

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<sup>1</sup> Marlborough Sounds Navigation Bylaws, 2002, Schedule 1



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## 1.2 PREVIOUS RISK ASSESSMENTS OF RELEVANCE

A risk assessment of high speed craft operations on the Sounds was undertaken in 2000; this concerned high speed passenger operations and the options for regulating speed in the Sounds<sup>2</sup>.

The second, reported in March 2004, looked at wider safety issues in the Sounds and Tory Channel in particular<sup>3</sup>. It's Author, Commander. M Hadley concluded there were real risks associated with transits of Tory Channel entrance and there existed a strong case for monitoring both ferries and small commercial craft transiting Tory Channel in particular.

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<sup>2</sup> R<sup>2</sup>a, Melbourne, Australia: Risk Assessment of Queen Charlotte Sound, Ref 240-01, 2000

<sup>3</sup> Assessment Report From Survey Visit to Tory Channel

## 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 Guidelines. 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 first with personnel involved in both Port Company operations and those managing the Harbourmaster's department, including the Harbourmaster and Deputy Harbourmasters. Pilotage is an independent function on the Sounds and was considered by direct liaison with the authorised pilot undertaking most of the movements.

Companies representing commercial services provided to the recreational user were either visited or invited to attend one of the structured hazard review meetings. Those involved with other commercial movements, e.g. logs; marine produce; marine farms; craft building were interviewed on a representative basis. The Study Team also undertook familiarisation trips on leisure and small commercial craft as well as a significant number of transits on board ferries operated by the main ferry companies. Visits were made to most part of the Sounds, with Havelock being given specific attention over the speed limits for the harbour approach channel.

### **2.1.1 Risk Consultation Input**

Consultation meetings were held with the harbour team; port company; and individual groups of key harbour stakeholders. Other consultation meetings were held with MSA and Ferry interests in Wellington, February 2005.

A public meeting was held in Picton at Waikawa Boating Club in early March, 2005 which involved invited representatives from sail, powered and other water-based leisure clubs on the Sounds.

## **2.2 DOCUMENT STUDY AND INCIDENT DATA**

Publications and various documents relating to navigation within the harbour area were provided by Marlborough District Council; these were reviewed and used for hazard identification.

The Risk Assessment Team were also provided with incident and near-miss data covering the period from 2000 to 2004 from the Harbourmaster's incident database. Other significant incidents and their frequency were reviewed and taken into account. This information was used to assist in the initial compilation of the hazard lists (and also later in assigning frequency and consequence to the respective hazards).

## **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 series of structured hazard identification meetings, held in Picton and Blenheim. These involved senior harbour personnel familiar with marine operations and navigation within harbour limits, the Study Team and other stakeholders. 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 84 hazards were identified at overview level as being associated with navigational activities within the 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 structured meetings. The incident database records for the Harbour were reviewed to provide consistency and underpinning to the quality of hazard scoring.

Further meetings were held both in Picton and Wellington to seek wider stakeholder input from general leisure users and ferry company management. The scoring produced a ranked hazard list, which is available in ranked output at **Annex B**.

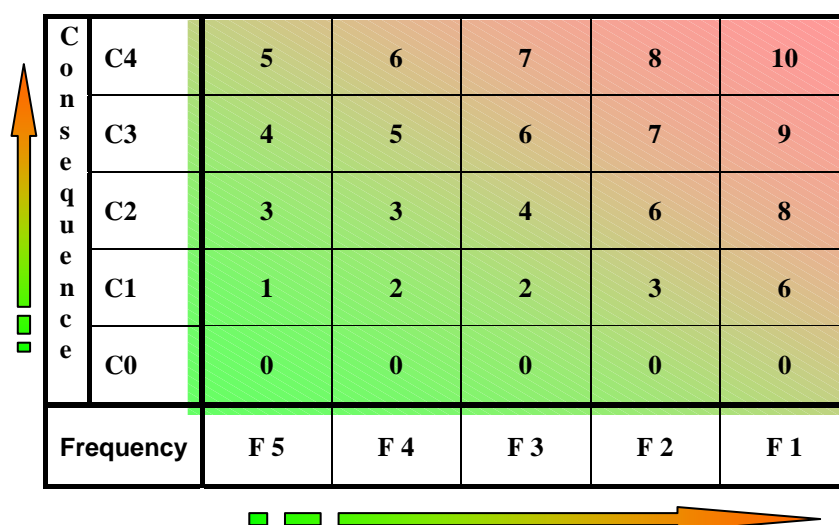
## **2.5 IDENTIFICATION OF RISK CONTROL MEASURES**

After the hazard list was generated and rationalised, a number of risk control identification meetings were held. These were then developed in relation to the key hazards as appear at the top end of the ranked hazard list. A list of the risk control measures as identified are attached at **Annex C**. The initial risk management package recommended is discussed further in section 7.

### 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 (i.e. impacts on: Life; Property; Environment; Harbour Stakeholders).



C o n s e q u e n c e	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

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 84 hazards, is produced in full in **Annex B**. This Ranked Hazard List describes the Risk Profile of the Harbour with regard to navigational operations.

## 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

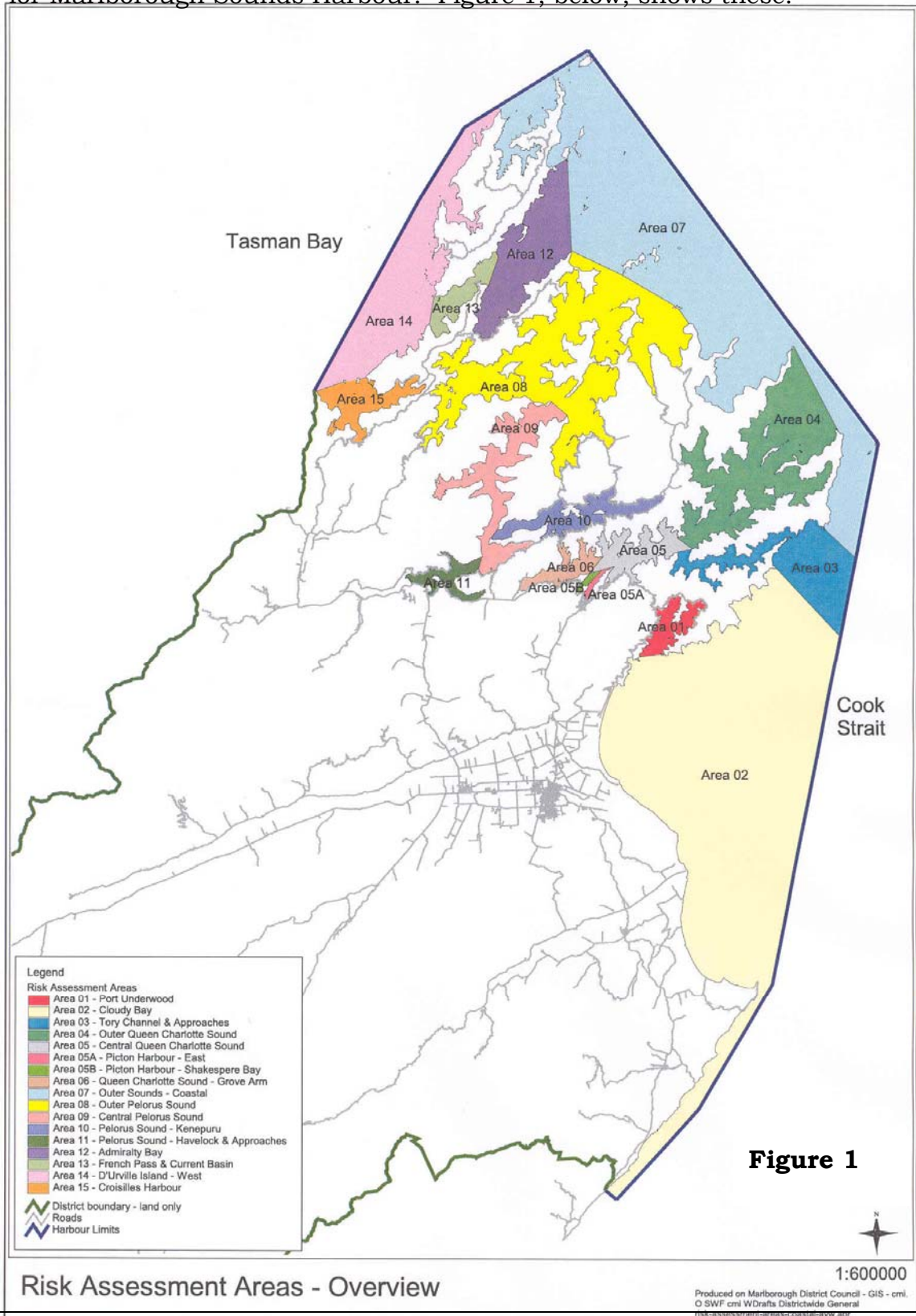
The NZ risk assessment guidelines recognise the existence of ALARP, but also recognise that risks need to be managed in a qualitative and comparative way in situations where the actual levels of risk are very difficult to determine. Part of the reason for this difficulty is that, whilst a Harbour Regulator (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 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. 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, but the Harbourmaster would be duty bound to facilitate entry if it was in order to uphold the principle of safety of life at sea. This however can be overridden by the Director of Maritime Safety.

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 MARLBOROUGH SOUNDS HARBOUR - RISK ASSESSMENT AREAS

To undertake the risk assessment, the Harbour was broken down into areas appropriate to the needs of the risk assessment. A total of 17 were derived for Marlborough Sounds Harbour. Figure 1, below, shows these.



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.

#### **4.1 MARLBOROUGH SOUNDS HARBOUR - OVERVIEW**

The Marlborough Sounds Harbour is both extensive and diverse. It has exposed coastal and inshore waters, areas of high tidal velocity, as well as relatively sheltered areas of the inner Marlborough Sounds. Accordingly a variety of marine environments exist, some of which provide natural hazards for the navigator; most notably exposed coastal sea areas directly influenced by weather systems in Cook Strait and narrow passages where strong tidal streams create extremely turbulent conditions.

The prevailing wind is from the north, however, winds flowing through valleys and over ridges results in local accelerations, variable direction and gustiness at sea level. As a result sailing is variable in the area; accordingly there is a predominance of power-driven vessels in marinas on the Sounds. The potential for uneducated leisure owners with high powered craft being involved in near misses and collision is reflected in the large number of incident reports.

Due to the low inputs from river systems sediment accretion to the Sounds is generally low and most sediment is caught either at the mouth or head, so that depths are relatively stable. However, some areas have not been hydrographically surveyed since the Second World War and actual accretion rates are unknown.

Navigational use within harbour limits is varied with a large range of vessel types including ships engaged on international and coastal trades, fishing and small commercial vessels, marine farming and supporting craft. The population of recreational craft has been rapidly growing, with increasing demand for berths, especially in Queen Charlotte Sound.

The Sounds may be divided up into distinct areas, these being the Queen Charlotte and Pelorus (including Kenepuru) Sounds, between which there is no channel, Admiralty Bay and Croisilles Harbour. The areas differ somewhat in physical characteristics, but more significant is the difference in the patterns of navigational use. Distinct patterns are evident, with the greatest range and concentration of use confined to the Queen Charlotte Sound and Tory Channel, with corresponding greater potential for conflict

between harbour traffic. Pelorus, Admiralty Bay and Crossilles Harbour are used more extensively for marine farming and large ships are generally absent from this area (with the exception of occasional cruise vessel and ferry visits into Pelorus Sound).

In other areas the range of vessel types is less extensive but potential navigational conflicts remains significant. The nature of the physical environment in several areas requires precise vessel handling and navigation, so that even where overall use is low, significant hazard potential may still exist.

The principal port for the Marlborough District is Picton, which is located near the head of Queen Charlotte Sound. Shipping includes ferries, bulk carriers (engaged on international and coastal trades) and visiting cruise liners. A resident fishing vessel fleet is supplemented during the Hoki fishing season over winter, and many small commercial vessels supply services to marine farms, residents in outlying areas and forestry activities throughout the Sounds. Lack of road access to much of the Sounds limits opportunity to launch trailerable boats. Water Taxis provide a vital link to remote properties.

#### **4.2 AREA 01 - PORT UNDERWOOD**

Port Underwood is a heavily indented inlet of approximately 6 miles in length which lies in a NE/SW direction. The port is relatively exposed in most wind directions and local wind acceleration occurs through orographic flow. However wave generation is limited in all but strong south-southwest winds. The bottom is sand or mud based with reportedly good holding in most conditions and the area can provide anchorage for cruising or small commercial vessels which have been caught in deteriorating conditions in Cook Strait.

There is a small resident population, a wharf at Oyster Bay as well as a number of moorings. In addition, there is a launching ramp of sorts, although Port Marlborough does not encourage its use. The predominant navigational activity is marine farm related, with service vessels from Pelorus Sound coming to work farms in the area. There is road access around the coast of the port but the next nearest launching ramp in use is located at Robinhood Bay, south of the Port Underwood entrance. Overall, leisure use is not high.

In the past groundings of fishing vessels have occurred through mechanical failure and vessels dragging anchor or moorings.

#### **4.3 AREA 02 - CLOUDY BAY**

The area is generally more sheltered than elsewhere in Cook Strait due to the inland topography from the north-west to south. However, the area is exposed to southeast winds and a large sea may develop during south-easterly gales. Port Underwood can provide a sheltered anchorage under these conditions and several anchorages are marked charts.

Navigational usage of this area is light, and comprises marine farming and associated vessels, and commercial fishing at sea. Leisure users tend to be local powerboat owners with launching taking place at Robinhood Bay or from private jetties in Port Underwood.

The Wairau River discharges into Cloudy Bay and has a shallow bar entrance with approximately 2 metres depth at HW, over which surf may break with tidal streams of between 3-5 knots opposing incoming swell. It is a dangerous area for small craft. A small number of leisure vessels transit the Wairau Bar and such craft have been overturned or swamped in adverse conditions. Other incidents have involved grounding of fishing vessels through mechanical failure, dragging anchor or mooring failure.

The main national power and communications cables come ashore in Fighting Bay to the North of Port Underwood, with this area under radar surveillance of a cable protection vessel operating in Cook Strait. The Marlborough Sounds incident records show this vessel has come to the assistance of distress and disabled vessels in this area on several occasions.

Larger vessels may from time to time anchor in Cloudy Bay (in water depth of 17 to 21 metres in muddy sand) after aborted attempts to enter Wellington Harbour in severe conditions, medical evacuations or by advice from Agents or Wellington harbour interests. The decision to anchor is not always shared with the Marlborough Harbourmaster.

#### **4.4 AREA 03 - TORY CHANNEL**

##### **4.4.1 Tory Channel Approaches**

Tory Channel entrance is the main route used by inter-island ferries for entering Queen Charlotte Sound; there are in excess of 8000 transits a year.



Navigational aids comprise a light on West Head to identify the entrance from Cook Strait, a set of leads located on Arapawa Island and a sector light on East Head to assist vessels turning onto and off the leads when in or outbound. Generally reported as adequate, the leads can be difficult to pick out from seaward during daylight in conditions of low visibility. The entrance can be difficult to detect for smaller vessels approaching from Cook Strait until a mile or two off; this is of lesser consequence with efficient radar.

Tory Channel entrance experiences strong tidal flows of up to 7 knots in springs. The south-east ebb can create a severe tide-rip at the entrance, slowing inbound vessels considerably. The entrance may be extremely turbulent where an ebb tide encounters a heavy south-east swell from Cook Strait. The flood has the same effect for low powered vessels, even where no appreciable sea is present. When inbound the tidal set swaps over from a starboard bow influence to the port bow when abeam of West Head, making the entrance difficult for inexperienced navigators. Vessels have been recorded to sheer off course unexpectedly when entering in southeast gale conditions.

The strength of tidal streams at Tory Channel Entrance; the narrowness of the channel (approximately three cables<sup>4</sup> on the leads); the presence of underwater hazards close to the track on either side; the short distance to run before making a 60 degree turn to enter or exit the channel entrance, all combine to produce an area where precise shiphandling skills and experience are a must.

Occasionally the entrance has been prudently closed by the Harbourmaster in severe weather conditions. Vessels have also been directed to use the Northern Entrance, usually owing to mechanical or other deficiencies. At times ferry masters elect to use the Northern Entrance to Queen Charlotte Sound due to severity of weather, in response to mechanical deficiencies of the vessel and for training and maintaining pilotage currency purposes.

Traffic protocol for the entrance is well established and a Controlled Navigation Zone is in place by Bylaw. A 10 minute call is required giving notice of entering the navigation zone and in the same call an ETA for passing East head is required. There is no external monitoring or traffic management operating in this area, other than ship to ship or craft. All

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<sup>4</sup> A cable is a nautical measurement of distance. There are 10 cables in a nautical mile, which is itself the length of a minute of longitude when measured at sea level on the equator (1852metres). A Cable is thus a distance of 185.2 meters.

vessels over 300 gross tons should now be fitted with AIS transponders, but a high installation standard is required for ferries to see each other throughout the Sounds. At time of tripping with ferries, not all had this system working successfully in the Sounds.

Radio coverage of the Picton Harbour Radio channel (VHF 19) is reported to be good in the area. However, it is reported that VHF channel 16 does not work particularly well.

Vessels other than ferries over 500 gross tons require Harbourmasters' permission to use this entrance. It is reported that some coastal bulk-carriers occasionally wish to do so.

#### **4.4.1.1 Tory Channel Entrance - Incidents and Issues**

There is a high frequency of close-quarters situations recorded (at least once a year) between vessels or craft inbound or outbound. This may indicate that many are not following or are misinterpreting the reporting requirements<sup>5</sup>. Furthermore, recreational vessels may be monitoring Channel 63, a local private radio channel resulting in each vessel being unaware of the presence of the other<sup>6</sup>.

Feedback from tripping with ferry masters draw conclusions that meeting a leisure craft (cruising or fishing) or even a commercial fishing vessel in the centre of the channel on rounding the bend inbound occurred to *each* watchkeeper about once a year<sup>7</sup>.

In the event of this becoming a close-quarters situation, larger vessels have little room to manoeuvre due to the proximity of navigational hazards and limitations imposed by the tidal stream.

There have been a regular number of near-groundings and groundings in the vicinity of the entrance over the years. Some of these have been potentially serious. The incidence of these does not appear to have been reducing over

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<sup>5</sup> A note on chart NZ6153 and 51 advises that "...all inward bound vessels must give way to all outward bound vessels". This note does not remind vessels of less than 500 Gross Tons they are obliged to avoid impeding the passage of vessels over 500 gross tons - a Marlborough Harbour Bylaw requirement -, and here some confusion may arise as to who has right of way at the entrance. NZ6153 and NZ 6154 both reference a 10minute call for East Head instead of entering the controlled Navigation Zone.

<sup>6</sup> The high volume of radio traffic on channel 63 discourages many ferry masters from broadcasting their 'All Ships' call on this channel, although this option is noted in the Pilot book and also in Bylaws, if deemed to be practicable; it probably is.

<sup>7</sup> Yachts under sail in light winds find difficulty clearing away when against the tide.



the years, which should be expected as technology and industry safety culture improves<sup>8</sup>. This data is made more important by a perceived reluctance to report incidents.

Fishing vessels top the losses at Tory Channel entrance; one suffered a glancing grounding and floated off only to sink on the line of the leads, the crew abandoned safely although the hull was never recovered. Another fishing vessel foundered there, with loss of all hands. The risk is only mitigated on the basis of the relatively small number of people normally on board a fishing vessel.

Incidents in the past have highlighted the need for vessels to issue an accurate ETA for entering the Controlled Navigation Zone and passing East Head, to allow for the effect of tide on the vessels progress, and furthermore to amend any ETA if necessary. The situation would be improved with a shore based real time monitoring system.

#### **4.4.2 Tory Channel - Inside Entrance**

Tory Channel extends in an east-west direction for approximately nine miles to link central Queen Charlotte Sound with Cook Strait, and is separated from the sound by Arapawa Island. The channel is winding, backed by steep relief on either side and the coast is generally rocky. The seafloor is mostly steep with navigable water existing in close proximity to land; fairway depths are between 35 and 65 metres.

Once inside Tory Channel Entrance, pilotage of a large vessel through Tory Channel is relatively straightforward if a high level of vigilance and positional monitoring is assumed. Constructions and natural features in the area provide reasonable radar targets assisting pilotage in restricted visibility. Although the channel is winding, there is approximately 4-6 cables width. A notable cross set can be experienced in the vicinity of Arrowsmith which catches many unawares and can be greatest mid channel. If not anticipated and countered, vessels are likely to take a sheer, possibly reducing the passing distance between any two vessels already navigating in relatively close proximity.

Wave generation other than at the eastern entrance is more limited than elsewhere in Queen Charlotte Sound. However, wind over tide can produce

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<sup>8</sup> In a number of European jurisdictions, improvements in both Technology and Organisational Safety Culture have resulted in measurable improvements in the rate of incidents or near hit occurrences. Both became the subject of research and marine regulatory targeting from the mid 1980s onwards.

seas which are dangerous to small craft between the eastern entrance to Tory Channel and Diffenbach Point.

Tory Channel has tidal stream influence throughout its length, which is reported at up to 4 knots. Streams are generally weaker to the west of Arrowsmith and diminish in rate towards Diffenbach.

Overhead power cables cross the channel at Arrowsmith and these can show on radar as a target resembling an approaching vessel. The alternative is that a genuine target in the area is diagnosed as the cable and disregarded<sup>9</sup>. The confusion reported by users has potential for contributing to collision or grounding incidents.

Yachts under sail against the tide can find areas of Tory Channel difficult to pass through in light conditions. Arrowsmith Point is one such place and Dieffenbach-Ruaomoko and Clay Point east to a lesser extent. Difficulty in crossing safely ahead of ferries ensues, especially if speed of approach is misjudged. Yachts, or low powered vessels with local knowledge, may attempt to gain speed by moving to mid-channel when going with the stream, as this is where the rate is highest, conflicting with ferries needing mid channel for sea room.

Drift fishing by charter or leisure vessels occurs off main headlands and can reduce sea room for ferries. Requirements are in place for a minimum distance off, however users reported that smaller boats can become unaware of how far out they have drifted.

Like many locations in the Sounds, power craft leisure users have a reported tendency to navigate from headland to headland at Dieffenbach to Ruaomoko and others.

A fairway exists for vessels of more than 500 gross tons under Navigation Bylaw 3.4. Such vessels are required by Bylaw to keep prescribed distances off salient points throughout Queen Charlotte Sound, including Tory Channel. In effect this creates an 'inshore' zone where smaller vessels should not normally encounter larger vessels. Smaller vessels are not prohibited from navigating further out, but should observe the relevant Bylaw and Collision Prevention Rules to avoid impeding the passage of larger vessels.

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<sup>9</sup> Charts show the presence of the power cable, but there is no note relating to the radar echo which can be produced. Regular operators in the area are generally aware of the qualities of the cable, however visiting vessels or leisure vessels, or fishing vessels not under pilot will not necessarily be aware.

#### **4.4.3 Tory Channel - Navigational Users and Activities**

Tory Channel has both catamaran and conventional ferries operating, with speed restrictions to 18knots for vessels operating under the IMO High Speed Craft Code.

In addition to ferry and shipping movements, fishing vessels regularly use Tory Channel on passage to Cook Strait fishing grounds, especially during Hoki season in winter months where the local fleet is considerably augmented by visiting vessels. Several larger fishing vessels (approximately 700gross tons) may transit the entrance with pilot exempt masters. Leisure use of the entrance is frequent with yachts and launches visiting from Wellington or local vessels engaging in recreational fishing in Cook Strait. Several charter vessels from Wellington visit the Sounds regularly and are of between 20 to 40 metres in length and a maximum size of about 350 gross tons. Cray fishing occurs within the entrance itself and adjacent coastline. By agreement with the Harbourmaster, the fishing industry has a voluntary initiative in place to manage the deployment of craypots. These are set on both sides with a 'fairway' of 75 metres each side of the leads being left clear for shipping; the initiative appears to work well. Notes are placed on relevant charts alerting vessels to their likely presence. However, this can present a fouling hazard to small craft which typically transit the entrance on the western side.

Marine farming is carried out in some of the bays leading off Tory Channel, although not to the same extent of development as in other parts of the sounds.

##### **4.4.3.1 Tory Channel - Incidents and Issues**

Most incidents are close-quarters in nature (i.e. near hits). Close quarters situations regularly occur between leisure craft and ferries, where leisure craft (normally powered) are navigating by a 'point to point' method, instead of keeping to the outer limits of the channel. This typically results in the leisure craft slowly converging with the ferry track at an oblique angle and altering course at a late stage to avoid the ferry. While the manoeuvre may be considered appropriate to the leisure user, on the ferry bridge there is often a period of considerable doubt as to the intentions of the smaller vessel. Other frequent occurrences are reported to be close quarters situations between smaller vessels proceeding at speed and meeting on rounding a headland. In both cases, incidents are more likely to occur during the summer months when the leisure load is highest.

Groundings have occurred throughout Tory Channel, most notably as a result of fishing vessel watchkeepers falling asleep or navigating on autopilot with watchkeepers absent from the wheelhouse.

Close quarters situations regularly occur between commercial vessels (large and small) and leisure vessels, this type of event being reported widely to the risk assessment team throughout the Sounds area (the majority of reports related to Queen Charlotte Sound and Tory Channel). Ferries approach blind corners from Diffenbach to Ruamoko and the presence of leisure vessels in mid channel (particularly yachts) contribute to close-quarters situations.

#### **4.5 AREA 04 - OUTER QUEEN CHARLOTTE SOUND**

The Outer Queen Charlotte Sound begins at the Northern Entrance to Cook Strait between Cape Koamaru and Cape Jackson and extends for approximately 12 miles south west to Diffenbach, where Tory Channel branches off. The bays and reaches in this section are generally wider than in the inner sounds, and in conjunction with the stronger winds occurring nearer Cook Strait it is possible for a sea of around two metres (significant height) to build up, particularly in south or south-easterly storms. Swell may be present in the outer limits of the area, although it rapidly dissipates as it travels south; its influence may be felt as far south as Long Island.

Tidal streams are weak and attain one knot (reportedly at most), although streams do set strongly across the entrance in association with the very turbulent waters found around Cape Koamaru.

The area is also relatively exposed to wind and sea from the north-north east entering from Cook Strait. These winds are also funneled by Motuara and Long Island although in some wind conditions the several larger islands in this area provide sheltered water. Between Resolution Bay and Cape Jackson the winds from the north or northwest are reportedly 10 knots stronger than further South. However insufficient fetch is available for any significant wave development. Some sheltered areas exist, mostly associated with the larger islands, particularly Blumine Island off the West shoreline of Arapawa Island. Patten Passage is occasionally used by small vessels.

In common with the rest of Queen Charlotte Sound, periods of fog are relatively rare. However heavy rain is regular and can create conditions of extreme low visibility. Shore based navigation aids are relatively few but the surrounding shore is free of residential development, making lights easy to

detect other than in periods of poor visibility. Lights are generally placed on the west side of the sound. There are only two unlit navigation aids from Cape Koamaru to Tory Channel along the Arapawa Island coast. The approach from seaward by night is not too difficult for vessels using radar; however there are no other references, such as leading lights. By day, White Rocks can be used in conjunction with the shore of Long Island<sup>10</sup> to provide a clearing line as marked on the chart.

#### **4.5.1 Water Depths and Topographical Hazards**

Between Cape Koamaru to approximately half the length of Long Island water depths are relatively shallow (less than 30 metres as opposed to the 30-50 metres elsewhere in Queen Charlotte Sound).

Controlling depths through the area are 13.4 metres west of Long Island and 19.2 metres to the East. There is a 13.1 metre sounding west of Motuara Island which is of significance as cruise vessels have been known to visit nearby Ships Cove and anchor in this area. Deeper draught vessels have now been directed to use the channel east of Long Island where the water is generally deeper<sup>11</sup>. This area is unlit by shore based navigation aids and as a consequence, piloted transits occur during the hours of daylight only.

For the greater part of this area the last hydrographic survey was by the HMNZS Elaine in 1942 although a section in the east closer to Koamaru was last surveyed in 1985 by HMNZS Monowai. Accretion rates are unknown but thought to be relatively low. The bottom is generally mud or a mixture of muddy shells or sand. Several dangerous rocks exist and are unmarked. These include 'White Rocks', a patch of small islets approximately one cable northwest of Cape Koamaru and 'Stella Rock' at 2.2m depth half a cable west of the Cape. Other dangerous rocks of uncertain depth exist to the North of Motuara Island and Long Island.

#### **4.5.2 Outer Queen Charlotte Sound - Navigational Users and Activities**

The Northern Entrance of Queen Charlotte Sound is used primarily by non-ferry shipping traffic including log carriers, visiting cruise ships and coasting cement carriers. This route to Picton is approximately 5 miles longer than the route using Tory Channel, (not including the additional distance to Cape

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<sup>10</sup> Long Island is a marine reserve and the Council may wish to consider improvements to Navigation aids in the area or move the boarding area further away.

<sup>11</sup> Action was taken during the risk assessment to limit transiting draught of vessels in the area pending hydrographic survey.

Koamaru) but ferries use this entrance when conditions at Tory Channel Entrance are extremely adverse.

Other use of this area includes occasional scallop dredging but more commonly it is a transit area for inshore fishing vessels and leisure vessels on passage to and from Wellington, Mana and Nelson. Barges servicing the forestry industry and marine farms operate throughout the area. Water taxis service resorts in the adjacent bays.

Ferry masters may also make the decision to use the Northern Entrance where the vessel has suffered a steering or propulsion defect. The Harbourmaster may also direct ferries to use the Northern Entrance under these circumstances. One company is known to transit the Northern Entrance from time to time for training purposes to keep bridge teams familiar with the route, although it is not required for keeping Pilot Exemption certificates valid. Vessels are known to go to anchor to the west of Long Island, typically ferries sheltering in severe gales from a southerly quarter.

Transits by the main shipping users would be in the order of around five a month on average including handy size log carriers, salt carriers, passenger vessels up to 250 metres length and cement carriers, generally around 3000GT. A woodchip trade is being considered and an outside possibility of coal in bulk as well. The Pilotage Limit is approximately 3.5 miles within the entrance and the Pilot Boarding Station is another half a mile to the South of this limit between Motuara and Long Island.

The typical range of leisure vessels are present; fishing; cruising; kayaking; sailing, throughout this area, although these are naturally in lesser numbers than in the central Queen Charlotte Sound due to distance from Picton and other launching points. Lone Kayakers have been reported by transiting vessels, these often only being detected at the last moment.

Commercial use of this area includes scallop dredging. It is a transit for inshore fishing vessels and leisure vessels on passage to and from Wellington, Mana and Nelson. Water taxis service resorts in the adjacent bays.

#### **4.6 AREA 05 - CENTRAL QUEEN CHARLOTTE SOUND**

This part of the Sound provides the transiting route to the terminals of Picton and Shakespeare Bay and can be one of the busiest areas of the



Sounds. The Central Queen Charlotte Sound lies northeast-southwest across the prevailing wind direction, providing limited wave generating capacity in north north-west winds. Sea breezes are at their peak mid-afternoon and during summer months can raise a short steep sea which can be dangerous to small craft. Paddled or rowed craft can also make slow progress. Northeast or southwest winds blowing down the Sound are not frequent but also generate short steep seas which can present a hazard to small craft. The tidal stream running through the central Sound area is generally less than a knot.

A large marina in Waikawa Bay provides berths for yachts and motor cruisers. Obtaining space is difficult and demand for further berths is reported.

#### **4.6.1 Pinch Points, Isolated Dangers, Incidents and Issues**

The area at Dieffenbach connects Tory Channel to Central Queen Charlotte Sound and there are many examples of close-quarters situations in this area recorded in the incident database. These have occurred between bulk carriers and ferries even where VHF communication has been established between vessels approaching this area. Conflict involving two large vessels arises where ships are outbound for the Northern Entrance and must cross Tory Channel at Diffenbach, from which ferry and other traffic may be exiting.

Dieffenbach presents a 'blind corner' where a northbound vessel has little time to detect the presence of and then take collision avoidance action with a vessel outbound from Tory Channel on her starboard side. Ferries exiting Tory Channel are engaged in a turn to port of approximately 90 degrees. To reduce the likelihood of these encounters, bulk carriers and other shipping bound for the Northern Entrance (including tugs and tows) are inclined to proceed up Queen Charlotte Sound on the north side and give Diffenbach a wider berth to create more time for collision avoidance action if necessary. However this is contrary to the navigational rules of the road (Collision Regulations) and introduces the need for a negotiated passage. Vessels are dependent on traffic information passed by Picton Harbour Radio at this point as well as inter-ship communications to manage potential conflicts.

Isolated underwater dangers are few in the Central Queen Charlotte area. However the presence of Luke Rock<sup>12</sup> opposite Dieffenbach constrains

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<sup>12</sup> Luke Rock is located on the north side of the sound nearly opposite to Diffenbach and marked by a beacon.



effective fairway width in this area. In addition, Perano Shoal lies approximately 1.8 miles west southwest of Luke Rock on the north side, with least charted depth of 4.6m. This shoal is currently not buoyed but has been in previous years. While the shoal is not normally within the fairway used by shipping, it presents a hazard to a vessel should loss of spatial awareness occur; or alternatively if the vessel is forced up to the north through manoeuvres to avoid other traffic.

Shipping traffic is directed by Bylaw to maintain minimum distances off salient points which (in effect) creates an unmarked fairway through the sound<sup>13</sup>. It is also practice for vessels heading west-southwest to keep to the north side or middle of the “fairway” and for vessels bound east-northeast to keep to the south. For traffic transiting Tory Channel this arrangement assists vessels in maintaining a safe passing distance on reciprocal courses.

Another area of conflict is ‘The Snout’ at the Waikawa Bay exit into Queen Charlotte Sound as it is blind to transiting and exiting traffic. Small craft rounding ‘The Snout’ from Waikawa Bay have been recorded to come into conflict with traffic (large or small) outbound from Picton Harbour. The smaller vessels are approaching the fairway around a blind corner.

There are also regular yacht races occurring across the central area of the ferry route. Consultation with ferry masters showed different interpretations of what manoeuvring options were available to masters, especially with respect to routing around the back of Allports Island.

Generally in this area, leisure craft are regularly reported to be involved in ‘typical’ navigational situations; close-quarters situations with other craft and vessels; reported disregard of the 5 knots limit within 200 metres of shore bylaw reported are common. Lack of compliance (or understanding) by leisure craft with fundamental requirements of the Collision Regulations is a widely perceived problem, with evidence of this reported regularly by commercial users and ferry bridge teams.

#### **4.6.2 Central Queen Charlotte Sound - Navigational Users**

This part of Queen Charlotte Sound is used by a wide variety of vessels and craft. Commercial traffic includes inter-island ferries, tug and tows, marine

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<sup>13</sup> Marking a fairway for ferries through the sound has been avoided by the harbour regulator as it limits the perceived sea room for a ferry to take close quarters avoiding action. Ferries can in any event remain in the effective fairway by discharging an agreed passage plan.

farm service craft, water taxis, bulk carriers and visiting cruise vessels. The Central Sound also supports a growing leisure load of all types, both seasonal visiting craft and those of residents of outlying areas.

#### **4.6.2.1 Central Queen Charlotte Sound - Sailing and Yacht Racing**

Waikawa Bay is connected by road to Picton and contains a large number of moored boats and a 500 berth marina operated by Port Marlborough. Over 50% of craft in the marina appear to be powered, reflecting perceptions about sailing in the Sounds. Keeler and trailer sailor yachts regularly participate in races organized by the local yacht club, with courses typically extending from the Snout across to Allports Island. This course crosses the fairway and reports of conflict with ferries are common. There have been no actual collisions to date, but some yacht racers obviously pass ferries inside the bridge to bow vision line (i.e. they cannot be seen by the ferry).

It should be noted that Ferries are able to route round the back of Allports Island if passage planning for a particular day facilitated this. Programmed yacht racing and associated liaison is likely to be of relevance to the passage plan.

Sailing vessels cruising in the Sound can elect to sail down the middle of the fairway as the winds here are steadier and severe gusts, which tend to issue from bays, have reduced in strength. That, of course, is where the fairway is located. Accordingly, yachts are more likely to come into general conflict with shipping on passage to and from Picton. Powered craft are more likely to come into conflict because of point to point navigation.

The Waikawa/Mana/Pelorus Boating Clubs maintain many moorings throughout the Sound and a significant portion of members join to gain access to these assets rather than for regular participation in club activities. Access to these members is mostly by newsletter.

### **4.7 AREAS 05A&B - PICTON HARBOUR**

#### **4.7.1 Area 05 A - Picton Harbour East**

Picton Harbour East provides the terminal for road and rail freight arriving from Wellington and experiences in excess of 8,000 ferry movements a year and around 1.2 million passenger journeys<sup>14</sup>. Like most ferry services,

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<sup>14</sup> The ferry terminal recorded 1,118,774 passengers passing through the ferry terminal for year ended 30.6.04. From July 2004 to the end February 2005, 813,202 passenger journeys were recorded.

passenger loads during summer are much greater than during winter. Coastal cement carriers are regular visitors, as are cruise ships in the summer months. Controlling conditions are the least depth off Rail Ferry Terminal 2 (10.7m), and the fairway has a minimum width of approximately 1.75 cables. Panamax sized bulk carriers have been berthed in the past at Waitohi wharf, but these vessels are now accommodated at the Shakespeare Bay terminal.

The prevailing wind is from the northerly quarter. However the strongest winds at the ferry berths can be from the northwest or southeast. Vessels are not permitted to berth at Waitohi wharf when wind speeds exceed 30 knots without prior permission of the Harbourmaster, but no such limiting condition exists for the other ferry berths. Tidal range at Picton is about 1.5m.

The Port of Marlborough operate 'Picton Harbour Radio' which records major movements to and from the berth, receives trip reports from inbound vessels prior to their entry into Marlborough Harbour Limits and also at approximately 10 minutes prior to entering the swinging area. The station also provides wind direction and strength readings obtained through instruments on the Long Arm. A systematic vessel information service is not provided but the known movements of vessels in and out of port are generally given, although this information is frequently reported as being incomplete by ferry masters. At time of the risk assessment Picton Harbour Radio was relocating to an entrance gatehouse on the road to Shakespeare Bay terminal.

Vessels over 500 gross tons are not permitted to exceed 12 knots south of Mabel Island, nor are such vessels permitted to overtake one another in this area during the hours of darkness or in restricted visibility. A designated anchorage exists in the area between Mabel Island and Wedge Point. This area is occasionally used, if thought to be clear of anchored vessels, by inbound shipping to avoid passing outbound vessels South of Mabel Island, especially during the hours of darkness in order to comply with Bylaws. Advance notice from Picton Harbour Radio regarding the presence of anchored vessels in this area is important for passage planning purposes. Ferries therefore can and do pass either side of Mabel Island, if the deviation is planned for safety reasons.

In addition to this traffic, a large marina provides berths for a considerable recreational fleet, local fishing vessels and water taxi operators. Some tug

and tow and barge operators also operate from Picton Harbour East. It is clear that if further berths were available, then leisure traffic would increase as considerable demand for space is reported.

A yacht club on the eastern shore caters for small centerboard yachts (up to 5m in length) which frequently race within the harbour. It is reported that there can be with up to 30 centreboard yachts on the water during weekend events, many sailed by children; safety boats are in attendance. The Club has a safety management system in operation, although there has been no involvement of the Harbour Regulator in its development.

Organized powerboat races take place within the harbour area from time to time.

Kayaks are hired both as guided tours and bareboat, and small powered craft are also available for hire from the foreshore. Kayak hirers were found to be mostly very professional, offering both instruction as part of the hire contract as well as good advice. Like all voluntary systems its quality relies on those that care and there is room in Marlborough for hirers with much lower standards. Kayaking is an important area of growth on the Sounds and the difficulties vessels or craft have in spotting them is well documented, not only in the Sounds but throughout New Zealand.

A number of yachts and some commercial barges are moored in the south-western corner of the harbour, with further moorings directly in front of the foreshore.

Swimming occurs from the foreshore beach area. Swimmers are separated from boating and shipping activity by the yachts moored off the beach.

#### **4.7.2 Picton Harbour East - Incidents and Conflicts**

Although collisions are infrequent within the harbour, the potential for conflict is high. Vessels with a range of manoeuvring characteristics operate at varying speeds; close quarters situations are regularly reported. Ferries have anecdotally reported small craft being 'washed off the bow wave'.

The swinging area is tight and wind can be very gusty and across the berth. Heavy contacts have occurred with ferries damaging wharf piles and setting plating in. Piercing of shell plating above the waterline occurred in one incident.

Ferries typically berth unassisted in most conditions, unless they have a system deficiency which affects berthing ability. Small independently operated tugs are available but require at least two hours notice and are unlikely to be available for a vessel which suffers a system failure while attempting to berth in adverse conditions. Ferries with defective bow-thrust equipment have been directed by the Harbourmaster to abort berthing attempts until the wind moderates. However such defects may not in the past have been routinely passed to Picton Harbour radio or to the Harbourmaster.

Near groundings have occurred in fog where berthing ferries have run off course in shaping up for the berth and strayed into mooring areas, in cases contact has resulted with damage to yacht rigging. Fog is relatively rare, occurring less than 10 times a year on average. The infrequency of fog has been held as a contributing factor in incidents which have occurred in the harbour, where bridge teams have not adjusted their watchkeeping procedures accordingly. This was evident in a contact incident as a ferry approached the wheelover position for swinging in thick fog. The Officer of the Watch was instructed to take up his mooring station forward, in keeping with clear weather practice, when deployment of the skill to assist the master in observing the radar and relaying information would have been a better use of the bridge team skill-base - the vessel subsequently ran on to contact a moored yacht and narrowly avoided grounding.

Traffic management in this area, and throughout the Sounds, is reported to be facilitated by Picton Harbour radio. In reality, it is achieved by watchkeepers on individual vessels monitoring radio traffic between vessels and Picton Harbour Radio. All users providing feedback into the risk assessment reported incomplete or inaccurate information regarding movements in the Sounds issued by Picton Harbour Radio. There are bylaw requirements relating to radio reporting but passing information of relevance to other vessels moving in the Sounds is an area of concern reported to the risk assessment team.

It can be difficult for vessels approaching Picton Harbour East to detect the navigation lights of vessels departing or navigating within the harbour at night due to background light from ashore. It is a common problem affecting many port and harbours, but is especially so in the case of yachts showing combined masthead lanterns, as the light tends to blend in with background lights. Bridge teams of incoming vessels may also be confused

by navigation lights continuing to be shown by vessels berthed at the various wharves, giving an appearance of being underway.

There has been a near miss incident involving a moored barge at night and a ferry passing round the back of Mabel Island. The role of Picton Harbour Radio is significant in providing such information. The option to relocate the designated anchorage was considered in the risk assessment and recommended.

#### **4.7.3 Picton Harbour – Shakespeare Bay**

Shakespeare Bay is adjacent to Picton on the west side of the bay and provides a bulk cargo loading facility for salt and logs. The wharf is 200m in length with depth alongside of 15.7m. The bay is approximately 2 cables wide with depths gradually shoaling at the head of the bay. Such deep water naturally occurring at a berth in New Zealand is rare and the potential for future expansion or for larger bulk carrier to visit should be considerable. The bottom is generally soft, composed of muddy shells. Yacht moorings exist to the south of the berth.

The majority of vessels using this facility are log carriers (specialist Bulk Carriers) of approximately 180 metres length. These vessels arrive under pilotage and are swung off Wedge Point and backed down to the berth with the assistance of a Voith Schneider tug of reported 24 tons bollard pull. The wind limits for berthing operations have not been documented but are thought by the pilot to be in the region of 20-30 knots owing to the limitations of the available tug.

Shore based beacons, one at the eastern head of the bay and another on the western shore provide guidance to berthing operations during the hours of darkness.

#### **4.8 AREA 06 - GROVE ARM**

This area generally experiences less wind than elsewhere in Queen Charlotte Sound and this, coupled with easy access to Picton has resulted in a large number of permanent and holiday homes. It is generally used by leisure vessels and small commercial operators but it is not unknown for ferries to enter the arm while awaiting a berth or for sea trials.

The Outward Bound Trust at Anikiwa near the head of Grove Arm operate open whaler type sail training vessels. These vessels usually operate in the



vicinity of Allports Island but may range as far as Long Island. Their safety record is good and a safety craft is in attendance. These vessels generally stay to the north of the fairway.

#### **4.9 AREA 07 - OUTER SOUNDS COASTAL**

The outer Sounds Coastal area comprises most of the seaward approaches to the Marlborough Sounds. Vessels transit this area, both passing the Sounds on passage to Nelson and to access any part of the Northern entrance to Queen Charlotte Sound or any part of the western area of the Sounds. It is remote and exposed and is best described by areas of note.

##### **4.9.1 Perano Head to Stephens and Western Area of D'Urville**

This area forms the western side of Cook Strait and with the exception of the area in the lee of Arapawa Island, is exposed to winds from all directions. Strong tidal flows, up to 4 knots in places combine with the shape of the seafloor to produce significant overfalls and rips in several areas, notably between Cape Koamaru and The Brothers islands. Narrow, navigable passages with strong tidal streams and turbulence exist between Stephens and D'Urville islands and Cape Jackson and Walker Rock (Stephens Passage and Jacksons Passage respectively).

The coastline along Arawpawa Island is steep and dangers, such as Awash Rock, are of an isolated nature. To the West of Cape Koamaru the coast is more indented and includes the entrances to the Queen Charlotte and Pelorus Sounds, as well as significant inlets such as Port Gore and Guards Bay. Several offshore islands in this area are of special conservation value and serve as predator free breeding grounds for native species such as Tuatara.

The sea area to the West of D'Urville Island is particularly exposed to wind and large swells from the northwest, and the presence of a group of unlit rocks known as the 'Beef Barrels', exists off the SW tip of D'Urville Island. Commercial vessels under 500 gross tons, fishing vessels and leisure craft transit the area off Admiralty Bay en route to and from the French Pass.

##### **4.9.2 Stephens Passage**

This passage between the northern tip of D'Urville Island and Stephens Island is a turbulent area with a strong tidal stream, eddies, rips and overfalls. A spring rate of 4 knots has been measured in the south of the



passage. Even in light winds steep seas can develop when the tidal stream opposes swell.

The main track through the passage leads between two rock groups, these being the Tower and Saddle Rocks which generally have disturbed water around them. Uncharted rocks have been reported and patches of dangerous rocks which are not easily seen also exist in several places. No shore based navigation aids are provided for transit of the passage.

A Bylaw now prohibits passage to vessels of more than 500 gross tons, subject to exemption; usage is mostly confined to local fishing vessels and leisure craft.

The NZ Cruising guide warns sailing vessels against transiting the passage under sail alone due to the turbulence likely to be encountered. The passage was previously used routinely by coastal trading vessels of around 1400 gross tons en route to Nelson (draught of 3-4m). Vessels currently on the run to Nelson from other ports now use the route north of Stephens Island due to Bylaw restrictions on the transit of Stephens Passage.

#### **4.9.3 Cape Jackson**

The west side of the Northern Entrance to Queen Charlotte Sound is marked by Cape Jackson. Strong tidal streams occur in the area and have been reported as attaining 4 knots with wind against tide producing short steep seas, hazardous to small craft.

A lighthouse on Jackson Head stands approximately 6 cables out from the Cape, with patches of dangerous rocks north-northeast and south of the lighthouse. Strong southeast and northwest going streams run through the area between the light and shore, and also to seaward of the lighthouse. Overfalls and eddies can be present.

Three sunken rocks at between 5m and 7m depth are spread out across the passage between the lighthouse and the cape.

Vessels of more than 500 gross tons are prohibited from using the passage through Bylaw. However in previous years small coasting vessels would routinely transit this area to save passage time. The passage lies outside the Compulsory Pilotage Limit for Queen Charlotte Sound.

Approximately 1.5 miles from the Cape lies Walker Rocks, a small islet of 0.9 metres elevation. To the east and west of Walker Rock are other sunken

rocks and the area is also subject to tide rips. Kelp beds can also present an additional obstacle to small vessels.

Leisure craft and small commercial and fishing vessels are the most probable type to use this passage, when transiting to Pelorus Sound or Nelson.

#### **4.9.4 Outer Sounds Area - Issues and Incidents**

There are known to be regular grounding incidents involving fishing vessels and leisure craft (at least one a year of minor significance), although reporting of incidents in this area is also not good.

In 1986 the Russian passenger cruise vessel MIKHAIL LERMONTOV grounded while attempting to navigate between Cape Jackson and Jackson Head. The vessel sank with the loss of one crew member. The wreckage lies in nearby Port Gore, the top of it being at a depth of 12-13 metres and is popular dive spot. To date four divers have been lost while diving this wreck - the base of the hull lies in deeper water. The Marlborough Sounds has a poor set of statistics when recreational diving is considered.

#### **4.9.5 Outer Sounds Area - Navigational Users**

Navigational use of this area is relatively light, although there are variations in the pattern of usage. The most frequent non-leisure users are fishing (including Cray-fishing vessels), marine farm service vessels on passage and coastal trading vessels of between 3000-6000 gross tons en-route to and from South Island ports. This traffic is not heavy; for example a Wellington-Nelson Ro-Ro service is weekly. Yachts and launches transit this area on passage to and from Paremata Harbour on the South West coast of the North Island, and there is evidence that the movement of larger yachts and launches through this area, while on passage to Nelson, may be increasing. Leisure vessels including kayaks use the area around the various islands as cruising and fishing grounds.

#### **4.10 AREAS 08 AND 09 OUTER AND CENTRAL PELORUS SOUND**

Pelorus Sound in comparison with Queen Charlotte is more winding with narrower reaches and generally shallower. This is especially so near the head of Pelorus where dredging is required to maintain the narrow approaches to Havelock, where tidal streams up to 4 knots are augmented by the discharge of the Kaituna River near the entrance to Havelock marina. The tidal range at Havelock is approximately 2.5 metres during springs.

Pelorus Sound is fronted by the Chetwode islands and winds about 25 miles south-southwest through several reaches with branching arms and bays with the port of Havelock at its head. At the entrance to the sound a swell may be present and steepened by a tidal stream of up to two knots. The surrounding land is steep and mountainous rising to elevations of over 900 metres, giving rise to strong wind gusts of variable direction and the development of deceptively steep seas in the reaches. This is particularly so in Tawhitinui Reach where the prevailing northwest wind is accelerated as it is funnelled over from Croiselles and the Current Basin. Southeast winds may also raise a steep sea and anchoring options for vessels seeking to await abatement in weather, are limited. Throughout the Pelorus area in general anchoring can be difficult, although many anchorages are detailed in the NZ Pilot and NZ Cruising Guide for various conditions.

Marine farming is the major activity in the Pelorus area with approximately 300 farms located in a 'ribbon development' pattern, occurring up to 200m from shore. The farms are required to be lit and marked with radar reflectors but can still present a hazard to vessels navigating by night or in poor visibility. Lights of varying standards are displayed and compliance is no longer actively measured, given the vast area to cover compared with the resources of the harbour department. At the same time however, marine farms can provide a breakwater of sorts for any craft attempting to shelter or anchor between the farms and shore, which is generally a distance of 50 metres.

A scarcity of shore based navigation aids and limited residential development in the Outer and Central Pelorus areas makes this area one where visiting leisure users can easily become disoriented. This is exacerbated by surrounding land lacking a great deal of variety in appearance (tending to be limited areas of native bush, pine plantation or farm land). Assistance for disabled craft or those in distress is limited to local vessels, there being no Volunteer Coastguard presence in this area. The local radio station provides vital communication to leisure and commercial craft using this area.

A major feature of the Pelorus area is the extensive ribbon development of marine farming and the presence of a large fleet of service vessels of between 15 and 30 metres length which operate from Havelock Marina. There is an absence of the shipping which characterizes Queen Charlotte Sound, and fewer fishing vessels transiting Pelorus, so that overall the pattern of

navigational use is dominated by marine farm vessels and leisure craft, these being both resident and seasonal visitors.

#### **4.10.1 Outer and Central Pelorus Sound - Navigational Users**

Navigational use is characterized by marine farming and attendant service vessels, most of which are based in Havelock. These tend to be self propelled barges, which range throughout the Pelorus Sound and transit to other areas of the Marlborough District Council Harbour Limits, depending on where they are required to harvest or seed mussel farms. Other commercial users are fishing vessels (trawlers) and scallop dredgers, both of these activities being seasonal.

The leisure use sector differs from that of the Queen Charlotte area in that most sailing vessels are cruising rather than racing; a significant number visit from the Mana Cruising Club near Wellington, although many do come from farther afield. Moorings are maintained throughout by local boating clubs which is likely to attract members who seek their use for summer cruising. Many members are seasonal visitors, normally resident in other parts of the country.

#### **4.11 AREA 10 - KENEPURU SOUND**

Kenepuru Sound extends 12 miles east-northeast from the southern end of Pelorus Sound. It is regarded as a good cruising ground being valued both for its attractiveness and sheltered anchorages. In general the western part of the Kenepuru is sheltered and difficult to pass under sail, while the rest of the sound is exposed to winds from all directions being funnelled and accelerated by the surrounding land.

By night the sound is very dark as there is very little in the way of obvious shore development, and it is easy for visiting vessels to become disoriented by night or in poor visibility. Although depths are generally more than 10m mid channel, there are many shallow areas and deep water is not available close to shore as is the case in many other areas of the Marlborough Sounds.

Early road development linking Picton with Kenepuru is probably responsible for the greater usage of Kenepuru as a holiday destination in comparison to the rest of Pelorus Sound. Currently there is a hotel with 20 berth marina and several lodges around the Kenepuru area and further

development is likely in the future. This potential needs to be taken account of in any ensuing navigational safety management system.

Navigational use of this area is characterized by log barges for local forestry, marine farms and their service vessels, tourist industry vessels and leisure craft, many of which are likely to be seasonal visitors.

#### **4.12 AREA 11 - HAVELOCK AND APPROACHES**

Havelock provides a small but vibrant port which serves the local marine farming, fishing, logging and tourist industry. The port operator is Port Marlborough who maintains a presence through a Marina Supervisor. The supervisor is based in an office adjacent to the marina and equipped with VHF radio. This is a roving position, so the office may not necessarily be manned throughout the day. Port Marlborough is also responsible for the local dredging program keeping navigational access to Havelock open. There are 340 floating berths in the marina which cater for vessels up to 30 metres length and 2m draught. In addition there is a commercial wharf with separate unloading areas for logs and marine farm products.

The port of Havelock is located at the head of Pelorus Sound on the west bank of the Kaituna River and near its confluence with the Pelorus River. The approaches to Havelock are shallow and follow the shoreline very closely in the vicinity of Cullen Point with a limiting depth of 2m in the approaches to the marina. A tidal stream of approximately 4 knots may be experienced during springs in the channel with local operators reporting that the rate may exceed this, possibly during periods of higher outflow from Pelorus River which may augment the tidal stream.

Due to the outflow of the two local rivers, freshwater inputs to the local waterway lower the water density near Havelock to considerably less than sea (1.025sg). Accordingly, transiting vessels are subject to greater sinkage than is the case further out. It is also likely that laden barges are experiencing squat conditions when navigating through the harbour approaches and at times are required to reduce speed to minimize squatting (interaction with the bottom) in the outer parts of the approach.

Approximately two thirds of the leisure vessels in the marina are power driven. There is also a launching ramp for trailerable boats. Navigational use of the area is set to increase with plans for further marina development in adjacent sites and the continued expansion of marine farming activity.

Radiation fog is often present in the early morning in the approaches to Havelock.

#### **4.12.1 Navigation Aids**

The channel is marked with lateral beacons with three extra marker poles recently established on the Western side of the channel near the marina entrance. Commercial operators report that the leads for entering the marina are difficult to pick out at night against background shore lighting. However, lights with a synchronised flash are fitted in the approach channel, which should already have gone some way to improving this.

There is a set of unlit leads on an extensive shoal at the entrance to Mahakipawa Arm which are marked on the chart as 'disused'. Local operators report that these leads are in fact still used and would benefit from being fitted with lights as they provide a reference for course alteration when inbound.

#### **4.12.2 Havelock Approaches - Navigational Issues and incidents**

The Havelock approach channel is narrow and shallow and the presence of large logs embedded in the otherwise soft bottom, provides an unusual hazard set. These logs are lifted off the beaches during high water springs or washed into the sea by river discharge, to sink and become lodged in the seafloor. Vessels running aground on these obstructions are likely to suffer far greater damage than would be the case for a soft grounding. There is a 5 knot speed limit in place in the channel which is in need of review as both commercial and leisure users report it being impossible to comply with because of the tidal set. Commercial vessel operators transiting the channel with the stream report that they are often unable to maintain steerage at a proper speed of 5 knots (as required through Bylaw) and therefore navigate at a higher speed to maintain steerage. Leisure vessels are reported to substantially exceed 5 knots when transiting the channel and to often fail to keep to the starboard side of the channel. Warning signs are in place to remind craft operators of these requirements, but on site inspection identified that these could be improved.

Limiting speed reduces wash effects in the narrow channel, but this is particularly important around Cullen Point which presents a relatively sharp and blind bend. This alteration of course also results in a period of steaming in close proximity to shore to follow the channel. Room to manoeuvre on meeting other vessels rounding the point is limited as is a barge's ability to stop when steaming with the tide, making this an area



where extreme caution is required. There have been incidents reported anecdotally at Cullen Point. These comprise collisions involving leisure craft; one person is reported to have landed on the deck of a struck craft.

Sound signals are not commonly in use for any type of vessel approaching Cullen Point. Some vessels make a 10 minute 'All Ships' call by VHF prior to rounding the point, however, a variety of VHF channels are in use and vessels so equipped are not necessarily monitoring Channel 16 (coverage of channel 16 is poor at best and the Channel of choice for commercial operators seems to be 66 or 65).

There is evidence that a non-compliance culture prevails amongst vessel operators out of Havelock which has been observed by harbour rangers while on patrol in the area and through discussion with local users.

#### **4.12.3 Traffic Patterns and Channel Constraints**

The general pattern of traffic is for marine farm vessels to depart by 0400hrs. Return times are subject to harvesting requirements as well as the time it takes to load the required tonnage, thus service vessels are liable to use the channel at any time during the day, usually from early afternoon. Most marine farm vessels are self propelled, however dumb barges are towed alongside through the channel.

Leisure craft out cruising or fishing are reported to generally depart and return during daylight hours.

#### **4.13 AREAS 12 AND 13 ADMIRALTY BAY AND FRENCH PASS**

There is limited information available at present about navigation in the area of Admiralty Bay. It is thought to generally comprise only local leisure vessels, visiting yachts or fishing related activities.

The narrow northeast-southwest channel of French Pass connects Admiralty Bay with the Current Basin and provides an inner route between Cook Strait and Tasman Bay which is shorter than the route to the north of Stephens Island by 15 miles as well as avoiding the cross sea which is often present there.

The main feature of this area is the pass itself, named French Pass or Te Aumiti, which lies between D'Urville Island to the North and Channel Point to the South. The fairway is marked by a mid-channel beacon and a lighthouse on Channel Point, where the width of the fairway is less than one



cable and depth is a minimum of 6 metres. Between the mid-channel marker and Reef Point on D'Urville Island is a drying reef with a passage used by small vessels with local knowledge at its Northern extremity (Fisherman's Reef).

A strong tidal stream which has been reported as attaining 8.5 knots in springs, sets either to the northeast or southwest through the pass where the narrow channel and seafloor irregularities cause eddies, especially in the northeast going stream. Vessels may be set towards the shore on clearing the pass. The shallow ground of Middle Bank is liable to change in position; it is marked to the southwest by a starboard hand mark and has depths of between 3-5 metres.

Tidal predictions are provided in the NZ Nautical Almanac giving the time and direction of set but these predictions are not considered totally reliable, owing to a lack of tidal observations for the area. By night or in poor visibility it may be difficult for approaching vessels to visually detect which way the tide is setting by observation of streams showing around the reef or mid-channel marker. If not detected at an adequate range to abort the approach there is the possibility of a vessel committing to a transit either stemming the tide or with a strong stream.

The dogleg approach to the pass is such that vessels intending to transit from opposite directions are not in sight of one another and therefore rely on broadcast and receipt of accurate VHF 10 minute 'All Ships' calls being made by those approaching. The NZ Pilot recommends that vessels transit at slack water or with the tidal stream; however the New Zealand Cruising Guide refines this further for smaller high powered craft, recommending that vessels with a speed of less than 9 knots should avoid stemming the tide through the pass. It should be noted that for the transit of the pass proper, ranges between commonly used references are too small for radar to be an effective aid to rate of turn and position, so that navigators must rely on visual references and possibly the assistance of electronic chart systems if considered sufficiently accurate.

#### **4.13.1 French Pass - Navigational Users**

Navigational use of the pass is limited to vessels under 120 metres length through Bylaw, subsequent to the grounding of a coastal Ro-Ro in 2000. Leisure users frequently transit the pass while cruising in the area or on passage to Nelson, similarly fishing and other small commercial vessels of

less than 500 gross tons regularly use the pass although actual frequency of transits is not known.

#### **4.13.2 Incidents and Issues - French Pass**

In addition to the grounding of a coastal Ro-Ro in 2000 there have been several incidents over the years involving vessels taking a sheer on transit and losing deck cargo in the subsequent heel, contact with the mid channel light and loss of life by recreational divers operating in the area. There has also been a vessel loss due to grounding immediately after transiting French Pass.

This area contributed to the (appalling) loss of life statistics from recreational diving in the Sounds (20 deaths in 12 years) three divers were lost in French Pass after being swept into the Pass area during a training 'drift' dive in close proximity to these turbulent waters.

#### **4.14 AREA 14 - D'URVILLE ISLAND WEST**

D'Urville Island West presents a steep wooded coastline with two particularly large inlets of Greville Harbour and Port Hardy, both of which offer anchorages to smaller vessels. Difficult sea conditions at the entrance to both these inlets are reported when a heavy swell is present from west to north, as these tend to break due to the influence of an irregular seafloor, which also causes eddies to form.

Greville Harbour is divided into inner and outer areas by a boulder bank through which there is a channel marked by unlit lateral beacons. A tidal stream in excess of 6 knots may be experienced through the channel in springs. The set is also reported to carry vessels towards the port hand beacon while an area of dangerous rocks extends northwards from the starboard beacon.

The 'Beef Barrels', a patch of rocks, some awash at low water exist off the southern tip of D'Urville Island. These rocks are referenced by a light on Okuri point to the south. Other patches of rocks or isolated dangers exist all along the coast with the majority unmarked and the NZ Cruising Guide recommends that vessels stay at least 100 metres off generally to avoid possible uncharted hazards.

The navigational use of the sea area around D'Urville Island West is leisure cruising by sailing vessels and launches. Port Hardy and Greville Harbour tend to be the most popular destinations. Kayaking is also reported all

along the coast. The area is relatively remote with approximately a dozen houses on D'Urville served by residents' craft.

## 5 KEY RISKS

There are 84 hazards in the Hazman database relating to the navigation in The Marlborough Sounds. In order to construct a risk assessment economically over such a large water area, the hazards are by necessity written at an overview level. They therefore represent “hazard groups” and it is doubtless that further hazards could be identified if the groups were broken down into variants. Most hazards are important in themselves and a considerable number score significantly on one or more individual risk categories. This should be borne in-mind when setting periodic review and when considering risk management implementation. Before considering the rankings, two points from the risk assessment should be borne in mind:

- The risk assessment has been populated using historic incident data and relying less on expert judgement. This leaves the assessment in a powerful but simple position to underpin its later recommendations for risk management.
- The risk assessment numerically reflects both present risk levels and the present status of risk control effectiveness on the Sounds. Adding further effective risk management can only reduce risk levels.

### 5.1 HAZARD RANKING

The top twenty ranked hazards are presented in summary form in **Table 3**, below. They are ranked by the overall average risk score, from which it can be appreciated the highest ranked hazard is posing “Significant Risk” on a weighted average basis (showing a rating of 7, 8 or 9 using the criteria in section 3.2). However, many of the risks in the top 20 also score appreciably in individual risk categories.

In many cases the hazards are scoring highly due to potential injury and loss of life if the risk is realised. Following the study risk assessment policy, Most Likely risks have been scored optimistically (i.e. most likely consequences have been scored lower). This is because a large number of near misses (near-hits) are recorded in the data. However, this belies the underlying frequency of incident reports, which in the opinion of Authors is in need of attention.

The full list of hazards, ranked by risk, are attached at **Annex B**. This report has not taken a course to consider hazards individually, but has

concentrated on Risk Control measures which should improve underlying incident frequency across the board. The Safety Management System can then begin to review these top 20 hazards and seek evidence of decaying risk levels.

Rank	Hazard Reference	Hazard Description	Overall Averaged Risk Score.	Most Likely Risk				Worst credible Risk			
				Life	Property	Environment	Stakeholders	Life	Property	Environment	Stakeholders
1	11	Grounding of Ferry at Tory Channel Entrance: Ferry off track and grounds within the Tory Channel Controlled Navigation Zone or approaches in either direction.	7.08	6	3	0	7	8	8	8	8
2	48	Ferry and fishing vessel in collision situation within the Tory Channel Controlled Navigation Zone and approaches.	6.40	8	0	0	8	6	7	2	6
3	79	Vessel over 120 metres length in grounding situation in narrow passage with strong tidal flows. This is possible in French Pass, Stephens Passage and off Cape Jackson.	6.24	0	6	3	7	4	7	7	7
4	18	Collision involving Ferry and leisure craft in areas of the ferry route, excluding Tory Channel and Approaches.	6.16	6	0	0	8	7	4	4	7
5	3	Collision involving Ferry at key headlands. Ferry meets leisure craft in centre of channel on rounding Clay, Heaphy or other blind headland.	6.16	6	0	0	8	7	4	4	7
6	40	Recreational fishing vessel or Leisure craft loses hull integrity while engaged in recreational fishing in Tory Channel.	6.07	6	6	6	6	7	4	4	6
7	83	Personal injury to recreational divers within the Sounds.	6.02	9	0	0	8	7	0	0	6
8	12	Fishing vessel grounds within Controlled Navigation Zone or in Channel.	5.9	0	3	3	6	7	7	6	7
9	73	Small vessel, leisure or commercial in contact with marine farm while navigating.	5.81	0	6	3	3	7	6	6	7
10	21	Person in water run over by powered vessel (swimmer or diver in path of a vessel or craft).	5.69	8	0	0	9	6	0	0	6
11	1	Two ferries in developing collision situation within the Controlled Navigation Zone	5.65	6	0	0	7	6	6	6	6
12	77	Fishing vessel in grounding situation in narrow tidal passage with strong tidal flow. This is possible in French Pass, Stephens Passage and off Cape Jackson	5.59	0	6	0	6	3	7	6	7

Rank	Hazard Reference	Hazard Description	Overall Averaged Risk Score.	Most Likely Risk				Worst credible Risk			
				Life	Property	Environment	Stakeholders	Life	Property	Environment	Stakeholders
13	10	Leisure craft in developing collision situation with another leisure craft in the Sounds generally.	5.59	6	0	0	6	7	6	3	7
14	35	Fishing vessel foundering in heavy weather while transiting Tory Channel Controlled Navigation Zone.	5.45	4	6	4	6	6	5	3	5
15	9	Vessels of any type approaching or departing Picton Harbour in developing collision situation. Scenario is affected by one or other vessel in process of manoeuvring. Hazard scenario can include leisure craft.	5.4	6	6	0	6	6	6	5	5
16	60	Yacht engaged in racing in developing collision situation with a ferry or other vessel over 500GT.	5.35	6	0	0	8	6	2	0	6
17	39	Kayak and power driven craft in developing collision situation.	5.29	6	0	0	6	7	0	0	8
18	15	Ferry and ship >500GT in developing collision situation while entering or transiting Central Queen Charlotte Sound	5.28	0	0	0	7	6	6	6	6
19	76	Leisure vessel in grounding situation in narrow passage with strong tidal flow. This is possible in French Pass, Stephens passage, Cape Jackson, Greville Harbour, but hazard relates to outer Sounds area generally.	5.24	6	6	0	6	6	4	2	6
20	74	Vessel greater than 500GT in contact with marine farm while navigating.	4.96	0	6	0	6	2	6	6	6

**Table 3 - Top 20 Ranked Hazards**

It is clear that the passenger ferry services feature at the top of the table and, perhaps inevitably, it is those services which are the source of highest risk. They become involved with leisure users and fishing interests on the Sounds and if either vessel or craft type were taken out of the equation, the risk levels would fall. That is not possible, although it does demonstrate that the sources of risk are dominated by ferry movements, but that ferries are not the sole source. A reasoned estimate is a 65 - 35% split.

## 6 STATUS OF PRESENT RISK CONTROL SYSTEM

This section of the report considers the existing risk management system and is designed to identify where improvements can be made, as opposed to attempting to map the effectiveness of existing risk management systems. This approach has been taken to reflect the identified needs of the Marlborough Sounds Harbour System. Although there are comprehensive and well thought out requirements in place on paper (i.e. Bylaws), the harbour regulator presently has little ability to measure the level of compliance with its requirements, or their true effect. Assessing the risk reduction available from improvement of existing measures is thus pointless until the harbour safety management system is introduced and capable of measuring such systems. In accepting this, the Council with its responsibility for harbour regulation will understand that standing still is not an option.

As introduced in the methodology section, the level of compliance (and thus effectiveness of the present risk control system) is at present mostly the domain of third parties. Even pilotage is an independent entity.

There are also some features (e.g. the higher proportion of engine powered leisure craft than sailing vessels) and other evidence (difficulty in regulating the Havelock approach channel five knot speed limit, which has been around for some time) that presently show a need for the harbour to have an increased regulatory presence on the water and feedback intelligence about its safety management system.

It has resulted in the recommendations arising from this risk assessment concentrating on the delivery of new but effective risk control measures, designed to make improvements on an incremental basis for the longer term. It will be a task of the safety management system to put in place the means to measure the risk mitigating effectiveness of all measures, and from the results of that measurement, update the harbour safety plan.

The overwhelming evidence strongly indicates the need to pull the harbour management system back together. Following that there is a need to introduce then risk control measures outlined in **Annex C**.



## 6.1 INCIDENT RECORDS

Incidents records normally appear at the beginning of a risk assessment report. However incident records also provide some guidance about the effectiveness of risk management in a harbour.

There are about 200 incidents and near misses recorded on the Marlborough Sounds each year (although this is naturally a fluctuating figure). Many of these have lower consequence outcomes, although there is an ongoing perception that reporting is low and that true incident rates are higher. It is difficult to comment on reporting rates without significant local knowledge, but the intelligence links retained by the present Harbourmaster to third parties is recognised in this report to be positively influencing reporting.

A fundamental conclusion that can be reached from the incident reports is that there are far too many incidents of note, which are occurring annually. This annual frequency of return provides a general heightened average risk score across many hazards, which is underpinning a need to allocate resources to understand why incidents occur at this frequency. It is also significant to find that incident rates have not been falling over the years as has occurred in other parts of the world as societal tolerance to accidents generally has hardened; compensation has risen as has potential liability. Of underlying concern is the rate of incidents and near misses that are recorded for Tory Channel entrance. The fact that these are not decaying in frequency should be a cause for concern for the Harbour Regulator. Accepting the status quo is not an option as the data is demonstrating, with some clarity, that sooner or later one of these “near hits” will result in an accident involving a vessel with a large complement on board. What should be noted is that improvements will require action by vessel operators to improve ISM Safety Management systems as well as action by the Harbour Regulator. This risk assessment report can only consider action that the Harbour Regulator should introduce.

**Table 4** shows the incident record extract for January and early February, 2005. Incidents have been given three categories in the Marlborough Sounds incident database; Safety Incidents (S.I.); Navigational Occurrences (N.O) and Pollution Incidents (P.I.). The shaded records are those which harbour staff had time to investigate.

Incident	Incident Reference	Date	Cat	Summary
Reported oil slick between Arrowsmith and Clay Point	399	8/01/05	P.I.	Outbound ferry reported nothing seen
Grounding	400	8/01/05	N.O.	Vessel grounded Fern bay, Kenepuru. MSA investigating
Navigational Hazard	401	9/01/05	S.I.	Floating mooring line, Picton harbour. Mooring weighted and sunk, Owner advised
Close Quarter	402	6/1/05	N.O.	Small vessel crossed bow of Incat 046 at close range during berthing manoeuvre
Close Quarter	403	9/01/05	N.O.	Ferry passing yachts engaged in regatta at close range
Fire/Explosion	404	11/01/05	S.I.	Large amount of smoke reported from anchored Seatow barge. Investigated, false alarm.
Diving	405	11/01/05	S.I.	Paua diver reported being run over by small outboard powered vessel
Contravention of Bylaws	406	16/01/05	S.I.	Non-observance of speed limit by jet-ski within 200 metres of shore, non-use of observer while skiing
Collision	407	17/01/05	N.O.	Collision between 2 vessels in Tory Channel
Berthing/Manoeuvring	408	16/01/05	S.I.	Loss of propulsion in outer Sounds
Close Quarter	409	15/01/05	N.O.	Launch cut across bow of ferry in vicinity of Dieffenbach
Mooring Failure	410	18/01/05	S.I.	Runabout found drifting in vicinity of Mabel Island – origin Grove Arm
Contravention of ROR	412	10/01/05	S.I.	Several boats reported as failing to exhibit appropriate navigation lights. In some instances, no lights were exhibited
Grounding	413	3/01/05	N.O.	Charter yacht grounding Ruakaka Bay
Public Nuisance	415	11/01/05	S.I.	Moorings interfering with jetty approach
Close Quarter	418	20/01/05	N.I.	Small vessel on line of Tory Channel Entrance leading marks, impairing ferry's approach
Contact (with wharf)	419	20/01/05	N.O.	Inbound ferry in contact with Waitohi wharf during berthing manoeuvre
Collision	420	24/01/05	N.O.	Windsurfer and small vessel in collision
Navigation Hazard	421	31/01/05	S.I.	Large, semi-submerged log in vicinity of Bob's Bay
Excessive Speed	422	29/01/05	S.I.	PWC operating at excessive speed in near-shore area
Excessive Speed	423	3/02/05	S.I.	Unidentified small vessel speeding in an area where divers were active
Collision	424	03/02/05	N.O.	Moored vessel sustained collision damage while on mooring
Wash	425	21/01/05	S.I.	Wash generated by commercial vessel operation
Grounding	426	10/02/05	N.O.	Vessel struck 'uncharted' rock
Grounding	427	13/02/05	N.O.	Vessel grounded leaving anchorage area

Table 4: Incident Record for January and Early February, 2005

**The type and nature of incidents recorded are such that (from undertaking a risk assessment) any Harbour Regulator would find a need to respond with improvements.**

## **6.2 BYLAWS**

Marlborough District Council have regularly reviewed their Bylaw requirements and the system is both comprehensive and relatively easy to understand. This process is driven by a proactive Harbourmaster, and detailed requirements for reporting for ferries are already in place. However the process of Bylaw modification is lengthy. There is no system of General Directions<sup>15</sup> in use, yet the Harbourmaster has recognised powers to make Special Directions to ships. From a review of Part 39A of the Local Government Act (LGA), 1974, saved into the LGA 2002, it would appear to Authors that the ability to provide for Directions is general in nature. Thus it would appear that the Harbourmaster could introduce a system of General Directions to complement Harbour Bylaws.

## **6.3 SIGNAGE AND AIDS TO NAVIGATION**

Signage at launching points on the Marlborough Sounds is reasonable. However signage on the water in general is in need of review, especially at Havelock. For example, the Havelock approach channel speed limit, although itself in need of review, could be dramatically improved with improved signage focussed on the type of messages needed by an uneducated power craft user - perhaps one of the predominant problems facing the Sounds into the future.

### **6.3.1 Navigation Marks in General**

Navigation marks are available and often lit, especially on the main shipping routes. Where they are placed, they are all kept in good order and response is readily available should one go out. The risk assessment has identified a need to review those deployed at the Port of Picton, where a turning reference should be considered as ferries swing to both Port and Starboard in differing weather directions.

However the remainder of the Sounds are not so well populated with Navigation aids and the present deployment of these should form a separate review by the Harbourmaster's Department. References for boarding at Long

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<sup>15</sup> General Directions are in effect a list of standing orders which vessel must comply with when navigating within a harbour. They can be reviewed regularly and do not need a lengthy process for their introduction on safety grounds.

Island and in relation to the Northern Entrance waypoints should be considered.

### **6.3.2 Channel Markings at Havelock**

Havelock was given special attention during the risk assessment and signage has been referenced already. The Havelock entrance channel obviously suffers from wash and speed problems, probably also squat by the larger vessels using the Harbour. The channel is narrow, but as yet it is only marked on one side. The narrowness of the channel will be emphasised at high water if the channel was marked on both sides (but not necessarily gated). This is likely to influence a reduction in speed.

## **6.4 THE REGULATOR – HARBOURMASTER’S ORGANISATION**

Like many harbours in New Zealand, the Harbourmaster function has been separated from the terminal operations. The role presently resides under the wing of Marlborough District Council, a Unitary Authority. Compared with Harbours around the world, the New Zealand Harbour system is fragmented and Marlborough is no exception. The Harbourmaster is not presently in the flow of information about movements in the Sounds. Given the sheer geography of the Sounds, achieving this should have a priority of risk management.

In 2004 a harbour patrol craft was procured and harbour rangers employed for the 2004\5 summer season. This has had a positive effect, although the risk assessment shows there is an uphill climb to educate many leisure users about the basics of navigation. A presence on the water by the “Harbour Authority” is an important way of raising awareness of navigational issues and circulating information amongst the leisure users. Given the risks identified, it is disappointing that this service cannot as yet be funded on a permanent basis.

The Harbourmaster role presently reports to second tier management in the Council. In Authors’ opinion, it should be an entity in its own right, assuming the role remains within the Council. The income to rate payers from the Port Company is important to the Council and liaison occurs, as would be expected, at Chief Executive level. The system managing Harbour risk is critically important in securing the safety of the trades and activities that provide income to the public purse. The Marlborough Sounds are geographically extensive and requires a larger department if the harbour regulator (i.e the Council) accepts this report’s recommendations to manage

navigational risk on the Sounds. It appears from the data to have little choice in this. In properly introducing the requirements of the Port and Harbour Marine Safety Code, it is inevitably that the present management arrangements will change. A measure of societal risk associated with 1.2 million annual passenger journeys provides both justification and a low cost of change if measured by passenger journey.

In introducing the Code, the Harbour Authority will be responsible for deriving policy and the role of the Harbourmaster will involve delivery to the objectives of that policy. A role that is at the policy setting level in any organisation needs direct reporting access to the appropriate levels of the Council Organisation. Organisationally, we would therefore expect the Harbour Regulator to evolve into a department itself, like other Council departments, reporting directly to the Chief Executive level of the Council Organisation. This does not mean that the Harbourmaster would neither be part of the Executive Management Team for all Council functions, nor that additional CEO time would be needed to provide the Harbourmaster with management. However, such an arrangement would reflect present arrangements whereby there is some direct Harbourmaster\CEO liaison. This is compatible with the Port and Harbour Marine Safety Code, which recommends a direct reporting link to the highest level of management. What the Marlborough system perhaps has on an informal basis can thus be formalised to better effect. Authors also understand that in reality, there is limited liaison between the Harbourmaster function and the next level of management, except for budgeting or funding issues. If a ring-fenced harbour account was introduced (see section 7.1.1.1), Harbourmaster responsibility and accountability for that would also be direct.

In addition to this, the system would be better served if the Harbourmaster had direct access to technical marine expertise for two-way brainstorming when solutions to harbour problems need to be developed, sometimes rapidly. This could only improve decision-making recommendations to Council<sup>16</sup>.

In order to start the process of raising the profile of the Harbour Regulator, it cannot be hidden away at the rear of a small library. An exercise during the summer months asking leisure users at Picton Marina about what the Harbourmaster did and where he was located showed how little knowledge

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<sup>16</sup> This was one of the potential strengths of the old Harbour Board system design intent in that it facilitated a concentration of marine expertise that comprised the “Harbour Authority”, which gave reasoned input into Harbour Regulatory decision-making.

existed. Only one person approached knew a Harbour Office existed in Picton but even that respondent did not know where it was located. The harbour system needs a public interface and the Council is recommended to seriously consider moving the whole department into a location that provides the harbour regulatory function with an office having direct access by the public and harbour users alike. There are a number of potential options that would achieve this in Picton. The Harbourmaster's department needs to establish a status amongst users that presently is missing.

## **6.5 COMMUNICATIONS - PICTON HARBOUR RADIO**

Picton Harbour radio was the subject of the hottest feedback from the process of consultation with users. It stood out as an item that all commercial operators considered to be a high priority item for improvements arising out of the risk assessment. Feedback was provided by ferry masters and other commercial users, e.g., log barge operators. Ferry masters were supported at consultation by a similar response from ferry management representatives. Leisure users had little involvement with the service and did not comment (however, the alternative Marlborough Marine radio was valued by fishing and leisure users alike, especially in Pelorus and Kenepuru Sounds).

As introduced earlier, ferries report their position to Picton Harbour radio and it is tasked to respond with information to all. A systematic vessel information service is not provided from Picton but the known movements of vessels in and out of port are generally given. Many masters and users reported problems created by incomplete or inaccurate information. Log barge operators expressed some frustration at calling the service to advise letting go and positions passed during transit; information was then not passed on to other users calling Picton Harbour Radio. A number of operators also referenced problems with no response or delayed response when calling the radio service. A number also referenced inaccurate environmental information.

The liaison with shipping moving on the Sounds is presently undertaken by a multi-tasking team based at Picton ferry terminal. There is little doubt that those operating the service are doing their best, but when in a multi tasking role, tending moorings or undertaking security duties, they are often relying on memory and their perception to provide information to vessels moving within the Sounds. There is no method of knowing the location of any vessel other than by voice calling. The importance of accurate



information for vessels approaching each end of Tory Channel cannot be overstated and a number of masters have cited an increasing leisure population on the Sounds and the need for dramatic improvements in communication.

The role at Picton was originally intended to provide information to ships heading to and from the berth. With their redeployment to a security gatehouse away from the ferry berths, the time has come for introducing a system dedicated to shipping movements in the Sounds. This would replace the existing system, not duplicate it.

There is an option to explore the use of Wellington Signal Station resources to do this, but without installing radars to provide complete coverage of the Sounds (or at least the Queen Charlotte and Tory Channel) it is unlikely that Wellington Signal Station could be any more effective. At least four linked radars would be needed; set up costs in the order of \$1-2M would be realistic. If Wellington took on a wider role, training of Wellington operators to a recognised VTS standard would be required as well as a system upgrade at the Signal Station. Limitations associated with loss of local knowledge by remotely sited operators would also need to be addressed. However, it would be possible to achieve this technically and, if cost effective, it is an avenue to explore.

## **6.6 PILOTAGE**

Pilotage is an area in which the port and harbour experience of the Authors was used directly in the review of harbour functions.

Pilotage is supplied on the Marlborough Sounds by an independent pilotage company, which also supplies pilotage services to users of Port Nelson. The service is used exclusively to bring vessels into Picton and Shakespeare Bay. Training, assessment maintenance of currency and licensing of Pilots (and PEC holders) is now the domain of the MSA via the appropriate part of Maritime Rule Part 90<sup>17</sup>. The pilotage service is contracted directly to the ship owner and is not discharged on behalf of either the harbour regulator or the port company. Vessels needing to use the service of a pilot contact the pilotage company directly via local shipping agents. The Harbourmaster function may thus not even be aware of a piloted movement prior to its completion (when the vessel is delivered alongside). Accordingly, there is little guidance or liaison between Harbourmaster, Port Company and pilot

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<sup>17</sup> Maritime Rule Part 90 is due for review by MSA in 2005-2006 financial year.



and the pilot takes all (or most) of the decisions to proceed to anchor or to and place a vessel alongside the berth, as contracted by the owner. It is the case that occasions have arisen where Harbourmaster advice to the pilot would have been beneficial prior to a movement occurring. Pilotage is a key risk control measure available to a harbour and the system in Marlborough is presently disconnected and fragmented.

There is little doubt that the pilotage service itself comprises highly experienced, professional and competent individuals. However there is as yet no succession planning and both the partners of the Pilotage Company would reasonably be expected to seek retirement within five years. A serving master occasionally provides relief pilotage, but it is reported this individual is not likely to leave employment with a shipping company to commence fulltime pilotage – the returns overall are low due to unconnected factors at Nelson. There are no young pilots under training with the Pilotage Company, nor is there a programme of wider knowledge updating or ability for simulator training where movement experience may be low. This is not a healthy situation and is one that the Authors of this report have come across before; following a serious Grounding Incident at the harbour in question it was found the harbour had no management control over pilotage criteria, training, health or succession. The present system of totally independent pilotage may be seen as liability avoidance in the event of a mistake; however this perception of liability avoidance will be of little value in the aftermath of any serious incident involving a piloted vessel.

At present the pilotage system is reliant on the long term experience of individuals. There is no problem today but the system will become increasingly vulnerable to accident likelihood as time passes.

#### **6.6.1 Pilotage Contract**

Where pilotage is independent (and the Authors have seen independent pilotage systems working very well), it is strongly recommended that the contract for pilotage should be either via the port company or via the Harbourmaster's department; this having no effect on the rights of Authorised pilots to access the work they are trained to undertake. Reasons for doing this are many, but some points in favour are:

1. It brings together the key functions of pilotage and port or harbour interests – pilotage is not left 'doing its own thing'.
2. Decision-making for unusual vessels will always be between the shore interface and pilotage system, and not interests associated with

- ownership of the vessel – these are very different interests when difficult decision-making is required.
3. The pilotage system is never placed in any conflict of interest where proceeding to deliver a vessel to the berth may be in the commercial interests of the vessel, but not in the safety interests of the harbour (port company or harbour regulator). In reality, this does happen.
  4. It provides guarantee of the communication flow between the contracting organisations.
  5. It involves harbour management interests in pilotage (a fundamental movement risk management system) and the planning for the ongoing health of the system is not left to an organisation with limited resources, whose primary interest has to be to earn a living.
  6. The wider resources available to the harbour system can provide proper training and competence updating.

Reasons against doing this are hard to find. However the present system:

1. Probably provides the shipowner with minimal cost (but to the potential detriment of training and succession planning).
2. Leaves the pilot duty-bound to provide advice to the ship's crew to take the vessel to any part of the Harbour with the tacit acceptance of all other harbour stakeholders. Sometimes this can involve taking a vessel through or to inappropriate and higher risk parts of the harbour.

#### **6.6.2 Pilotage Currency, Training and PEC Criteria**

Systems to monitor currency need to be considered as well as structured pilot procedures and training requirements for Authorisation to unlimited status.

Succession planning and training of pilots should be an area in which any Harbour Regulator has a significant stakeholder interest. It is one which the Marlborough Harbour Authority and Port Company stakeholders need to address as soon as practical.

It should not be forgotten that a ship's master gaining an exemption licence is actually conducting an Act of Pilotage on each transit through the harbour. Given this, the present system of PEC holder eligibility appears, to the minds of the Authors, flawed. There are significant navigational and ship handling skills needed to be acquired to transit Tory Channel Entrance; this is different to navigating the Sounds from, say, the Northern Entrance. The number of trips required to be eligible for a PEC licence (or for that

matter a pilot unrestricted throughout the Sounds) should be set in relation to the local conditions and the number of transits needed to acquire the necessary skill base. Furthermore the present system of ongoing currency, both to maintain PEC status and Pilotage is open ended (i.e. other than exercise of privilege, there is no requirement for ongoing periodic skill validity check trips for currency). The number of pilotage trips needed to maintain PEC or Pilotage licences are in need of review in relation to the difficulty of pilotage in each area of the Marlborough Sounds. In waters such as these, the Authors would expect to see both practical and oral examinations in place for pilotage assessment. The ability for a vessel master to apply for an exemption licence after only three transits in and three out<sup>18</sup> is inappropriate for some areas of the Sounds (e.g. Tory Channel entrance). Such criteria need setting with regard to the difficulty of the pilotage transit, which is different in different harbours.

Pilotage limits for an entrance such as Tory Channel would also be better considered on a length criterion (length is more applicable to pilotage as length is directly related to the time take for a vessel to swing through a set number of degrees). It is also recommended that more onerous size limitations be set for pilotage and PEC limits at Tory Channel than at the Northern entrance to the Sounds.

It is recognised these issues reflect national requirements for New Zealand, which may have been centralised for good reason. However, the Marlborough Harbour Authority is recommended to pass these recommendations on to the MSA as a result of this risk assessment and commence developing the criteria needed for pilotage in the Marlborough Sounds.

### **6.6.3 Pilot Boarding**

The present pilot boarding area at the Northern Entrance is close to Long Island, which is a marine reserve. In this location, significant shelter is obtained as the boarding area lies somewhat down the outer Queen Charlotte Sound. Long Island also provides shelter. However, there is reduced sea room in the location, limiting the margin of safety if mechanical failure occurred or confusion by the bridge team occurred. Moving the pilot boarding area in the Northern Entrance further out is an option as there remains a significant area of relatively sheltered water. Consultation with

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<sup>18</sup> Three trips in and three out was the PEC criteria in place at Milford Haven, UK, prior to the SEA EMPRESS grounding. This was later radically changed.

Pilots about this and the need for additional navigation aids should be initiated.

## 7 RISK CONTROL MEASURES

A number of risk control recommendations have already been made in the preceding section as a result of a review of the present harbour system. The total risk control measures proposed in response to the risk assessment are recorded at **Annex C**. However if change is to take place, the Harbourmaster function needs to start somewhere. The purpose of this section is therefore to provide risk control measures that form the starting point, allowing others to be implemented as part of an ongoing programme of improvements. For that reason two key risk management packages are presented below; one to improve management of the harbour; the second to improve monitoring of harbour transits by SOLAS standard vessels<sup>19</sup>. As both packages relate to addressing risks that are significant, planning for their implementation should be within a two year timescale, in accordance with the Port and Harbour Marine Safety Code Risk Assessment guidelines.

A third part of this section considers the speed limit at Havelock.

As part of this risk assessment, there have been a large number of risk control measures derived (**Annex C**), which should be viewed in parallel with this section; the whole annex should be considered as part of the implementation process. Risk control measures at **Annex C** also reference the hazards that are mitigated by each measure. Further work will be needed to refine these as part of the Safety Management System introduction.

### 7.1 PACKAGE TO IMPROVE HARBOUR MANAGEMENT - RCM 1 AND 2

The risk levels scoring for the parts of the Sounds experiencing regular ferry traffic have provided risk scores at the *significant* level, this being a result of ongoing incident or near-hit reports and the potential involvement of the travelling public in any incident. The incident profile in some areas, particularly Tory Channel Entrance, also suggests there only needs a minor change in factors to change a near miss event into an incident of international significance. The risk management criteria set a timescale of two years to introduce risk management control. It is against this

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<sup>19</sup> 300GT for radio regulations, 500GT for other SOLAS safety requirements.

background that Authors propose the harbour management system be modified to facilitate a much closer interaction between the ferries in the Sounds and the Harbourmaster function. It is also designed to raise the profile of the Harbourmaster function in the harbour and involve the Harbourmaster system more in the “ship delivery function” for the port. The second package introduces the ability to monitor the progress of ferry traffic, but without the first package in place, the monitoring system could only be the domain of a multitasking team, which would defeat the object.

### **7.1.1 Risk Management Package - RCM 1 and RCM 2**

#### **7.1.1.1 RCM 1 - Development of Improved Harbour Organisation**

The aim of the package is to develop a harbour organization to bring the Harbourmaster function and Port Company marine operations closer together to deliver in the wider interests of all harbour navigational users. This will mean introducing a central harbour organization to serve as the interface between the shore and larger vessels using the harbour. It will mean the harbour regulator taking on a dedicated VHF communication role, allowing the multitasking arrangements at Picton to concentrate on vessel berthing and ISPS Code security arrangements. A 24 hour capability would be introduced, taking over the present harbour radio system at Picton. At night this could provide additional monitoring of the recreational channels during the period that Marlborough Marine Radio is off the air. Thus the arrangement would add value to the harbour safety system. The risk management package would comprise an increase in resources available to the Harbourmaster function, which would participate in the ship delivery function, thereby being placed in the flow of information about vessels in the harbour.

Core functions of the harbour organization would include:

- The Harbour regulator becoming the ‘focal point’ for all navigational users within Marlborough Harbour Limits. This would mean the organization locating to premises readily accessible by the public as well as commercial users.
- Providing a Vessel Information Service (VIS) for vessels transiting to and from Harbour Limits (see RCM 2, Annex C). This would in time be optionally upgradeable to a VTS (Vessel Transiting Service), once training to IMO standards was implemented.
- Co-ordination of marine services to commercial vessels.
- Competence availability monitoring of pilot and PEC holder currency.

- Proper audit of small craft moorings and marine farm installations.
- Facilitation of liaison meetings between key stakeholder groups e.g. Ferry operators and yacht racing clubs.
- Introducing a proceduralised safety management system.
- Facilitating the introduction of traffic monitoring for the Marlborough Sounds.
- Introducing a system of General Directions. General Directions are simpler to implement and can be reviewed and updated in much shorter timeframes than Harbour Bylaws. Existing legislation already appears to facilitate this.

This will essentially provide for an expansion of the Harbourmaster function, which will obviously require budgeting and funding. It should be a policy objective of the Harbour Organisation to achieve a balance between income and expenditure within three years. Options for funding include setting a regulatory charge for delivery of the improved harbour management function. This could be based on the “risk imposer pays” principal. A self funded Harbour System would also require a “ring fenced” harbour account, which is solely to provide for the regulation of the Harbour. The Authors have experienced Council-run harbour systems operating very successfully in this way.

#### **7.1.1.2 RCM 2 - Improvements to Picton harbour Radio**

Cease harbour radio operations at the Port of Picton and introduce a new Vessel Information Service operated by the Harbourmaster system, thus operating throughout the Marlborough Regional Council Harbour Limits. This is achieved by making Harbour Radio a core function of the Harbour Regulator and will separate the shore based security role at Picton and the harbour monitoring role for the Sounds. The former would be retained by the Port Company and the latter become the responsibility of the Harbour Regulator. This change would also place the Harbourmaster in the flow of information throughout the Marlborough Sounds. The harbour radio system would provide the point of contact for all users on the Sounds and form a liaison role with Marlborough Marine Radio, monitoring all channels when it is outside the operating hours of Marlborough Marine radio. The service would be a Council delivery on behalf of all navigational users. On the basis of the potential risk reduction available from proper coordination for communication, the Authors see no reason why a regulatory charge could not be made to facilitate this.



To achieve this, a skill base able to interpret the progress of a ferry transiting the Sounds would need to be recruited.

The radio service would include the following functions:

- Be capable of 24 hour recording of voice transmissions.
- Receive VHF calls made by vessels intending to enter Harbour Limits and recording relevant information relating to draught, carriage of Dangerous Goods, responsible PEC holder's name, and ETA's for salient points within Sounds limits.
- Passing current vessel movements to relevant vessels or craft on the shipping transit route. Receiving ship location updates.
- Monitoring of calls made by vessels approaching any Controlled Navigation Zone and providing a proactive response to vessels broadcasting incomplete or ambiguous calls
- Facilitating traffic monitoring and provision of traffic information to navigational users based on information obtained via subsequent electronic traffic monitoring systems, later established by the harbour organization (RCM's 3, 3.1, 3.2, 3.3, 4).
- Receipt and promulgation of hazards to navigation or other information of significance to shipping.
- Co-ordination of marine services for delivery of vessels to the port, including pilotage.
- A contact point for any navigational user needing to contact the Harbourmaster in connection with an incident/accident or relevant navigational issue e.g. to report a hazard to navigation or oil spill.

## **7.2 PACKAGE TO IMPROVE HARBOUR MONITORING - RCM 3**

Significant risk may be posed by vessels operating on regular service, the operation of which is not the ultimate responsibility of Marlborough Sounds Harbour Authority. Requirements can be set (e.g. Bylaws) that should positively influence navigational safety, but there is no way of determining if the requirements are having any effect, other than receiving information from third parties. The present Harbourmaster has been particularly good at engendering relationships that facilitate the flow of such information. Without these third party links, there is little doubt that the quality of near miss information would be much lower than at present. Positive Monitoring of Ferry progress removes all doubt about vessel location and provides a



system that interfaces and monitors each bridge teams' intended track and position in the Sounds.

The risk management package is described in sequence at items 3.1 to 3.3, **Annex C**. The risk management package is intentionally targeted with a solution that has a low start-up cost. First an AIS (Automatic Identification System) transponder base-station is introduced at Tory Channel Entrance. This will allow Ferries to always be aware of each others presence or the presence of any vessel to which Radio Regulations apply (over 300 Gross Tons). If all ferries introduce chart plotter systems on the bridge, they will each have a chart based "picture" of the location of other large vessels. This will have the net affect of ameliorating collision risk in the Ferry to Ferry (or other SOLAS vessel) scenarios. A local system at Tory Channel entrance would record tracks locally<sup>20</sup>.

The next step would be to introduce a wireless link to Picton, perhaps in the second financial year, allowing staff in the new harbour organisation to view a live plot of each transiting ferry or other vessel on the Sounds. Areas such as Diffenbach would be much simpler to manage as radio operators would have instant information to hand, but only about vessels fitted with AIS equipment.

The next step of implementation would be to add a small radar turning head at Tory Channel Entrance and introduce the technology to re-transmit radar targets as AIS VHF transmissions. By installing this, small targets (leisure, fishing) not fitted with AIS transponders would be picked up by the radar scanner. These would then be delivered to the ferry bridge by AIS transmission. This would thus finally ameliorate the risk (to ALARP levels) of collision between a ferry and a fishing vessel or leisure craft.

Further coverage and vessel monitoring ability should be gradually added in successive financial years.

The option exists to explore if this system could be monitored at Wellington. If this was the case, a microwave communication link may be needed to send data across Cook Strait. However, once the data is brought to a location where broadband internet exists, it would be a relatively simple matter to deliver it back to Picton.

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<sup>20</sup> A number of MSA incident investigation reports have made similar recommendations.

### 7.3 HAVELOCK SPEED LIMIT

The risk assessment has considered the present 5 knot speed limit at Havelock. This has little effect on vessels stemming the tide in the Havelock Harbour approach channel, but a tidal current (of up to 4 knots), leaves a vessel moving with the tide with too low a speed through the water for steering to be effective. Marking of the channel on both sides is recommended in section 6.3.2 to influence a slower transit. Reference to the type of signage needed at Havelock has also been made, citing the need to target an audience of motor craft owners and make an assumption of a low level of understanding about the marine rules of the road.

However, providing a speed limit (5 knots) that only allows one knot through the water for steerage is unworkable. On the basis of past experience and subject to a survey of the actual current in the Havelock approach channel, Authors recommend that a speed limit of 8 knots over the ground be considered for introduction. Once this is implemented, a process of education and monitoring should be anticipated.

It would be prudent to first survey the tidal current in the Havelock approach channel to confirm (or otherwise) the recorded velocities.

## 8 CONCLUSIONS AND RECOMMENDATIONS

There are a large number of individual recommendations arising from this risk assessment, which are contained in appropriate sections of the main body of this report. A full list of Risk Control Measures has also been derived (at **Annex C**). In order to prioritise and summarise the tasks ahead, the Authors have made the following conclusions and recommendations, which are not presented in any order of priority:-

1. This risk assessment has been wide-ranging and for the first time has evaluated relative risks associated with navigation on The Marlborough Sounds. These have been ranked in order of priority. The result leaves the Harbour Regulator in a position where standing still is not an option.
2. Fundamentally, the Marlborough Sounds harbour system has some risks that have ranked as significant. Risk Control should be introduced within two years in accordance with the MSA Risk Assessment and Safety Management Guidelines. The prime sources of risk are associated with the passenger and freight services on the route to Wellington and the realisation of hazards involving themselves or caused by other vessels or craft.
3. In the order of 1.2 million people transit the Sounds on the ferry service to Wellington and it is in the public interest to introduce measures to reduce the frequency of incident reports involving ferry operations. Accordingly, recommendations are made for the Harbour Regulator to participate more in the management of navigational risk.
4. Marlborough District Council is recommended to commence the introduction of vessel monitoring within the Sounds. A strategy to achieve this in a cost effective manner has been presented at section 7.2. It commences with deployment of an automatic Ship Transponder at Tory Channel entrance, which will interact with equipment already fitted to ferries and other eligible vessels over 300gross tons.
5. In order to achieve effective vessel monitoring in the Sounds, Marlborough District Council is recommended to make changes to improve the organisational and external status and role of the Harbourmaster's department. This will involve moving it to a location with direct interface with harbour users. A strategy to achieve this has been presented at section 7.1.
6. Marlborough District Council is recommended to introduce a Harbour wide communication system, primarily aimed at providing a Vessel Information Service for all commercial vessels transiting the Sounds. This would take over the present arrangements at Port Marlborough, Picton, and allow the terminal to concentrate on the shore based

security role. Reasons for this recommendation are presented at section 6.5 and section 7.1.1.2.

7. Marlborough District Council is recommended to introduce a “ring fenced” harbour account and to budget and fund the system of Harbour Regulation from this. A regulatory charge should be introduced using the principle of “the risk imposer pays”.
8. Pilotage succession planning needs to be considered in the near future. The Marlborough Sounds Pilotage System is presently independent of all harbour interests and this needs to change. It is recommended that consideration be given to either the Port Company or Harbourmaster system providing the contract for pilotage; this having no effect on the deployment of pilotage resources.
9. A package of further issues and recommendations for Pilotage is referenced at section 6.6. Some of these require taking forward to the MSA for consideration as they reflect the present status of Maritime Rules.
10. A review of the disposition and nature of Navigation Aids on the Sounds in general is recommended, given the findings of this risk assessment.
11. Improved signage and navigation channel markers are recommended at Havelock, targeted at the navigational education needs of the predominant end user, as opposed to terminology readily understood by competent mariners
12. Introduction of an eight knot speed limit over the ground for Havelock entrance channel is recommended. This should be introduced after tidal flow rate in the Havelock entrance channel is confirmed.
13. A programme of hydrographic survey updating needs to be introduced in targeted areas of the Sounds. In the first instance, the Pilot Boarding area at the Northern Entrance needs to be surveyed. Centralising information and survey records into a GIS package would be advantageous.
14. Marlborough District Council is recommended to proceed to introduce a Harbour Safety Management system and Harbour Safety Plan on the basis of the Risk Control Measures presented within this report.

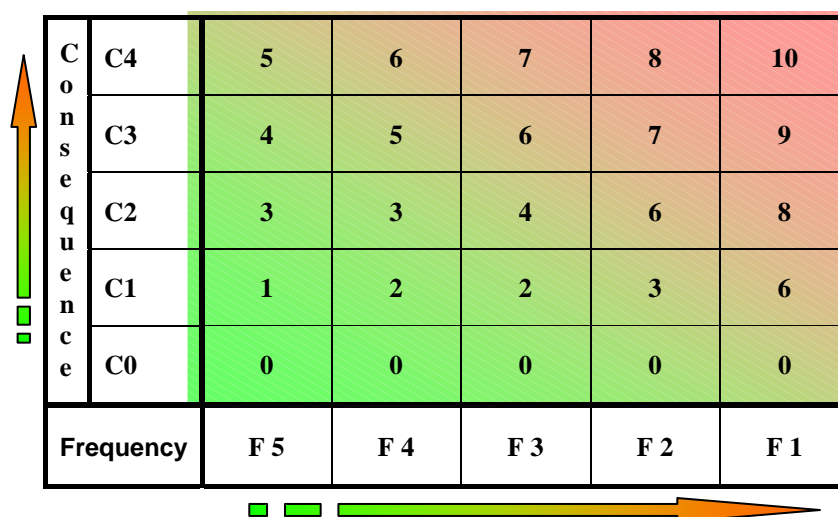
**ANNEX A**

**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



C o n s e q u e n c e	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

### Risk Matrix Used to Score This Risk Assessment

Scale	People	Property	Environment	Harbour Stakeholders
<b>C0</b>	<b>Insignificant</b> Possible very minor injury (e.g. bruise).	<b>Insignificant</b>  (NZ\$0-10,000).	<b>Insignificant</b> Negligible environmental impact. Tier 1 may be declared but criteria not necessarily met.  (NZ\$0-10,000).	<b>Insignificant</b>  (NZ\$0-10,000).
<b>C1</b>	<b>Minor</b> Single slight injury.	<b>Minor</b>  (NZ\$10K-100K).	<b>Minor</b> Tier 1 to Tier 2 criteria reached. (small operational spill).  (NZ\$10K-100K).	<b>Minor</b> Bad local publicity or short-term loss of revenue, etc.  (NZ\$10K-100K).
<b>C2</b>	<b>Moderate</b> multiple minor or single major injury.	<b>Moderate</b>  (NZ\$100K-1M).	<b>Moderate</b> Tier 2 Spill criteria Reached, capable of being limited to immediate area within harbour or port zone.  (NZ\$100K-1M).	<b>Moderate</b> Bad widespread publicity, temporary navigation closure or prolonged restriction of navigation (NZ\$100K-1M).
<b>C3</b>	<b>Major</b> Multiple major injuries or single fatality.	<b>Major</b>  (NZ\$1M-10M).	<b>Major</b> 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).	<b>Major</b> 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).
<b>C4</b>	<b>Catastrophic</b> Multiple fatalities.	<b>Catastrophic</b>  (NZ\$10M+).	<b>Catastrophic</b> 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+).	<b>Catastrophic</b> 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**

### **RANKED HAZARD LIST**

Rank Position	Hazard Reference	Areas	Accident Category	Title	Hazard Detail	Possible Causes	Consequences		Risk By Consequence Category								Overall Risk Score	Remarks
							Most Likely	Worst Credible	People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
1	11	Tory Channel & Approaches	Grounding	Ferry grounding at Tory Channel Entrance	Ferry off track and likely to ground within the Tory Channel Controlled Navigation Zone or approaches in either direction.	Ferry loses steerage through mechanical or other systems failure. Poor positional awareness or failure to appreciate affect of tidal flow. Ferry manoeuvres to avoid collision with another vessel and runs out of sea room. Ferry loses steerage in heavy weather and/or strong rate of tidal flow. Inexperienced Helmsman. Poor BRM or training in integrated navigation equipment. Sea conditions unsuitable for safe Transit of Tory Channel entrance. Inappropriate reliance on technologically advanced electronic navigation systems. Loss of interface between navigators and control of vessel track.	Grounding averted by recovery action of bridge team. Possibility of striking submerged rock struck with glancing blow, passenger caught off balance and injury but no loss of bunkers.	Ferry grounds in controlled navigation zone. Potential breach of fuel tanks and loss of up to 300 tonnes of intermediate fuel oil and/or Packaged Dangerous Goods. Rapid flooding, loss of stability reserve, or ferry drifts into deeper water. Potential for multiple fatalities but an alternative possible outcome is ferry being intentionally run up the beach to mitigate loss of life.	6	3	0	7	8	8	8	8	7.08	Tory channel entrance may be closed to shipping in heavy weather. Ferries have suffered system failures and groundings have occurred inside the entrance. 3 have occurred in last 50 years; last occurred just over 10 years ago. Groundings have been averted.
2	48	Tory Channel & Approaches	Collision	Ferry in conflict with fishing vessel	Ferry and fishing vessel in developing collision situation within the Tory Channel Controlled Navigation Zone and approaches.	Both vessels attempting to use line of the leads at the same time. 'All Ships' 10 minute VHF call not transmitted / received by either or both vessels. Either vessel fails to keep to starboard side of channel. Incorrect ETA for entrance and lack of monitoring on either vessel. Lack of local knowledge on fishing vessel. Either vessel loses steerage through gear failure or state of sea and tide in close proximity to other vessel. Either vessel unaware of position of other vessel prior to rounding headland. Poor lookout on either vessel. Fishing vessel fouls propeller on cray pot line and drifts into path of ferry. Fatigue impairs watchkeeping ability of fishing vessel crew.	Close quarters situation but collision averted or situation results in glancing blow.	Ferry in collision with fishing vessel in controlled navigation zone. Fishing vessel capsizes with fatalities (up to 5).	8	0	0	8	7	6	4	7	6.40	Fishing vessels

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									Most Likely				Worst Credible					
									People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
									0	6	3	7	4	7	7	7		
3	79	Outer Sounds - Coastal, French Pass & Current Basin	Grounding	Vessel over 120m length in narrows - Grounding	Vessel over 120 metres length in grounding situation in narrow passage with strong tidal flows. This is possible in French Pass, Stephens Passage and off Cape Jackson.	Craft loses steerage through mechanical or other systems failure. Tidal influence greater than vessels forward momentum. Loss of control with strong following tide. Failure to monitor position and poor BRM. Lack of local knowledge. Vessel runs out of sea room through manoeuvre to avoid another vessel. Incorrect tide calculation or local correction from tide tables. Vessel fails to comply with Harbour Bylaws regarding maximum length or tonnage permitted to transit area.	Vessel runs aground by the bow on the eastern side of French Pass requiring subsequent dry docking.	Cruise ship grounds on Walker Rock area and subsequently lost. Potential for loss of life. Discharge of up to 500 tonnes of heavy or intermediate fuel oil into local sea area.	0	6	3	7	4	7	7	7	6.24	Vessels over 120 metres length are not now permitted by bylaw to transit French Pass, although prevention relies on voluntary compliance. Risk level associated with this is likely to be reducing. Vessels over 500gt are not permitted to transit Stephens Passage. Most likely case occurred in last five years. Worst credible case is a scenario similar to the large passenger vessel loss at Cape Jackson.
4	18	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespeare Bay	Collision	Ferry and leisure craft in conflict generally	Ferry and leisure craft in developing collision situation in key areas of ferry route, excluding Tory Channel and Approaches; Picton Harbour.	Lack of local knowledge by leisure craft (ferry routes and navigational requirements). Leisure craft fails to comply with Harbour Bylaws and Collision Regulations, navigates by 'Point to Point' method based on headlands. Improper lookout on either vessel. Poor positional or spatial awareness on either vessel or craft. Sudden mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Yacht under sail in light winds. Small craft operating in restricted visibility without radar or navigating at speed by GPS. Small craft not detected by ferry radar in restricted visibility or by night (inadequately lit).	Serious close-quarters situation but collision averted by actions of bridge team and leisure craft skipper. Leisure craft heels and rolls heavily from sudden deviation to recover situation.	Leisure vessel attempting to cross track of ferry is in collision and sinks with potential for multiple fatalities.	6	0	0	8	7	4	4	7	6.16	The probability of collision between a leisure craft and ferry in the Sounds is likely to be low except in periods of restricted visibility, or by night if leisure craft are inadequately lit. Picton Harbour and Tory Channel are dealt with by separate hazards.

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5	3	Tory Channel & Approaches, Central Queen Charlotte Sound	Collision	Ferry/leisure craft in conflict at Tory Channel	Ferry meets leisure craft in centre of channel on rounding Clay, Heaphy, or any blind headland.	Lack of local knowledge by leisure craft (ferry routes and navigational requirements). Leisure craft fails to comply with Harbour Bylaws and Collision Regulations, navigates by 'Point to Point' method based on headlands. Improper lookout on either vessel. Poor positional or spatial awareness on either vessel or craft. Sudden mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Small vessel or craft stemming tide at Tory Channel Entrance causing collision risk by being unable to transit controlled navigation zone within reasonable time (e.g. 25 mins). Yacht under sail in light winds. Small craft operating in restricted visibility without radar or navigating at speed by GPS. Small craft not detected by ferry radar in restricted visibility or by night (inadequately lit).	Serious close-quarters situation but collision averted by actions of bridge team and leisure craft skipper. Leisure craft heels and rolls heavily from sudden deviation to recover situation.	Leisure vessel attempting to cross track of ferry is in collision and sinks with potential for multiple fatalities. Ferry manoeuvres to avoid collision and runs aground sustaining significant damage to hull and propulsion, requiring subsequent dry dock.	6	0	0	8	7	4	4	7	6.16	Many leisure vessels only monitor 'Marlborough Marine Radio' or are not equipped with VHF radio and not necessarily aware of large vessel movements in this area. Ferry masters have reported power craft standing on for the ferry at high speed and turning away at a late stage, sometimes turning into ferry wake. Queen Charlotte Sound; Picton Harbour and Shakespeare Bay are covered by a separate hazard.
6	40	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Queen Charlotte Sound, Queen Charlotte Sound - Kenepuru, Admiralty Bay, Croisilles Harbour	Foundering	Recreational craft ingress	Recreational fishing vessel or Leisure craft loses hull integrity while engaged in recreational fishing in Tory Channel.	Vessel overloaded with occupants resulting in inadequate freeboard and stability for prevailing sea conditions and weight distribution of crew. Lack of local knowledge regarding weather and sea conditions. Power driven vessels failing to comply with Harbour Regulations (50m/5knot rule) creating steep wash close to fishing vessel. Lack of general seafaring knowledge including poor appreciation of affect of passing vessels wash on stability of vessel. Occupants of vessel or person in charge under influence of excess alcohol, impairing judgement. Fishing gear of recreational vessel or anchor fouled on bottom, capsize moment on attempted retrieval. Sea conditions unsuitable for transit of Tory Channel entrance or approaches.	Recreational craft suffers controllable water ingress.	Recreational craft with low freeboard in a damaged condition rolls heavily heavy seas in outer area of the Sounds. Water ingress and loss. Potential for fatality.	6	6	6	6	7	4	4	6	6.07	

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7	83	Port Underwood, Cloudy Bay, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Personal Injury	Injury to recreational divers	Personal injury to recreational divers within the Sounds.	Divers have insufficient experience for nature of attempted dive. Divers operating in areas of strong tidal flow. Lack of local knowledge. Divers injured by power driven craft failing to comply with Harbour Regulations. Divers fail to display Flag A or flag is of insufficient size. Inexperience or lack of care on part of dive vessel operator. Faulty diving equipment.	Diver swept away from dive boat by current is picked up from surface by other vessel.	Diving in vicinity of French Pass when strong tidal flow is present results in multiple fatalities.	9	0	0	8	7	0	0	6	6.02	There have been ten fatalities in the past 10 years and 21 in 20 years. Commercial divers have not be involved in reports of fatality incidents.



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8	12	Tory Channel & Approaches	Grounding	Fishing Vessel Grounds in any part Tory Channel	Fishing vessel grounds within Controlled Navigation Zone or in Channel.	Vessel loses steerage through mechanical or other systems failure. Influence of tidal current pushes fishing vessel or craft onto Arrowsmith point. Poor positional awareness, lack of local knowledge of tidal stream characteristics. Fishing vessel runs out of sea room during manoeuvres to avoid another vessel. Steerage lost in heavy weather and/or strong rate of tidal flow. Propulsion fouled on cray pot line. Fatigue. Sea Conditions too severe for safe transit of Tory Channel entrance.	Averted grounding or fishing vessel aground for a short period and refloats. Loss of fish stored on deck.	Vessel grounds on one of the rocks in Tory Channel Entrance. Loss of up to 20 tonnes of diesel. Vessel drifts off rock and drifts into deeper water, loses stability and sinks. Potential for a fatality.	0	3	3	6	7	7	7	6	7	5.9	No current navigational control of vessels under 500GT transiting Controlled Navigation Zone. Fishing vessel has been lost and not found after Grounding on Rocks in calm conditions at Tory Channel entrance. Fishing vessel came off the rocks and the vessel sank, but was never located. There have been several incidents of Fishing Vessel Groundings, a number of which have occurred at Arrowsmith Point. Two have sunk, but to date no one has been killed on commercial fishing vessels. A recreational user suffered loss of life as a result of a high speed grounding at Arrowsmith. Number of groundings were occurring annually but record has been improving.	

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9	73	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespeare Bay, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Contact Navigation	Small vessel or craft in contact with marine farm	Small vessel, leisure or commercial in contact with marine farm while navigating.	Poor lookout on vessel or craft. Marine farm difficult to see with low angle of sun reflecting on water. Marine farm inadequately lit. Marine farm not detected by sight or radar in poor visibility or vessel reliant on GPS navigation. Loss of spatial awareness at night. Broken lines Marine farm not moored in charted position. Broken or stray lines in heavy weather.	Vessel runs over marine farm mooring lines but does not foul propeller, no or minor damage to either vessel or marine farm.	Leisure vessel runs over marine farm mooring lines while navigating at high speed. Propeller fouled and propulsion unit pulled off transom resulting in loss of hull integrity; possible loss of vessel or craft. People in water with potential fatality.	0	6	3	3	7	6	6	7	5.81	A vessel could also be holed in contact with a marine farm structure with a similar worst credible outcome. Diesel outdrives and outboard motors have been severely damaged by contact with marine farm ropes. Compliance checks have been difficult to achieve and process with present resources of harbour regulatory system. Reports of problems exist. Lighting of marine farms is reported to now be improving.



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10	21	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Personal Injury	Person in water run over by powered vessel.	Swimmer or diver in path of a vessel.	Vessel not aware of swimmers/divers operating more than 200m from shore or structure (Dive vessel not showing proper flag). Vessel navigating at excessive speed within 200m from shore or structure. Vessel navigating at excessive speed within 50m of a raft or vessel from which people are swimming/diving. Person under influence of excessive alcohol navigates power-driven craft recklessly in proximity to swimmers or divers. Swimming in waterski or Jet-Ski (PWC) designated area. Divers or swimmers in wharf area. Poor look-out. People (students) jumping over side of berthing ferry. Non use of deadmans shutdown for outboard motor (fall overboard and run over by own craft).	Diver or swimmer injured.	Person in water run over with fatality.	8	0	0	9	6	0	0	6	5.69	Unlikely to involve larger vessels. Vessels or craft often have swimmers or divers in the water. Swimmers or persons in charge of vessels may be under influence of alcohol especially during summer period. Event has occurred in sounds on at least two previous occasions.

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							People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders				
11	1	Tory Channel & Approaches	Collision	Two Ferries in conflict at Tory Channel Entrance.	Two ferries in developing collision situation within the Controlled Navigation Zone.	Two passenger carrying vessels over 500GT transiting Tory Channel sea entrance controlled Navigation Zone at the same time. Failure of either or both vessels to transmit/receive 'All Ships' VHF call prior to entering the Controlled Navigation Zone. Poor BRM on each vessel. Miscalculation of timings for approach VHF transmission. Mechanical or electronic system failure on either ferry. Ferry transiting pilotage waters reliant on autohelm control satellite navigation system (i.e. watchkeeper not continually interfacing with ships heading and track at Tory Channel entrance). Poor positional/spatial awareness on either/both vessels. Presence of another craft in close proximity compromises ability of one or both ferries to alter course. Inappropriate sea conditions at Tory Channel entrance affects entry track and timing of inbound vessel. Complacency from routine experience of many Tory Channel transits.	Averted collision or glancing blow (side contact by interaction) between passing vessels.	T-bone collision. One ferry rapid loss of stability and sinking. One ferry suffers glancing grounding on any of the rocks at entrance. Passengers in water in rough conditions on ebb tide with likelihood of multiple fatalities.	6	0	0	7	6	6	6	6	5.65	All ships approaching Tory Channel Controlled Navigation Zone must provide 10 mins vhf "All ships Call" and monitor other ships transmissions. Transmission made on ch. 16 and 19. Diffenbach Point is an area of special interest. Ferry on Ferry Collision is likely to be a reducing risk with the mitigation in place, but mitigation could be improved.
12	77	Cloudy Bay, Outer Sounds - Coastal, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Grounding	Fishing vessel in grounding situation.	Fishing vessel in narrow tidal passage with strong tidal flow. This is possible in French Pass, Stephens Passage and off Cape Jackson.	Fishing vessel loses steerage through mechanical or other systems failure. Tidal influence greater than vessels forward momentum or moving with tide. Failure to monitor position. Lack of local knowledge. Fatigue impairs judgement of watchkeepers. Craft runs out of sea room through manoeuvre to avoid another vessel. Incorrect tide calculation or extraction\correction from tide tables. Vessel strikes uncharted underwater obstruction.	Vessel runs aground in fair weather, crew able to abandon safely or refloat. Possible minor ingress managed by pumps.	Vessel attempts to abort transit of French Pass in mid-tide and is carried onto rocks on western side of channel. Vessel rolled in strong tidal influence. Potential for loss of life. Diesel spillage.	0	6	0	6	3	7	6	7	5.59	Some fishing vessel operators no longer transit French Pass due to safety concerns. Five events have occurred in the last five years.

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13	10	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, Croisilles Harbour	Collision	Two leisure craft in conflict - Sounds generally.	Leisure craft in developing collision situation with another leisure craft in the Sounds generally.	Improper look out on either craft. Failure to comply with Collision Regulations and/or Harbour Bylaws. Sudden mechanical failure while navigating at high speed in close proximity to other craft. Inadequate or improper navigation lights shown on either craft. Navigation lights obscured by deck working lights of fishing vessel in close proximity (night). Vessels meet on rounding a headland. Either vessel fails to comply with Harbour and/or Collision Regulations. Lack of local knowledge regarding patterns of leisure use.	Close quarters situation or collision causing shock, but no injuries.	Two power driven craft collide at high speed. One vessel takes on water and in danger of total loss. People in water. Potential for multiple fatalities.	6	0	0	6	7	6	3	7	5.59	Craft navigating at high speed close to shore may have insufficient time to avoid collision upon meeting another vessel or craft rounding a headland. Leisure with Leisure is most likely to occur in Queen Charlotte Sound generally; Picton Harbour Entrance; Croisilles; Kenepuru and Havelock and approaches. Lack of compliance with 200m and 50m 5 knot Bylaws has been reported.		
14	35	Tory Channel & Approaches	Foundering	Fishing vessel founders	Fishing vessel founders on encountering heavy weather while transiting Tory Channel Controlled Navigation Zone.	Vessel has inadequate buoyancy, stability or hull strength for sea conditions. Vessel loses steerage through mechanical failure resulting in water ingress. Hatchway or hatchcover breaks open or is inadequately secured. Sea conditions unsuitable for transit of Tory Channel entrance or approaches.	Vessel sinks at entrance to Tory Channel. Evacuated successfully but loss of life could be expected in heavy weather.	Fishing vessel sinks at entrance to Tory Channel in heavy weather with strong SE going tide, loss of vessel (disappears without trace) with all hands.	4	6	4	6	6	5	3	5	5.45	If foundering occurs in heavy weather then the possibility of crew making shore is remote.		

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15	9	Picton Harbour - East	Collision	Vessels in collision situation in Picton Harbour	Vessels of any type approaching or departing Picton Harbour in developing collision situation. Scenario is affected by one or other vessel in process of manoeuvring. Hazard scenario can include leisure craft.	By night, back scatter of shore lights obscuring lights of vessels under way. Vessels fail to detect one another in restricted visibility. Failure of either vessel to comply with Harbour Bylaws and Collision Regulations. Either vessel unaware of approach of other prior to rounding Picton Point. Failure of either vessel to report departure or arrival to Picton Harbour Radio. Lack of Harbour movement management. Poor positional or spatial awareness on either vessel. Urgent medical condition affecting skipper of a craft. Presence of other vessels limits sea room available to manoeuvre to avoid collision.	Close quarters situation but collision averted or possibility of minor scrape.	Ferry in collision with other passenger vessel on rounding Picton Point. Worst Credible is based on involvement of a water taxi. One vessel loses hull integrity and sinks with persons in water/trapped in hull, potential for multiple fatalities. Discharge of bunker fuel into surrounding sea area (circa 200 tonnes).	6	6	0	6	6	6	5	5	5.42	Mabel Island rule by night for ships over 500gt. It is possible for ships rounding Picton Point to sight one another with little time available to manoeuvre to avoid a close quarters situation. Although unlikely, vessel could also be entering Picton harbour on the on the opposite side to convention (i.e. does not keep to starboard). Picton point tends to be used as is reporting point for inbound vessels. Other vessels (e.g. outbound) can be reliant on information from Picton Harbour Radio (or AIS) about the presence of another vessel approaching this point.



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16		Tory Channel & Approaches, Central Queen Charlotte Sound, Picton Harbour - East	Collision	Racing yacht and vessel over 500GT in conflict	Yacht engaged in racing in developing collision situation with a ferry or other vessel over 500GT.	Yacht impedes navigation of vessel >500GT. Racing course regularly crosses track of ferries. Individuals in race ignoring vessel through competitive intent. Misinterpretation or disregard of Harbour Bylaws and Collision Regulations. Centreboard yacht capsizes in path of ferry. Yacht becalmed in light airs in path of larger vessel.	Racing Yacht disappears from vision under bow of larger vessel or a full astern movement needed to avoid serious collision.	Yacht is run down by ferry, persons in water with potential for fatalities.	6	0	0	8	6	2	0	6	5.35	Yachts are not penalized by their club for impeding navigation of vessels > 500GT or failing to comply with the Collision Regulations. Ferry crews from all ferries report racing to be a problem, raising concern about the entrance to Picton Harbour - East. An ongoing number of near miss incidents are on record. Ferry masters unaware in a number of cases that deviation around Allports island is an option. A race does occur in Tory Channel on an annual basis, but the risk is assessed on the probability at Picton. An estimate of Ferry needing to give sound signals ( five short blasts) about one race in six.
17	39	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin, Croisilles Harbour	Collision	Kayak in conflict with leisure craft	Kayak and power driven craft in developing collision situation.	Power driven craft navigating at speed over 5 knots within 50m of other vessels or 200m of shore. Low visibility of kayak and poor look out on either craft.	Close quarters situation collision averted.	Kayak run down by power driven craft at speed. Potential for fatalities.	6	0	0	6	7	0	0	8	5.29	Although reported to occur anywhere within the Sounds, kayak activity may concentrate in certain areas and conflict can arise where power driven craft use these same areas for transit or water-sports (e.g. Kayak inadvertently enters water ski area).

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18	15	Central Queen Charlotte Sound	Collision	Ferry and ship over 500GT in conflict, QC central.	Ferry and ship >500GT in developing collision situation while entering or transiting Central Queen Charlotte Sound.	Neither vessel aware of position of other prior to rounding headland (e.g.. Diffenbach Point). Misunderstanding of information passed by VHF radio by either ship. Poor positional or spatial awareness on either vessel. Presence of other vessels limits sea room available to manoeuvre to avoid collision. Depth of water available limits sea room available to manoeuvring room.	Close quarters situation but collision averted.	Other ship T bones ferry which suffers rapid loss of stability and capsizes with multiple fatalities. Alternatively, Ferry is striking vessel, floods RoRo deck and loses stability, with similar worst-credible outcome.	0	0	0	7	6	6	6	6	6	6	5.28	Ferries inbound to Picton have been in conflict with outbound log ships while ferry is rounding Diffenbach Point. Potential for bottle neck in vicinity of Allports Island with in and out bound ships in conjunction with heavy concentrations of yachts and other leisure craft at times.
19	76	Port Underwood, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Grounding	Leisure craft grounds in narrow passage.	Leisure vessel in grounding situation in narrow passage with strong tidal flow. This is possible in French Pass, Stephens passage, Cape Jackson, Greville Harbour, but hazard relates to outer Sounds area generally ..	Craft loses steerage through mechanical or other systems failure. Sailing vessel becalmed in light airs loses steerage. Tidal influence greater than vessels forward momentum. Failure to monitor position. Lack of local knowledge. Craft runs out of sea room through manoeuvre to avoid another vessel. Incorrect tide calculation or extraction from tide tables. Excessive speed within the 200m zone.	Craft lightly grounds in calm weather, occupants able to abandon safely or refloat. Hole punched in hull, but temporary repair possible and bilge pumps able to cope.	Low powered craft attempting transit of Stephens Passage or other remote area strikes rock in adverse weather. Craft holed runs on and is lost rapidly with persons in water in isolated area, potential for fatalities.	6	6	0	6	6	4	2	6	6	6	5.24	Several narrow passages with strong tidal flows exist within Marlborough Harbour Limits for which local knowledge is required. Uncharted rocks are reported by Fishing stakeholders at Stephens Passage, but between Saddle Rocks and Stephens Island, where navigation should not be undertaken in any event (Charts report area last surveyed in 1989). Greville Harbour has a number of minor groundings, but it is remote.

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							People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders				
20	74	Port Underwood, Cloudy Bay, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespeare Bay, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Contact Navigation	Vessel over 500GT in contact with marine farm	Vessel greater than 500GT in contact with marine farm while navigating.	Marine farm inadequately lit. Marine farm out of charted position through dragging moorings, not detected by sight or radar on vessel. Vessel navigating outside usual passage plan in close proximity to marine farms. Lack of positional awareness or manoeuvre to avoid collision or other danger. Vessel dragging anchor.	Vessel runs over marine farm resulting in significant damage to the marine farm installation, vessels propulsion and steering not affected.	Vessel of approx 500GT off track and runs over marine farm. Propeller and/or rudder gear fouled resulting in loss of steerage. Vessel drifts and grounds on shoreline holing double bottom tanks. Fuel spillage (circa 100 tonnes estimate; marine diesel). Drydock required.	0	6	0	6	2	6	6	6	4.96	Twin screw vessels such as ferries, and larger deep draught bulk carriers are likely to cause significant damage to a marine farm but are unlikely to become completely disabled themselves. A number of recommended vessel anchorages and safe havens are located adjacent to marine farm sites (recommended in New Zealand Pilot). Modern cruise vessel podded propulsion systems are susceptible to damage.
21	72	Port Underwood, Central Queen Charlotte Sound, Picton Harbour - East, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Pollution	Pollution at fuel berth	Pollution occurs through fuel spill at small commercial / leisure vessel fuel berth	Misuse or careless use of equipment by operator. Re-fuelling vessel not properly secured to wharf. Wash from passing vessel parts lines/fuel line or pulls delivery nozzle from filling point. No absorbent mats/cofferdams in deck area around filling point. Fuel pump equipment poorly maintained. Emergency shut off on pump not clearly marked. No savealls fitted to fuelling equipment. Wilful act of vandalism.	Minor spill of less than 1 litre.	Vessel left unattended while refuelling, nozzle comes out of filling point and discharges up to 500 litres of diesel into sea before being detected.	0	0	6	0	0	0	8	6	4.83	Most fuel berths are unsupervised. There are reports of a large number of small spills.
22	13	Tory Channel & Approaches	Grounding	Small commercial vessel grounds at Tory Channel.	Small commercial vessel grounds within the Tory Channel Controlled Navigation Zone	Vessel loses steerage through mechanical or other systems failure. Poor BRM (failure to monitor position). Vessel runs out of sea room during manoeuvres to avoid another vessel. Vessel loses steerage in heavy weather and/or strong rate of tidal flow. Lack of local knowledge. Propulsion fouled on cray pot line and loses control. Sea Conditions too severe for safe transit of Tory Channel entrance.	Grounding on rock reef, damage to bottom. Potential for diesel spillage (up to 1000lts). Diesel seeps out until fuel removed.	Vessel grounds, backs off and then sinks in deeper water. Loss of all hydrocarbons onboard (up to 10 tonnes Marine Diesel). Potential for fatalities in conditions at Tory Channel Entrance.	2	2	2	4	6	4	6	6	4.71	This hazard has occurred at Tory Channel entrance. Loss of life from grounding event has as yet not occurred. Transits of vessels in the order of 350 tonnes are reported to occur in the order of 10 visits per year.



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23	25	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin, Croisilles Harbour	Wash	Wash injury to occupants of leisure craft.	Personal injury to occupants of a moored or anchored leisure craft.	Wash from passing vessel causes heavy rolling of moored or anchored leisure vessel. Vessels passing too close at speed - breach of Harbour Bylaws. Fast Ferry in breach of bylaws by way of medical emergency.	Discomfort for occupants of moored/anchored vessel.	Rolling causes spillage of hot cooking oil in galley of moored vessel with potential for severe injury. People attempting to fend off craft rafted alongside suffer moderate crush injury.	6	0	0	6	6	3	0	6	4.66	Reports are made of vessels passing within 50m of other vessels at excessive speed creating dangerous wash. The wash generated from large vessels passing at a greater distance may also produce an adverse affect.
24	14	Tory Channel & Approaches	Grounding	Leisure craft grounds at Tory Channel Entrance	Leisure craft grounds on rocks within the Tory Channel Controlled Navigation Zone.	Vessel loses steerage through mechanical or other systems failure. Poor navigation or disorientation (loss of spatial awareness) during periods of restricted visibility. Vessel unable to maintain steerage in heavy swell and/or strong rate of tidal flow. Vessel runs out of sea room during manoeuvres to avoid another vessel. Vessel fouls propulsion or rudder on cray pot line with subsequent loss of control. Lack of local knowledge. Sea Conditions too severe for safe transit of Tory Channel entrance.	Averted grounding.	Craft grounds and spills some diesel fuel oil into surrounding sea area. A maximum of 1000 litres is assumed. Craft loses stability and can capsiz <span></span> e, drifts into deeper water and sinks with potential for fatalities.	0	0	0	6	6	4	2	6	4.5	Recreational craft and small fishing vessels are reported to have grounded on Taranaki Rock, on more than one occasion in 10 years. Other rocks in the area are Weke Rick, or Rocks on East Head side. Cray pots are set on either side of the channel at the entrance to Tory Channel where small recreational craft navigate. There has not been loss of life to date.
25	71	Central Queen Charlotte Sound, Picton Harbour - East, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Fire\Explosion	Fire\Explosion at a fuel berth in Sounds	Fire\Explosion during re-fuelling of small commercial or leisure vessel alongside a fuel berth.	Person smoking/causing naked flame within explosive concentration of fuel vapour. Fuel spilled on hot engine parts or other source of ignition aboard re-fuelling vessel. Electrical system not isolated prior to refuelling. Build up of fuel vapour in bilge undetected / not cleared prior to restarting vessel engine. Fuel spillage on berth is ignited. Cellphone in use.	Explosive concentration of fuel vapour not reached, explosion averted.	Explosion aboard vessel re-fuelling with petrol destroys vessel to waterline. Potential for loss of life.	0	0	6	0	6	4	2	6	4.5	Most fuelling facilities are unsupervised.

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26	16	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Swamping	Swamping or Capsize of Kayaks	Kayak Group or one Kayak caught in rapidly changing weather conditions.	Distance too great for good shelter location in weather conditions experienced. Kayaks caught unawares by sudden change in weather conditions. Failure to take advice from weather information sources prior to setting out.	Capsize recovery by Kayak group working together. Lone Kayak recovers but exhausted, possibility of hypothermia. Shelter not available in vicinity.	Capsize with casualties in water. Strong winds create spray and chop, making identification of capsized Kayaks difficult. SAR response needed as shelter not available. Group forced onto a Lee Shore or unable to get out of way of ferry. SAR response needed. Loss of life and cases of hypothermia.	6	0	0	3	6	2	0	6	4.44	Different locations in Sounds better for shelter, dependent on wind direction. Kayaks are used in all parts of the Sounds, even the outer areas. It is possible for a kayak to round a headland experiencing a light southerly breeze and meet a strong northerly gale on rounding the headland. Deployment random in nature. Spray impairs vision in heavy weather conditions.
27	4	Tory Channel & Approaches	Collision	Ferry/leisure craft in conflict in darkness	Ferry fails to detect leisure craft or vice versa at night at Tory Channel entrance and is involved in collision.	Fishing vessel working lights compromise night vision and ferry fails to reduce speed. Radar on ferry unable to detect small target at close range (height of scanner or human factor). Lack of positional or spatial awareness (error in judgement). Leisure vessel fails to comply with Harbour Bylaws and Collision Regulations. Inadequate or inappropriate navigation lights on leisure craft. Lack of experience of leisure user. Small vessel or craft stemming tide at Tory Channel Entrance causing collision risk by being unable to transit controlled navigation zone within reasonable time (e.g. 25 mins). Greater likelihood of alcohol being involved.	Close quarters situation but collision averted.	Leisure craft run over resulting in potential for multiple fatalities.	3	0	0	3	7	4	4	6	4.42	Ferry masters have reported occasional problems with fishing vessel deck working lights removing ability to see small craft at night. Feedback from ferry masters advised it is not uncommon to enter Tory Channel and meet a leisure craft in the middle of the channel. Reports of close quarters situation at night at Tory channel entrance have occurred.

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28	86	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West	Grounding	Charter cruiser grounds in narrow channel	Charter leisure craft grounds on tidal influence areas of Sounds.	Vessel loses steerage through mechanical or other systems failure. Poor navigation or disorientation (loss of spatial awareness) during periods of restricted visibility. Vessel fouls propulsion or rudder on cray pot line with subsequent loss of control. Lack of local knowledge.	Averted grounding or aground for short period and refloat. Damage to keel and propellers\rudders. Possible minor seepage into hull. Tying up to a jetty and tide goes out.	Craft grounds and spills some diesel fuel oil into surrounding sea area. A maximum of 500 litres is assumed. Craft grounds on falling tide and rolls on side, flooding on flood tide. Running over a rock and total loss of charter cruiser.	0	0	0	6	2	4	4	6	4.41	Charter cruisers are surveyed to MSA standards and cannot pass through Tory Entrance. Systems are in place to check the experience and competence of crew. Often hirer is experienced vessel owner from another location, so only area of weakness is local knowledge. There are a fleet of around 50 larger (28 foot upwards) cruise vessels and motor cruisers available for 'professional' charter. About 15 motor launches, rest yachts. Grounding have been minor and sailing related.
29	37	Picton Harbour - East	Collision	Ferry in conflict with small craft, Picton Hbr.	Ferry and leisure craft or small commercial vessel in developing collision situation on approach to Picton Harbour by night.	Navigating lights of either vessel not detected against shore lights in background. Vessels fail to show correct navigation lights. Vessels approaching Picton Harbour not aware of recent departures (small craft fails to monitor VHF Ch.19 or departing vessel fails to report departure).	Close quarters situation but collision averted.	Ferry runs down leisure vessel, providing the potential for capsizing. Possibility of multiple fatalities.	6	0	0	0	6	2	2	6	4.38	There is presently no harbour movement management for small commercial craft engaged in passenger service.

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30		Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Contact Navigation	Leisure vessel in contact while navigating	Leisure vessel in contact with moored/anchored vessel.	Poor lookout on commercial vessel. Anchored vessels showing inadequate or no lights. Inexperienced user at night entering bay with moored craft. Vessels moored or anchored in fairway. Moored or anchored vessels have dragged into fairway. Leisure vessel navigating at excessive speed within 200 metres of shore.	Minor contact.	Leisure vessel navigating at speed contacts anchored leisure vessel, loss of watertight integrity to both vessels resulting in sinking and potential for multiple fatalities.	6	0	0	0	6	2	2	6	4.38	
31	26	Picton Harbour - East	Contact Berthing	Ferry involved in contact during berthing	Ferry contacts berth during berthing operations in Picton Harbour East.	Error in judgement by ship handler. Mechanical or other systems failure. Manoeuvre to avoid collision with other vessel. Adverse environmental effects during berthing (gust of wind, 50 to 60 knots of northerly or southerly).	Minor damage to wharf fendering.	Ferry lands heavily on end of the Long Arm and fractures shell plating with potential to cause ingress, including to machinery spaces. Potential for minor to moderate injuries as crew/passengers thrown to deck. Ship disabled with economic loss to operator. One jetty (Long Arm) out of service for up to a month or until survey is carried out. Loss of revenue to Port Company.	0	6	0	0	4	6	0	6	4.35	Since 'freezing works' hill was excavated, berths are more open to the effects of a Norwest wind. Norwest pushes vessels onto wharfs. Loss of Long Arm would prevent discharge of rail cargo.



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32	41	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Grounding	Water Taxi Grounding	Water taxi grounds while navigating close to shore.	Craft navigating at speed close to shore, fails to comply with Harbour Regulations. Disorientation of launchmaster in restricted visibility. Loss of steerage through mechanical or other systems failure. Avoiding action to prevent collision with small leisure craft close to shore.	Grounding on soft bottom without structural damage, water taxi to continue on passage.	Vessel grounds on rock reef, runs on over. Running ashore at 25 knots with passengers onboard. De-acceleration causes passengers to be thrown off seats and injuries. Possibility of rupturing fuel tank, up to 2500 lts possible loss.	3	3	0	3	6	4	4	6	4.31	Water taxis are reported to navigate at speed within 200m of shore at times and may carry up to 150 passengers. Grounding at speed has occurred in Pelorus. Also at Punga Cove. Small taxi has climbed wharf at Picton after throttle stuck open.
33	38	Outer Queen Charlotte Sound	Grounding	Vessel over 500GT grounds in Queen Charlotte Sound	Vessel transiting Outer Queen Charlotte Sound grounds while proceeding to or from Pilot Station.	Navigational error. Ship loses propulsion or steerage through mechanical or other systems failure and drifts into shallow water. Low visibility contributes to lack of positional awareness on bridge. Failure of land based navigational aids contributes to lack of positional awareness on bridge. Ship encounters unreported shoal or other underwater obstruction while navigating with minimum UKC.	Grounding averted or rapid refloat.	Ship grounds in rock area and suffers loss of hull integrity, at least one bunker tank opened up. Potential to discharge up to 500 tonnes of heavy oil.	0	2	2	5	0	5	6	6	4.27	Area of 13.5m depth marked on chart and noted in risk assessment to be in need of review. Last survey in 1943, accretion rates unknown. Draught limitation of 10.5m imposed for the area.
34	42	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay	Collision	Water taxi and kayak in conflict	Water taxi meets group of kayaks, particularly on rounding a headland.	Water taxi navigated at excessive speed close to shore, fails to comply with Harbour Regulations. Poor lookout. Lack of local knowledge by water taxi launchmaster.	Averted collision, wash problem causes injury potential to Kayak occupant.	Water taxi runs down two kayaks with likelihood of fatalities.	6	0	0	0	6	0	2	6	4.22	Kayaks are reported to generally navigate within 200m of shore and should not encounter vessels proceeding at speeds greater than 5 knots.

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35	66	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Girting	Tug founders during ship berthing operations	Tug in potential loss situation while assisting larger vessel wishing to berth. Girting likely to occur.	Tug girted by towline. Error in judgement by tugmaster, pilot or ship's master. Poor communication between tugmaster, pilot and ship's master. Poor procedures on tug. Mechanical or other systems failure on tug or ship. Severe environmental conditions.	Capsize averted by recovery but significant list. Towline parts.	Tug unable to release towline and is girted. Potential fatalities amongst Tug Crew.	4	0	0	2	6	5	3	5	4.21	Tug towline is presently on a drum and incapable of quick release. About 40-50 Tug assisted visits a year involve Tug.
36	24	Tory Channel & Approaches	Collision	Two Ferries in Conflict at Arrowsmith	Developing Close Quarters situation between Two Ferries at Arrowsmith. Scenario complicated by the presence of leisure, leisure fishing or small commercial vessels.	Narrowness of channel, combined with alteration of required for normal transit. Recreational fishing off Arrowsmith point, Strong tidal set in area affects steerage and track of vessel or craft. Presence of other small vessels making effective channel width further confined. Overhead cables return spurious radar echo, fine on the bow, easily mistaken for an approaching vessel or small craft; inappropriate action taken. Genuine targets misinterpreted as echoes from overhead cables. Poor BRM (failure to monitor position or tidal set). Lack of local knowledge.	Interaction between ferry hulls causes track deviation. Close quarters situation recovered.	Fine angle of blow collision between ferries. Escalation to grounding of a ferry. Alternative of a collision with recreational craft. Potential loss of life.	3	0	0	3	6	6	4	6	4.18	Recreational fishing often occurs off Arrowsmith point (anchor and or drift). Overhead powerlines cross Tory Channel at Arrowsmith . A tidal set exists (recorded as up to 2 knots) which pushes a vessel or craft towards the point. A number of groundings have occurred in the area involving fishing vessels. A recreational user grounded on Arrowsmith at speed (20 Knots), resulting in loss of life.

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37	85	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Mooring Failure	Leisure craft mooring failure.	Small craft or leisure cruiser mooring fails and vessel drifts away in the Sounds.	Inadequate mooring maintenance. Craft or cruiser too large for mooring components. Extremes of severe weather. Improper attachment of craft or cruiser to mooring buoy\chain. Wilful act.	Craft or cruiser is recovered and returned to owner (towage). Alternatively a grounding occurs as drifting craft is blown aground.	Craft or cruiser drifts into fairway at during darkness and involved in collision with larger vessel.	0	6	0	0	0	0	2	6	4.13	This scenario occurs several times a year. The hazard case is also applicable to anchored craft.
38	34	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal	Man Overboard	Man overboard from ferry.	Passenger falls overboard while ferry transiting Marlborough Sounds.	Passenger climbs deck railings or enters non-passenger area of external deck. Passenger falls overboard while under the influence of excess alcohol. Depression\suicide.	Person recovered by ship's rescue boat .	Person swept away in tidal flow and rough sea, lost to sight of ferry crew with fatality.	0	0	0	6	6	0	0	6	4.07	Ferries have reported MOB situations while transiting Sounds.



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39	2	Tory Channel & Approaches, Outer Sounds - Coastal, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Grounding	Tug and Tow Grounding in Narrow Tidal Channel	Tug and Tow grounds within an area of narrows or one of the Passages with strong tidal streams. Tug remains afloat, but tow grounds.	Tug loses steerage through mechanical or other systems failure. Poor BRM (failure to monitor position or tidal set). Tow runs out of sea room during manoeuvres to avoid another vessel. Tidal influence greater than tugs forward momentum, tide pushes tow ashore. Tug moving on flood tide. Tow rope too long for conditions or area. Lack of local knowledge. Tug not engaging pilot Sea conditions too severe for safe transit of Tory Channel entrance.	Grounding averted or slight Grounding and rapid refloating of tow.	Tow grounds, barge holed and sinks. Partial obstruction of channel; channel closed or limited use for extended period, whilst salvage occurs. Cargo lost.	3	0	0	3	4	4	4	6	3.99	Tugs can have difficulty steering tows through narrow entrances during spring tides or during periods of heavy weather. Hazard has occurred in Tory Channel as well as French Pass. Steven's Passage and French Pass have a 500GT restriction without Harbournmaster's permission. French Pass has an additional 120m length restriction. Cape Jackson is another difficult area for Tugs and Tows, with local strong tides pushing vessels unexpectedly into rocks. Barges can have 2-300 lts of hydraulic oil on board. Fertilisers such as Phosphates can pose a significant environmental risk.
40	78	Outer Sounds - Coastal, French Pass & Current Basin	Grounding	Small commercial vessel grounding	Small commercial vessel in narrow grounding situation in narrow passage with strong tidal flows. This is possible in French Pass, Stephens Passage and off Cape Jackson.	Vessel loses steerage through mechanical or other systems failure. Tidal influence greater than vessels forward momentum. Failure to monitor position. Lack of local knowledge. Vessel runs out of sea room through manoeuvre to avoid another vessel. Incorrect tide calculation or extraction from tide tables.	Vessel in potential grounding overwhelmed by tide, but grounding averted and vessel passes through sideways and spills load.	Commercial vessel attempts to abort passage (e.g. French Pass in mid-tide). Vessel grounds on rocks. Severe hull damage results followed by rapid sinking if laden, potential loss of life (up to five crew on a mussel barge).	0	3	0	0	6	6	4	6	3.96	Actual tidal conditions at French Pass can be unpredictable. Decision is needed to abort quite early on approach to allow for sea room to swing away. Groundings have occurred but relatively infrequently in the areas covered by this hazard. A number of mussel barges have suffered groundings.

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41	51	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm	Collision	Fishing vessel and commercial vessel in conflict	Fishing vessel and small commercial vessel in developing collision situation.	Neither vessel aware of position of other vessel prior to rounding headland. Vessels navigating close to shore reducing available sea room for manoeuvre. Presence of other vessels in close proximity limits sea room to manoeuvre. Improper lookout on either vessel. Failure to comply with Collision Regulations. Fatigue of watchkeepers on either vessel impairs alertness and judgement. Disorientation or improper use of radar in restricted visibility, vessel navigating on GPS alone without reduction in speed.	Close quarters situation but collision averted.	Fishing vessel and small tug or marine farm workboat in T bone collision. One vessel holed below waterline and rapidly loses stability with potential for fatalities.	0	0	0	3	6	6	4	6	3.96	Smaller vessels may be navigating close to shore in an attempt to keep clear of shipping. This is currently not perceived to be a problem in the Sounds.
42	56	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Admiralty Bay, French Pass & Current Basin	Collision	Tug and tow in conflict with leisure vessel	Tug and tow in developing collision situation with leisure craft.	Poor lookout on either vessel. Leisure craft fails to comply with Collision Regulations. Leisure craft passes between tug and tow at speed. Leisure vessel operated by persons under influence of alcohol.	Close quarters situation but collision averted.	Leisure vessel runs over towline and is disabled, then in collision with tow. Leisure vessel loses hull integrity and sinks with potential for fatalities. Potential for person to hit tow wire and hull to pass under it.	3	0	0	3	6	2	4	6	3.96	Tug operators have reported close quarters situations with leisure vessels failing to comply with relevant Collision Regulations. Leisure craft at speed has passed between tug and its tow. Barging is on the increase as is leisure use. Towlines are relatively short in Sounds.
43	64	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay	Fire\Explosion	Fire/explosion onboard ferry	Fire or explosion onboard ferry	DG's stowed in inappropriate containers. Insufficient separation in stowage of DG's. Incorrect identification of DG's prior to loading /undisclosed DG's. Inadequate lashing of cargo (moves when ferry heels or with heavy weather motion). Ignition of fuels carried in vehicles. Loss of fuel containment in engine room.	DG spillage detected and contained, fire/explosion prevented. Minor engine room fire brought under control rapidly.	Vehicle deck fire initiated by vehicle fire on ferry. Dangerous goods in adjacent vehicle involved. Serious fire difficult to contain. Evacuation required. in Sounds.	3	3	0	3	4	4	0	6	3.94	DG reporting systems may be operating on an out of date basis due to backlog of DG shipments.

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44	8	Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Collision	Commercial and leisure craft conflict in narrows	A small commercial craft and a leisure craft are involved in a developing collision situation within an area of confined waters, such as Cullen Point at Havelock. Scenario of a powered leisure craft travelling at speed striking a marine farm service vessel clearing Havelock Channel. T Bone Collision geometry is likely.	Either or both craft fail to comply with Harbour Bylaws and Collision Regulations (rule 9, wrong side of the channel; regularly occurs). Lack of local knowledge regarding patterns of traffic in the area. Mechanical failure of either vessel while navigating in close proximity to other vessels. Leisure craft transiting Cullen Point bend at high speed.	Close quarters situation but collision averted.	Larger commercial vessel struck in side by powered leisure craft, travelling at speed. Craft seriously damaged, occupants thrown out of craft, possibly onto deck of large vessel - serious injury or fatality.	3	0	0	0	6	4	2	6	3.74	Commercial operators have reported lack of Collision Regulation compliance shown by yachts and power driven craft. Cullen point is blind and the channel exacerbates this. 5 five knot speed limit is in place in the area, but the tide can reach 5-7 knots (but actual velocity may not have been measured).
45	44	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin	Fire\Explosion	Small vessel Fire/explosion.	Fire in engine room or food preparation space of passenger vessel or water taxi on passage.	Build up of oily or combustible material in engine room ignites. Fracture of fuel line in engine room sprays fuel onto hot surfaces or provides explosive concentration of fuel vapour. Electrical fault.	Minor fire extinguished by crew without significant damage.	Fire on large GRP water taxi requires immediate evacuation of passengers. Potential for fatality.	0	2	0	2	6	6	2	6	3.65	Small passenger vessels may operate some distance away from dedicated search and rescue facilities resulting in delay obtaining assistance. Passengers may be required to enter the water after evacuation. Use of Open Reversible Liferafts (winter water temp 12 Celsius).
46	81	Cloudy Bay	Swamping	Leisure craft suffers water ingress crossing bar	Leisure craft is swamped by large steep swell when attempting to cross Wairau Bar.	Operator of craft attempts to cross bar in adverse conditions. Operator of craft lacks local or general boating knowledge. Craft loses steerage through mechanical or other systems failure including running out of fuel. Craft of unsuitable design for use in bar harbour conditions. Sudden change in Weather conditions.	Misjudgement in sea conditions, severe rolling and takes on water. Situation recovered.	Craft rolled in steep swell or swamped. Persons in water. Potential loss of life.	3	0	0	0	6	2	2	6	3.62	Cloudy Bay is a low use area.



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47	6	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespeare Bay, Outer Sounds - Coastal, Outer Pelorus Sound, French Pass & Current Basin	Collision	Two vessels over 500GT in collision situation.	Two vessels over 500GT in developing collision situation within the Sounds.	Neither vessel aware of position of other prior to rounding headland. Either vessel fails to comply with Collision Regulations. Misunderstanding of information passed by VHF radio by either ship. Poor positional or spatial awareness on either vessel. Presence of other vessels limits sea room available to manoeuvre to avoid collision. Depth of water available limits sea room available to manoeuvre for laden out-bound log ship or other vessel operating with minimum UKC.	Close quarters situation but collision averted.	Passenger vessel in T bone collision with laden bulk cement carrier (PEC Holder). Passenger vessel loses watertight integrity. Bulk Carrier more likely to be lost. Potential for fatalities amongst Bulk Carrier Crew in evacuation..	0	0	0	2	5	5	6	6	3.59	The probability of worst credible outcome is probably low given the relative infrequency of movements of vessels over 500gt, other than ferries. With only one Pilot the event could only occur with a piloted vessel and a vessel with a PEC holder on board.
48	61	Port Underwood, Cloudy Bay, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Tsunami	Serious earthquake in Region	Serious earthquake or slippage causes series of surge waves affecting Sounds	Earthquake. Slippage of underwater deposits at Kiakura canyon.	Far field Tsunami. Six hours warning, water surge (seiching). Sufficient warning for vessels to be at sea. Effect likely to be limited at Picton as wave energy is lost due to alignment of Sounds. Loss of live associated with navigation unlikely.	Near field Tsunami. Little or no warning. 12M peak arriving on the beach in 90 seconds. Cook Strait initiation more likely to affect the Sounds. Seiching takes out shore interface and vessels alongside severely damaged. Vessels navigating unaffected, but parting of mooring lines and passenger walkways likely.	0	3	0	4	4	4	0	5	3.55	NZ is part of the Farfield Tsunami early warning system. Advice taken from Blenheim emergency response centre. Direction would have to be from a Norwest direction to align with Queen Charlotte sound to cause major damage. Events have occurred off Wellington 1855, 10M surge. Kaikoura affected 139 years ago by a large underwater slippage.
49	65	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Collision	Berthing Tug in collision with berthing vessel	Tug in collision with vessel when assisting during berthing.	Error in judgement by tugmaster. Poor communication between pilot, ship and tugmaster. Error in judgement by ships master or pilot or poor spatial awareness. Mechanical or other systems failure on tug or ship. Interaction between tug and ship hulls.	Minor collision, minor indents damage to either vessel.	Tug suffers fractured shell plating in collision or very heavy landing with ship resulting in water ingress. Low speed - potential for injury. Tug out of action, vessel subsequently takes ground (soft seabed).	3	3	0	0	4	4	4	4	3.53	Maintaining currency on equipment and procedures in shipping operations has been identified as a potential issue due to the low frequency of ship visits that occur at Picton. Tug has only recently arrived at Picton.

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50	70	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm	Collision	Leisure craft (hire) in conflict with other vessel	Self-drive hire vessel in developing collision situation with other vessel in Picton Harbour and approaches.	Lack of knowledge or compliance with Harbour By-Laws and Collision Regulations on either vessel. Lack of knowledge of local traffic patterns on either vessel. Hirer fails to brief hiree on applicable regulations and traffic patterns. Mechanical failure of steering or propulsion system on either vessel. Operators of either vessel under influence of excessive alcohol. Hire boat operated by youths (under age of 15).	Close quarters situation but collision averted.	Hire vessel runs over a two seater kayak at speed. Kayak occupants struck by hull or propeller with fatalities possible (up to 2).	3	0	0	0	6	2	0	6	3.47	Power-driven vessels capable of high speed are offered for hire from Picton. Potential exists for conflict with swimmers/divers and other forms of accident. Few incidents have come to light.
51	5	Outer Queen Charlotte Sound, Central Queen Charlotte Sound	Collision	Two ferries in collision situation generally	Two ferries in developing collision situation within the Sounds generally.	Failure of either or both vessels to comply with Collision Regulations. Poor BRM on each vessel. Mechanical or electronic system failure on either ferry. Ferry transiting pilotage waters reliant on autohelm control satellite navigation system. Poor positional/spatial awareness on either/both vessels. Presence of another vessel in close proximity compromises ability of one or both ferries to alter course. Other circumstance may result in a ferry navigating outside its usual track.	Close quarters situation but collision averted.	Collision between two passenger carrying ferries shortly after rounding a headland. Fine angle collision, damage to accommodation. Potential for injury to passengers and fatalities.	0	0	0	2	5	5	3	6	3.43	In the Sounds generally, this is considered to be a low probability event. Its likelihood rises in the scenario whereby a ferry has to deviate from the normal track to avoid a smaller vessel or craft.
52	43	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, D'Urville Island - West	Contact Navigation	Water taxi in contact navigation situation.	Water taxi or charter fishing vessel (up to 20 persons) in contact situation with fixed object (aids to navigation) debris or semi-submerged object.	Poor lookout on water taxi. Marine Farm inadequately lit. Anchored vessel inadequately lit. Water taxi proceeding at speed in close proximity to moored or anchored vessels / marine farms. Lack of local knowledge by seasonal or new staff (staff training). Logs or other debris difficult to detect.	Contact with aid to navigation causing damage. Striking of submerged object.	Water taxi navigating at speed contacts large floating log and suffers loss of hull integrity, leading to flooding risk of loss of vessel. Potential for loss of life in extreme case.	3	3	0	0	4	4	2	4	3.4	Marine farming is reported as a growth industry in many areas of the Sounds. Logs and other debris is likely to be washed into the Sounds during heavy rainfall events.

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53	36	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Sound, Picton Harbour - East, Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Croisilles Harbour	Contact Navigation	Small vessel suffers contact during navigation	Small commercial vessel or leisure craft in contact with partly submerged object (e.g. Logs).	Debris/logs washed into Sounds during heavy rainfall, not detected. Floating fishing gear.	Minor damage to vessel hull, propulsion or steering.	Vessel navigating at speed strikes log and suffers rapid water ingress. Loss of a small craft may occur. Possibility of person being thrown out of a small craft (e.g. RIB).	3	3	0	0	4	4	2	4	3.4	Logs are reported to wash into the Sounds during flood events causing a hazard to small craft. Department of Conservation ruling forbids clearing of debris on beaches, this debris may later be washed into the Sounds area.
54	23	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Sound, Picton Harbour - East, Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, Croisilles Harbour	Wash	Personal injury on commercial vessel - Wash	Wash causes heavy rolling of a small commercial vessel or tug with tow alongside.	Small tug with barge alongside rolled heavily from wash of other vessel causing relative movement and snatching of lines. High Speed Craft exceeding 18 knots in a medical emergency.	Vessel being towed alongside bumps heavily on tug with minor damage. Loss of product off a mussel barge or propelled barge carrying, e.g., harvested salmon.	Tow-lines part and injury to crew member. Tow drifts and grounds. Crew injury from sudden rolling or shifting cargo.	3	3	0	3	4	2	0	4	3.34	Tug and barge operators have reported ferries failing to slow when passing laden tug and tows.



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55	50	Cloudy Bay, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Outer Sounds - Coastal, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West	Collision	Fishing vessel in conflict with vessel over 500GT	Fishing vessel on passage and vessel over 500GT in developing collision situation.	Fishing vessel impedes passage of vessel over 500GT within harbour limits. Fishing vessel on autopilot with improper lookout kept. Either vessel unaware of local traffic movements. Improper lookout on vessel >500GT. Poor BRM on vessel. Limited sea room available for vessel >500GT to manoeuvre to avoid collision.	Close quarters situation but collision averted or small glancing scrape.	Laden vessel >500GT runs down fishing vessel which could capsize. Potential for fatalities (up to 5).	0	0	0	0	7	6	4	6	3.2	
56	7	Tory Channel & Approaches	Collision	Ferry and commercial vessel in conflict	Ferry and small commercial vessel (workboat) in developing collision situation in Tory Channel or approaches.	Commercial craft or workboat fails to give way and impedes navigation of ferry. Either vessel unaware of other vessel position prior to rounding a headland. Mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Poor positional or spatial awareness on either vessel or craft/workboat. Either or both vessels fail to transmit or receive the 'All Ships' 10 minute call. Call made on wrong frequency (has occurred). Small vessel stemming tide at Tory Channel Entrance causing collision risk by being unable to transit controlled navigation zone within reasonable time (e.g. 25 mins).	Close quarters situation but collision averted.	Smaller vessel capsizes or sinks causing fatalities.	0	0	0	0	7	6	4	6	3.2	Tug and barge operators report that they are unable to cross some parts of Tory Channel at right angles in time to remain clear of any ferries which may round a headland without warning. Charter vessels of approx. 300GT may transit Tory Channel occasionally while relocating between Wellington and the Sounds. An incident has occurred with a marine farm vessel towing, that was not aware of 10 minute call rule. Commercial vessels are reported to be good.
57	30	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Contact Navigation	Ferry Contact Incident	Ferry contacts a moored vessel or barge whilst underway.	Another vessel anchors or moors in shipping channel. Poor positional or spatial awareness on ferry. Inadequately lit vessel or object moored behind Mabel Island. Ferry not aware of vessel or object moored behind Mabel Island prior to approach. Vessel or moored object drags into shipping channel and is not detected in darkness or restricted visibility. Barge illegally anchored outside designated area.	Close quarters situation but contact averted. Complaint made.	Ferry runs into moored barge at back of Mabel Island. Watertight integrity compromised. Barge of 500 tonnes involved. Flooding of one compartment of ferry; placed alongside alternative wharf. Passengers evacuated; Ferry out of service for a month.	0	0	0	0	6	6	4	7	3.2	Vessels have dragged anchor or mooring failure has resulted in a barge drifting into path of ferries. This hazard has been realised in the last five years. Ferries on approach to their Picton berth have been involved in contact with moored craft during periods of restricted visibility.



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58	69	Outer Queen Charlotte Sound	Swamping	Pilot vessel in loss of hull integrity situation	Pilot vessel suffers loss of airbag coming alongside and ships water during pilot transfer operation.	Pilot vessel or RHIB design loses buoyancy and stability through pontoon failure (heavy contact bursts bag, collision or accumulation of wear). Operation in heavy weather by inexperienced launchmaster. Operation in heavy weather beyond operating envelope of pilot vessel.	Pilot vessel heavy landing alongside. Damage to airbags occurs on one side, bilge pumps cope with ingress of water, vessel makes port safely.	Bow sections of pontoon come away from hull in rough sea, vessel loses stability and capsizes with potential fatality.	0	2	0	0	6	2	0	6	3.13	At least two recorded incidents in NZ waters have occurred with RHIB's where inflatable bags have come away from the hull, resulting in either capsize or severely reduced stability. Pilots at Marlborough use RHIB's.
59	27	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Contact Berthing	Vessel >500GT contact during berthing	Vessel > 500GT contacts wharf during berthing in Picton Harbour East or Shakespeare Bay.	Error in judgement by shiphandler. Error in judgement by tug master. Adverse environmental conditions during berthing (sudden gust of wind) Mechanical or other systems failure aboard any assisting tug. Mechanical or other systems failure aboard ship. Small vessels navigating in close proximity limit sea room available to larger vessel for manoeuvre.	Minor contact damage to wharf. Indented shell plating.	Vessel lands heavily on wharf and fractures shell plating causing ingress. Potential for minor to moderate injuries as crew /passengers thrown to deck. Ship disabled with significant economic loss to operator and delays to other vessels (up to one week). Loss of revenue to Port Company. Widespread reporting if cruise vessel.	0	3	0	0	4	4	0	4	3.03	
60	67	Outer Queen Charlotte Sound, Outer Pelorus Sound	Personal Injury	Personal injury during pilot transfer operation	Personal injury situation during operation of embarking / picking up pilot from vessel over 500GT.	Pilot loses grip while using pilot ladder. Pilot vessel fails to stay alongside ship as pilot transfers to or from ladder. Improperly rigged or poorly maintained pilot ladder. Heavy weather.	Pilot falls short distance to pilot vessel with minor injury.	Pilot vessel comes away from ships side in heavy weather while pilot transferring from pilot vessel deck to pilot ladder. Pilot falls in water and is caught between hulls with severe injury or fatality.	2	0	0	0	6	0	0	6	2.98	A light displacement pilot vessel may not provide a stable platform for pilot transfers in all weathers. Pilots boarding in relatively sheltered waters in Sounds at present. Low risk as low frequency of boarding.

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61	87	Pelorus Sound - Havelock & Approaches	Grounding	Leisure craft grounds at Havelock	Leisure vessel in grounding situation at Havelock and approaches.	Craft loses steerage through mechanical or other systems failure. Tidal influence. Failure to monitor position. Lack of local knowledge. Incorrect tide calculation (incorrect application of tidal correction - secondary port). Storm aftermath results in logs and other debris in channel. Fog or restricted visibility.	Craft grounds in sheltered waters, occupants able to abandon or refloat on change of tide.	Powered craft approaching Havelock grounds across channel. Channel closed for a tidal cycle, craft liable to suffer structural damage or roll over. Craft strikes submerged log held in soft mud, is holed, floods and requires salvage assistance to recover.	0	0	0	0	3	3	3	7	2.97	Havelock is an area of regular minor groundings, but it is soft mud and outcomes are likely to be minor overall. Leisure craft category includes small self drive day charters (15 foot) Fog is a problem in the area and small leisure craft rarely have radar fitted.
62	53	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Collision	Small Commercial Vessel Conflict	Commercial vessels meet on rounding a headland with developing collision situation	Vessels navigating close to shore at excessive speed with limited sea room available to manoeuvre. Poor lookout. Vessels not aware of position of other prior to rounding headland (lack of VHF reporting). GPS or automated navigation in restricted visibility without reduction in speed. Concentration of traffic in close proximity.	Close quarters situation but collision averted.	T bone collision between laden self propelled barge and a workboat. Workboat holed below waterline, rapidly loses stability and capsizes. Mussel Barge Laden (about 100 tonnes on deck) would sink rapidly. Fatality likely.	0	0	0	0	6	6	4	6	2.87	Commercial operators aware of potential risk assessed as low. Cullen Point, approaching Havelock is blind.

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63	22	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Swamping	Leisure vessel tender in swamping situation	Leisure vessel tender takes on water while taking persons and gear out to moored craft.	Tender is overloaded for prevailing conditions. Lack of local and/or general boating knowledge by person in charge of tender. Swamping by wash of passing vessel. Craft used as a tender is unsuitable or in unseaworthy condition. Person in charge of tender under influence of excess alcohol, impairing judgement.	Tender takes water but kept afloat by internal buoyancy while occupants bail, craft makes place of safety.	Tender capsizes in choppy sea, occupants without buoyancy aids unable to cling to vessel or make shore. Potential for loss of life.	0	0	0	0	7	0	0	7	2.78	Buoyancy aids may not be worn routinely by occupants of tenders, some may lack any internal buoyancy to enable swamped or capsized vessel to stay afloat and support occupants. One fatality has occurred. Resorts provide tenders to pick up and drop off people, which is thought to be a risk control measure that is saving lives.
64	20	Port Underwood, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin, Croisilles Harbour	Collision	Commercial vessel & leisure craft in conflict	Small commercial vessel and leisure craft in developing collision situation generally in the sounds.	Poor lookout. By night, inadequate or inappropriate lights shown. Lack of local knowledge regarding traffic patterns. Lack of knowledge of Harbour and Collision Regulations. Lack of positional or spatial awareness on either vessel. Loss of steerage on one vessel due to sudden mechanical or other systems failure. Reduced Visibility.	Close quarters situation but collision averted.	Leisure vessel run down by larger commercial vessel. Leisure vessel rapidly loses stability and sinks with potential fatalities.	0	0	0	0	6	4	4	6	2.78	Lack of obvious compliance with Collision Regulations by leisure vessels is reported by commercial operators. Unlit craft navigating have been reported in proximity to areas where other craft normally navigate.

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65	52	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Central Pelorus Sound, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Collision	Fishing vessel and leisure vessel in conflict	Fishing vessel and leisure vessel meet on rounding a blind headland.	Vessels navigating close to shore with limited sea room to manoeuvre. Improper lookout. Either or both vessels fail to comply with Collision Regulations. Lack of local knowledge of traffic patterns. Vessels navigating by GPS in restricted visibility without reduction in speed.	Close quarters situation but collision averted.	Fishing vessel T bones and holes leisure vessel which rapidly loses buoyancy and sinks. Persons in water with potential for fatalities.	0	0	0	0	6	4	4	6	2.78	Number of fishing vessels in commercial service is falling.
66	59	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Queen Charlotte Sound - Grove Arm	Collision	Water taxi and ferry in conflict	Water taxi and Ferry (RoRo) other vessel in developing collision situation within Queen Charlotte Sound or Grove Arm.	Either vessel unaware of position of other. Poor lookout on either vessel. Water taxi impedes passage of vessel over 500gt. Presence of other vessels, or proximity of navigational hazard, limits sea room available. Launchmaster unaware of ferry routes and operation. Ferry operating outside usual route. Sudden mechanical or other systems failure compromises either vessels ability to take avoiding action.	Close quarters situation but collision averted.	Watertaxi misjudges a crossing of the bow of a Ferry under way. Ferry T bones water taxi which rapidly loses stability and capsizes. Persons in water with multiple fatalities.	0	0	0	0	6	5	3	6	2.74	Reports of conflict, (ferry to watertaxi) have occurred. However Watertaxis and Ferries are in regular radio contact, this being operator dependent. Water taxis well aware of timing of ferry movements and have good local knowledge, but there are occasions when ferries deviate from their normal route.
67	57	Port Underwood, Central Queen Charlotte Sound, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, French Pass & Current Basin	Personal Injury	Water skier/recreational object in contact	A craft towing a water skier or other recreational object in developing contact situation with other vessel or fixed object.	Other vessels navigating within water ski lanes at the same time as water ski vessels. Water skiers active in areas of high traffic density. Poor look out on either vessel. No observer aboard water ski vessel. Water ski/recreational object towing vessel operator fails to appreciate arc of travel of towed object.	Water-ski towing vessel /skier or biscuit near strike to a fixed object.	Water ski vessel executes tight turn and towed object/person is brought into contact with fixed object with potential for fatality.	0	0	0	0	6	0	0	7	2.69	Contact instances resulting in severe injury have been reported (3 in 10 years)



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68	46	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West	Contact Berthing	Small passenger vessel suffers berthing Contact.	Small passenger vessel contacts berth heavily during passenger service (including water Taxis or charter services)	Error in judgement by launchmaster. Loss of steerage or engine control through mechanical or electrical failure. Wash from other vessels carries taxi onto berth. Water taxi manoeuvres to avoid vessel, person or debris in water on approach.	Minor contact.	Vessel contacts wharf at speed throwing persons to the deck with multiple moderate injuries. Water Ingress.	0	0	0	0	6	4	2	6	2.65	Excessive speed of approach with subsequent mechanical failure has in the past resulted in injuries to passengers.
69	31	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, D'Urville Island - West, Croisilles Harbour	Contact Navigation	Contact by Small Commercial vessel.	Small commercial vessel in contact with moored or anchored vessel or aid to navigation.	Poor lookout on commercial vessel. Anchored vessels showing inadequate or no lights. Vessels anchored in fairway. Small commercial vessel navigating at excessive speed within 200 metres of shore.	Contact averted.	Small commercial vessel or motorised barge in contact with anchored yacht or motor cruiser. Damage to yacht's hull results in loss or serious damage to struck vessel. Potential loss of life if anchored vessel is unlit at night and struck	0	0	0	0	6	4	2	6	2.65	Unlit craft at anchor have been reported in areas where other craft/vessels normally navigate. Small craft may be anchored near headlands close to shore, vessels rounding headland at speed have little time to take avoiding action. Moored or anchored vessels have dragged into fairway. Contact with Aids to Navigation has occurred on a number of occasions.

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							People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders				
70	58	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, Croisilles Harbour	Collision	Personal Water Craft in conflict with other vessel	Personal water craft (PWC) in developing collision situation with another vessel at high speed.	Poor lookout on either vessel or PWC. PWC operated at speed in area of high traffic density. PWC impedes navigation of vessel >500GT PWC fails to comply with Collision Regulations. PWC operated within 200 metres of shore or 50metres of other vessel at speed >5knots. PWC operated by inexperienced or underage rider. PWC operated by person under influence of alcohol. PWC engaged in towage of "biscuit" or waterskier and attention diverted.	Close quarters situation but collision averted.	PWC collides with double seater kayak at speed striking kayak occupants with fatalities.	0	0	0	0	6	2	2	6	2.52	Since 1997 around 7 fatalities involving PWCs have been reported in New Zealand Waters. PWCs are noted to be towing water-skiers or "biscuit". In Marlborough Sounds, PWC deployment is low, which is reflecting the low risk score.
71	45	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Queen Charlotte Sound, Queen Charlotte Sound - Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Admiralty Bay	Personal Injury	Small passenger vessel in adverse seas in sounds.	Small Passenger vessel operating outside advisable limits in adverse weather conditions and personnel injured.	Water conditions poor in area in which passenger vessel is trading on a particular day. Limited training or experience of local conditions required for operation of vessel. Sudden change in weather conditions. Commercial pressure from owner or charterer.	Vessel turns back for shelter, passenger safety not compromised.	Operation proceeds in poor weather conditions. Passengers thrown around in heavy seas. Injuries.	2	0	0	2	4	0	0	0	2.3	
72	49	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Outer Sounds - Coastal, Outer Pelorus Sound, French Pass & Current Basin	Collision	Leisure craft and vessel over 500GT in conflict	Leisure craft and vessel over 500GT in developing collision situation in the Sounds (outer areas).	Leisure craft impedes passage of vessel over 500GT (fails to comply with Harbour Bylaws). Poor lookout on either vessel. Inadequate lights shown on leisure craft by night. Small craft not detected by ships radar. Mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Poor positional or spatial awareness on either vessel or craft.	Close quarters situation but collision averted.	Leisure craft attempts to cross track of vessel over 500gt and is run down. Potential for multiple fatalities on small vessel.	0	0	0	0	5	3	3	5	2.26	Due to relative infrequency of shipping traffic other than ferries, the probability for this situation is likely to be low, other than in periods of restricted visibility.
73	54	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East	Collision	Kayak and ferry generally in collision situation.	Kayak and ferry in developing collision situation in Sounds area generally.	Poor lookout on kayak. Kayak not detected from bridge of large vessel. Kayak impedes navigation of vessel. Lack of local knowledge of speed and passage plans of ships transiting.	Kayaks spotted at close quarters, but collision averted; wash effect.	Kayaks travelling in company run down by ferry with potential for multiple fatalities.	0	0	0	0	5	0	0	6	2.15	Ferry masters report that kayaks are not generally encountered in close quarters situations along the ferry route. However, where kayaks regularly cross ferry routes, such as off Picton Point, the

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																	likelihood is increased.	
74	29	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, Croisilles Harbour	Contact Berthing	Leisure vessel in contact during berthing.	Leisure vessel in contact with jetty during berthing.	Error in judgement by leisure vessel skipper. Mechanical or other systems failure. Wash from passing vessel results in leisure vessel landing heavily.	Minor contact.	Leisure vessel contacts wharf at speed resulting in moderate injuries.	0	0	0	0	6	3	0	0	2.07	
75	17	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespeare Bay, Outer Sounds - Coastal, Outer Pelorus Sound, French Pass & Current Basin	Collision	Small Commercial vessel and vessel over 500GT	Small commercial vessel >500GT in developing collision situation in the Sounds.	Vessels meet on rounding headland Density and proximity of other traffic limits sea room available to manoeuvre. Poor positional or spatial awareness on either vessel. Small vessel impedes navigation of larger vessel (fails to comply with Harbour Bylaws). Mechanical or other systems failure resulting in one vessel losing steerage.	Close quarters situation but collision averted.	Small commercial vessel run over by larger vessel and capsizes or sinks with potential for fatalities.	0	0	0	0	4	4	3	4	1.96	Movements of small commercial vessels may not always be reported to shipping traffic management at Picton Harbour Radio.
76	19	Outer Queen Charlotte Sound, Central Queen Charlotte Sound	Collision	Ferry and small commercial vessel in conflict	Ferry and small commercial vessel in developing collision situation in the Sounds, other than Tory Channel and Approaches.	Commercial craft or workboat fails to give way and impedes navigation of ferry. Either vessel unaware of other vessel position prior to rounding a headland. Mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Poor positional or spatial awareness on either vessel or craft/workboat.	Close quarters situation but collision averted.	Small commercial vessel attempts to cross ferry track and is run down. Smaller vessel capsizes with potential for multiple fatalities. Ferry attempts to take avoiding action at a late stage and runs aground with significant damage to hull and possible discharge of IFO.	0	0	0	0	4	4	3	4	1.96	The probability for this type of worst credible outcome is likely to be low as most commercial operators are reported to comply with Harbour Regulations and are familiar with ferry routes and tracks.



Rank Position	Hazard Reference	Areas	Accident Category	Title	Hazard Detail	Possible Causes	Consequences		Risk By Consequence Category								Overall Risk Score	Remarks
							Most Likely	Worst Credible	People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
77	62	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Sound - Havelock & Approaches, French Pass & Current Basin, Croisilles Harbour	Personal Injury	PWC in conflict with person in water	Personal water craft operating at speed in close proximity to persons in the water.	PWC navigating within 200 metres of shore or dive vessel at speed > 5knots. PWC navigating within 50 metres of swimmers or raft at speed > 5 knots. Poor lookout on PWC. PWC operated by underage or inexperienced rider. Dive vessel fails to display Alpha flag correctly. PWC operated by person under influence of excessive alcohol.	PWC avoids swimmer at close quarters.	PWC runs over swimmer with fatality.	0	0	0	0	5	2	0	5	1.94	Dive flags may not always be shown correctly/at all and dive vessels may be difficult to distinguish from other craft. Low risk because of low deployment numbers.
78	55	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West	Collision	Kayak in conflict with small commercial vessel	Kayak and small commercial vessel meet in developing collision situation.	Failure by lookout to detect Kayak on commercial vessel. Small commercial vessel proceeding in restricted visibility or in conditions where kayaks difficult to detect (sun reflecting off water).	Close quarters situation but collision averted.	Commercial vessel at displacement speed runs down kayak. Kayak split. Potential for fatality.	0	0	0	0	6	0	0	0	1.85	Commercial operators report that kayaks are difficult to see in certain sea states and also when setting or rising sun is reflecting off the water. Hazard is related to displacement speed vessel operators feedback, such as log barges or tugs.

Rank Position	Hazard Reference	Areas	Accident Category	Title	Hazard Detail	Possible Causes	Consequences		Risk By Consequence Category						Overall Risk Score	Remarks		
							Most Likely	Worst Credible	People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
79	75	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East	Fire\Explosion	Ferry struck by aircraft	Aircraft or debris strikes overhead cables. Passing ferry in vicinity hit by debris. Overhead cables at Arrowsmith Point.	Aircraft flies into power cables which cross Tory Channel at Arrowsmith Point, ferry has insufficient time to avoid falling debris or airframe. Helicopter accident during emergency services transfer.	Ferry is not in vicinity when aircraft collides with power cables.	Aircraft in collision with power cables as fully laden passenger ferry passes underneath. Burning debris from aircraft lands on ferry upper deck.	0	0	0	0	4	0	0	5	1.84	Aircraft have collided with the power cables crossing Tory Channel. Overhead cables at Arrowsmith Point. Other possibilities exist for a similar outcome elsewhere in the Sounds, for example helicopters routinely fly over the Sounds at relatively low altitude.
80	47	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespeare Bay, Outer Pelorus Sound, Central Pelorus Sound, Admiralty Bay, French Pass & Current Basin	Collision	Kayak and large vessel in conflict	Kayak and large vessel (over 500GT) in developing collision situation with kayak crossing intended vessel track.	Poor lookout on kayak. Kayak not detected from bridge of large vessel. Kayak impedes navigation of vessel. Lack of local knowledge of speed and passage plans of ships transiting area. Log carrier restricted manoeuvrability.	Collision averted at close quarters, wash effect.	kayak run down with possibility of multiple fatalities (up to 2).	0	0	0	0	5	0	0	5	1.82	Kayak hirers may brief customers on where to cross shipping channels in the vicinity of Picton Harbour but kayak users without this knowledge, or operating beyond Picton Harbour must rely on own judgement. Kayaks hired through reputable commercial operators or on guided trips are reportedly less likely to become involved in close quarters situations with shipping.
81	82	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Personal Injury	Injury to divers at commercial berth	Personal injury to divers operating at a commercial berth in Picton harbour or Shakespeare Bay.	Divers have not informed appropriate authority before commencing operation. Shipping not informed that divers are operating in vicinity of berth. Vessel watchkeepers not informed of diving operations due to breakdown of onboard communication procedures. Unqualified divers.	Diver not in vicinity of propulsive or steering gear when tested or started, injury averted.	Propeller started when diver inspecting rudder bracket or jetty with potential for fatality.	0	0	0	0	5	0	0	5	1.82	At present the port operator must inform the Harbourmaster when diving operations are to take place around commercial berths. This information is passed to vessels by Picton Harbour Radio? Communication link between Harbourmaster office and port company.

Rank Position	Hazard Reference	Areas	Accident Category	Title	Hazard Detail	Possible Causes	Consequences		Risk By Consequence Category								Overall Risk Score	Remarks
							Most Likely	Worst Credible	People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders		
82	33	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Admiralty Bay, French Pass & Current Basin	Contact Navigation	Vessel >500GT in contact while navigating	Vessel > 500GT in contact situation with anchored or moored vessel.	Craft or vessel anchored in fairway. During heavy weather moored or anchored craft or vessel drags into fairway. Inadequate lookout on vessel >500GT. Radar on vessel >500GT fails to detect small vessel at adequate range. Poor positional awareness, machinery failure or loss of control in adverse weather on vessel >500gt shaping for berth.	Minor contact.	Anchored or moored leisure vessel run down by ship with potential loss of life.	0	0	0	0	4	3	1	4	1.8	A ship attempting to berth in Shakespeare Bay could run into yacht moorings at the Southern end.
83	28	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, Croisilles Harbour	Contact Berthing	Commercial vessel in contact during berthing	Small commercial vessel lands heavily on wharf while berthing.	Error in judgement by shiphandler. Mechanical or other systems failure. Wash from passing vessel results in heavy landing. Adverse environmental conditions during berthing.	Minor contact with no significant damage.	Small commercial vessel in heavy contact with wharf resulting in significant structural damage and water ingress, minor to moderate injury to crew member. Potential for serious injury.	0	0	0	0	4	2	0	2	1.69	
84	68	Outer Queen Charlotte Sound, Outer Pelorus Sound	Collision	Pilot vessel in collision when embarking Pilot	Pilot vessel in collision with vessel >500GT during pilot transfer operations.	Error in judgement of launchmaster on approach to ships side. Poor communication between launchmaster, pilot and ships master. Disorientation and poor spatial awareness of launchmaster. Mechanical or other systems failure on either vessel. Interaction between pilot vessel and ship hulls. Adverse weather conditions.	Moderate landing of pilot vessel on ships hull without major damage or injury.	Pilot vessel coxn misjudges approach in heavy weather. Heavy landing and damage to hull of pilot launch. RHIB in use, bags burst down one side.	0	0	0	0	0	2	0	2	0.91	RHIBs in use for pilot boarding. About 60 pilot movements per year. Boarding reported to be in sheltered area.

ANNEX C

RISK CONTROL MEASURES

Marlborough Sounds Risk Assessment – Risk Control Measures

No.	Risk Control Measure Intent	Risk Control Measure Description	Hazards mitigated Top 40 ranked	Hazards mitigated Lower 40 ranked	Remarks
1	Development of a Harbour Organization to provide co-ordination of marine services and navigational usage for the waterways within Marlborough District Council Harbour Limits.  Policy intent to provide a self funding entity.	<p>Develop a harbour organization to bring the Harbourmaster function and Port Company operations closer together to deliver in the wider interests of all harbour navigational users.</p> <p>A central harbour organization is needed to serve as the interface between the Harbourmaster and larger vessels using the harbour. Core functions of the harbour organization would include:</p> <ul style="list-style-type: none"><li>• Harbour Organization to become ‘focal point’ for all navigational users within Harbour Limits. The organization would be located in premises readily accessible by the public.</li><li>• Vessel Information Service (VIS) for vessels transiting to Harbour Limits (see RCM 2).</li><li>• Co-ordination of marine services to commercial vessels.</li><li>• Competence availability monitoring of pilot and PEC holder currency.</li><li>• Audit of moorings and marine farm installations.</li><li>• Facilitation of liaison meetings between key stakeholder groups e.g. Ferry operators and yacht racing clubs.</li><li>• Facilitate the introduction of monitoring for the sounds.</li></ul>	1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 28, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40,	41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84.	<p>There is a need to provide the Harbourmaster role with a raised profile and interface with users.</p> <p>Alongside this Risk Control Measure would be the wider review of the appropriate location for movement management and navigational safety in the Sounds.</p> <p>An improved harbour management system could provide ability for targeted Harbour Ranger Patrols, follow-up action and education.</p> <p>Make Key policies of enhanced Harbour Authority and Safety Management System clear to users (e.g. Havelock speed).</p> <p>Co-ordination of requests for port services such as hot work permits hot work permits, through Picton Harbour Radio.</p>



No.	Risk Control Measure Intent	Risk Control Measure Description	Hazards mitigated Top 40 ranked	Hazards mitigated Lower 40 ranked	Remarks
2	Improvements to Picton Harbour Radio	<p>Develop the current operation at Picton Harbour Radio (PHR) into a Vessel Information Service (VIS) throughout the Marlborough Regional Council Harbour Limits. Provide this with a skill base able to interpret and advise on traffic locations as a Regional Council delivery on behalf of all navigational users. Consider this as a core function of the Harbourmaster role.</p> <p>Include system upgrade to record Voice Transmissions.</p> <p>The VIS service would include the following elements:</p> <ul style="list-style-type: none"><li>(i) Receipt of VHF calls made by vessels intending to enter Harbour Limits and recording relevant information relating to draft, carriage of DG's, PEC holders name, and ETA's for salient points within Sounds limits.</li><li>(ii) monitoring of calls made by vessels approaching Controlled Navigation Zones and providing a proactive response to vessels broadcasting incomplete or ambiguous calls</li><li>(iii) traffic monitoring and provision of traffic information to navigational users based on information obtained in (i) and subsequent electronic traffic monitoring systems established by the harbour Organization (RCM's 3, 3.1, 3.2.1, 3.2.2, 4)</li><li>(iv) Receipt and promulgation of hazards to navigation or other information of significance to shipping eg. Tsunami warning received from Civil Defence.</li><li>(v) Co-ordination of marine services for the port, including pilotage, tugs, linesmen and hot work permits.</li><li>(vi) A contact point for any navigational user requiring to contact the Harbourmaster in connection with an incident/accident or relevant navigational issue, e.g. to report a hazard to navigation or oil spill.</li></ul>	1,3,4,5, 8,9,15,51,60	6,7,17,19,48,49,50,52,53,56,59,54,51,64	<p>VHF operators with relevant skills for ship movement management would provide accurate Information to vessels transiting the sounds about the locations of other traffic. Local navigational warnings and safety broadcasts would also occur. The Co-ordination of movements on or off any berth would be via the movement management system as would entry to or exit from any Controlled navigation Zone. The role would include acting as point of contact for ships requiring a pilot or tug or liaison for any intention by master's to anchor or deviate from passage plan. Would also act as a point of contact for yacht racing or any other organised leisure event on the water.</p>
3	Introduce AIS monitoring at Tory Channel Entrance.	Place either an AIS base station at Tory Channel Entrance to monitor and record movements of AIS equipped ships through Tory Channel Entrance.			AIS is a transponder device required for all ships over 300 Gross Tonnes that transmits the identity, position, course and speed of a vessel and receives the same information from other vessels.



No.	Risk Control Measure Intent	Risk Control Measure Description	Hazards mitigated Top 40 ranked	Hazards mitigated Lower 40 ranked	Remarks
3.1	Introduce Wireless LAN or other communication linkage to feedback AIS tracks to Picton Harbour Radio.	PHR operators provided with the ability to monitor progress of AIS equipped vessels through the entrance and pass this information to other vessels in the area intending transit.	1,11, 3,4	7,48	<p>This would provide real time information and therefore a significant reduction in the probability of collision by vessels within the confines of any Controlled Navigation Zone.</p> <p>A webcam could be sited to provide imaging of the entrance for number, location and possible identity of vessels, and also for assessment of weather and sea conditions (linked with RCM 5).</p>
3.2	Additionally introduce Radar coverage of Tory Channel Entrance (connected to Picton Harbour Radio) and retransmit targets as AIS data to ferries.	PHR operators are able to track non-AIS vessels and pass this information to vessel intending transit. Reduction in probability of vessels meeting and risk of collision within confines of Controlled Navigation Zone.	1,3,4,60	6,7,8,17,19,48,49,50,51,52,53,44	<p>This RCM would become effective once Ferries were fitted with integrated chart plotters. The bridge team of any vessel or craft fitted with AIS would be aware of the presence of a leisure or fishing vessel in the blind sector of Tory Channel entrance. Introduction of this RCM would require siting of a radar at a height and range setting to track small craft in Tory Channel.</p>
3.3	AIS and Radar coverage extended to incorporate all routes commonly used by shipping in Tory Channel and Central Queen Charlotte Sound.	Provision of full AIS and Radar Coverage in the Sounds using a progressive implementation strategy.	5,4,9,10,15,18,37,60	6,7,8,17,19,20,47,48,49,50,51  ,52,53,54,55,44,59,70	<p>PHR operatives trained to use information in order to manage traffic in all areas.</p> <p>Harbourmaster would be in a position to exercise navigational management over shipping when circumstances require i.e. In event of heavy traffic or major incident affecting navigation. Reduction in probability of collision within monitored areas.</p>
4	Introduce requirement for the carriage of Class B AIS Equipment (possibly with MSA national involvement).	Introduce national requirement for commercial vessels of less than 300GT and fishing vessels of any size to carry an approved Class B AIS transponder.	9	7,17,19,50,51,53,56,59,70	<p>Identification of targets allows for more efficient PHR operation and passing of information to and between vessels</p> <p>This links with RCM 3 with PHR ability to monitor movements of all commercial craft within Tory Channel and other areas as monitoring system is expanded.</p>

No.	Risk Control Measure Intent	Risk Control Measure Description	Hazards mitigated Top 40 ranked	Hazards mitigated Lower 40 ranked	Remarks
5	Establishment of improved Environmental Monitoring Instrumentation for narrow Tidal Passages and Picton Harbour Berths.	<p>Measurement of tidal, wind and sea state values at French Pass, Tory Channel entrance, Northern Entrance; Havelock, Picton Harbour East and Shakespeare Bay, by instrument. This information relayed to PHR in real time for passing to ships intending to transit narrow tidal passages or berth at main commercial facilities.</p> <p>Introduce windspeed readouts to Picton ferry berths.</p> <p>Make data available online to vessels.</p>	2,11,12,13,14,76,77,79, 86	78	Feedback by ferry masters recorded a wish to have accurate environmental information for the Sounds from Picton.
6	Use of Harbourmasters powers of direction to set environmental limits on transit of Tory Channel entrance	Setting of environmental limits for transit of Tory Channel Entrance by any vessel.	2,11,12,13,14	78	RCM 5 would allow for informed decision to be made by Harbourmaster regarding closure of Tory Channel Entrance to shipping in adverse conditions. RCM 2 ensures passing of information to vessels.
7	Manage transit time of Tory Channel Controlled Navigation Zone	<p>Setting of minimum engine rating or proper speed capability for vessels intending to transit Tory Channel Entrance or other narrow passage against the tidal stream.</p> <p>Minimum proper speed capability of 12 knots for vessels intending to transit entrance against the tidal stream.</p> <p>Slower vessels to avoid entering the Tory Channel Controlled Navigation Zone where their own ETA at East Head is within 15 minutes of that given by a vessel of more than 500GT.</p>	2,3,11,12,13,14,60	7,8,20,48,51,52,56,78	<p>RCM 2 would facilitate passing of information obtained by RCM 4 to vessels intending to transit a passage subject to environmental monitoring. 'Class B' AIS identification of targets navigating within harbour limits would allow for possible direction of navigation by PHR.</p> <p>Requirement would be set by Harbourmasters Direction.</p>
8	Setting of Environmental Limits for Berthing Operation where normal capability is reduced by defect in steering, bowthruster, engine or other systems	<p>Setting of environmental limits for ships berthing or sailing from either Picton Harbour East or Shakespeare Bay berths.</p> <p>Declaration of defects in steering, thrusters or other systems which results in impaired manoeuvring capability to be reported to PHR either during initial call to PHR stating intention to enter harbour Limits, or as soon as practical if the defect occurs within Harbour Limits. PHR will inform the Harbourmaster who may direct the vessel to engage a tug, pilot or use an alternative berth.</p>	26	27,30,33	<p>RCM 4 would provide accurate data for decision to be made by Harbourmaster, operations controlled through PHR (RCM 2).</p> <p>Any environmental limit set may be related to the towing capacity of the available tug when considering Shakespeare Bay (same probably applies to Picton Harbour East, eg when a ferry or other PEC vessel is affected by defect).</p>

No.	Risk Control Measure Intent	Risk Control Measure Description	Hazards mitigated Top 40 ranked	Hazards mitigated Lower 40 ranked	Remarks
9	Modification of existing Radio Reporting Procedures and Introduction of additional reporting of ETA at key points (e.g. East Head, The Snout and Diffenbach).	Radio reporting point (to PHR) to be established at Arrowsmith in Tory Channel until AIS monitoring system established in this area. 'Defects and Limitations' phrase to be included in report made to PHR by vessels intending to enter QS Sound. Standard phrase to be used in making 'All Ships' calls for narrow passages and ETA's amended by further 'All Ships' call where ETA likely to be more than 2 minutes in , error.	1,3,4,5,9,15,18,37,60	6,7,8,17,19,20,48,49,50,51,52,53,56,59	Passive listening to radio transmissions provides other users (e.g. tugs and tows, recreational users) with information about vessel positions.
10	Routeing Measures to reduce Traffic Conflict at Diffenbach Point.	Routeing measures established around 'pinch points' in the Sounds. Controlled Navigation Zone established to include a 1 mile radius around Diffenbach. Within this zone no vessel over 500GT would be permitted to enter the zone where a crossing situation would result with another vessel of more than 500GT. Compliance monitored by PHR through RCM 's 2 and 3. Alternatively, improved management of movements by an enhanced Picton Harbour Radio.	5,15,18	6,17,19,49,50,56	Vessels exiting Tory Channel would probably become the privileged vessel where two vessels have a conflict in ETA, however compliance with the Collision Prevention Rules would still apply.
11	Review pilotage requirements for Tory Channel Entrance	Pilot or Pilot Exemption Certificate to be required for vessels over 100 GT or 20m. Rules would include any passenger vessel intending to transit Tory Channel Entrance.  Move Pilot station to seaward of the entrance to Tory Channel.	2,12,13,35	7,8,20,45,48,51,52,56,78	Close quarters incidents have occurred at Tory Channel Entrance between ferries and vessels between 100 and 500 GT. Holders of a PEC for this area should demonstrate familiarity with local conditions and traffic protocols.  At present the Tory Channel Pilot Station is located one mile outside Tory Channel.
12	Maintain Currency of Marine Operations Personnel	Standard Operating Procedures developed between Pilot, tug operators and Harbourmaster.  Operators of tugs and providers of lines men to introduce training and monitoring system for operational staff to ensure on-going competence for tasks undertaken.	66	65, 67, 68, 69	Tug masters should have received specialist training in operation of tugs fitted with Voith Schneider propulsion. The RCM will record Tug usage and maintenance of competence.
13	Maintain up to date bathymetric information of fairways	Update the bathymetric survey of routes, berths and anchorages used by vessels of more than 500 gross tonnes.	38,79,77,76,2	87,86,78,41	Traffic through the Northern Entrance includes laden bulk carriers with draughts in excess of 10 metres. Limitation currently in place. Hydrographic survey last completed in 1943.

No.	Risk Control Measure Intent	Risk Control Measure Description	Hazards mitigated Top 40 ranked	Hazards mitigated Lower 40 ranked	Remarks
14	Review the present deployment of Navigation Aids and provide additional Aids on isolated dangers and narrow channels	Review placement and any operating characteristics of current marks, and requirement for additional marks or functions.	2,11,12,13,14,38,76,77,79,86	41,78,87	<p>Perano Shoal has been identified as a site possibly requiring marking.</p> <p>The channel on approach to Havelock could be further defined with additional markers with risk control benefits to both grounding and collision hazards.</p> <p>The need for a Ferry Swinging reference mark at Picton Harbour East has been identified.</p> <p>Tory Channel Entrance Leads could be fitted with Racons; alternatively and AIS base station could be sited on these Leads. AIS preferred measure as a racon signal may obscure the channel entrance on radar displays or provide unnecessary clutter.</p>
15	Reduction of collision and grounding risk in the approaches to Havelock	<p>Increase of maximum proper speed in Havelock Approaches to between 6 and 10 knots.</p> <p>Establish Cullen Point as a radio reporting point for commercial vessels, by way of an 'All Ships' VHF call.</p> <p>Increase number of starboard hand channel markers in vicinity of Cullen Point to improve definition of channel and water available for manoeuvres to avoid risk of collision.</p> <p>Improve signage informing users of requirement to keep to the Starboard side of the channel and observe the speed limit.</p> <p>Monitoring (e.g. Camera)</p>	10, 42, 86, 39	8,20,9,25,41,52,53,77,55,87,51	<p>Primarily for marine farm vessels which may not be able to comply with maximum speed of 5 knots through design or through inability to maintain steerage at this speed in a strong tidal stream and influence of river discharge into the channel.</p>



No.	Risk Control Measure Intent	Risk Control Measure Description	Hazards mitigated Top 40 ranked	Hazards mitigated Lower 40 ranked	Remarks
16	Improve safety standard of leisure user by Education.	Commence a programme of presentations and deploy harbour rangers to improve the level of basic navigational understanding amongst leisure users of the Sounds.  Allow attendance on a Coastguard Day Skipper Course within a set period as an alternative to an infringement notice.	3,10,14,18,25,32,37,39,57,71,73,76,83,86	8,20,22,24,29,49,52,56,58,62,70,81,85,87	On water presence of harbour authority is specifically required for deterrence value of this RCM to take full effect.  Photographs may be used to good effect to illustrate aspect and visibility issues between large and small vessels, to assist leisure users in their assessment of risk of collision with larger vessels.  Yacht clubs could be encouraged by the Harbourmaster to take self-enforcement action on members who impede the passage of vessels over 500GT (RCM 22 also).
17	Improvements in incident Reporting System.	Encouragement for all incidents, mishaps and accidents to be reported to the Harbourmaster for subsequent action and/or determination of future risk.  Make reporting policies clear to users and seek immediate reporting of mechanical or electrical failure of any type on board ferries. Review Dangerous Goods incident reports.  Maintenance of regular patrols.	All hazards	All hazards	PHR and harbour rangers may become well known contact points for the harbour authority. Other agencies and organisations, such as MSA, local Coastguard and private marine radio stations could be encouraged directly by the harbour department to report back to the Harbourmaster.
18	Laying and inspection of moorings regulated by Harbourmaster.	All moorings to be subject to ongoing regular inspection by an accredited person.  Introduction of mandatory specification for mooring tackle.  Bring mooring operations under Harbourmaster function.	32, 43	85, 30, 31, 33	Location for new moorings to be approved by the Harbourmaster and laid by competent provider to a minimum standard, which is to be maintained through regular inspection throughout the life of the mooring. The position of moorings and signs of neglect to be audited by harbour department staff.  Present Mooring standards are advisory only.
19	Requirement for Kayak Hirer to Comply With Industry Code of Practice	Commercial hirers of kayaks to demonstrate compliance with the Industry Code of Practice.	16,39,42	47,54,55	This compliance to be a requirement for licensing of the kayak hire operation by the Harbourmaster. Membership of SKOANZ is not compulsory.
20	Upgraded Signage for Display of Local Information and Regulations	Speed limits to be clearly marked on signs affixed to channel markers or on shore.	10,18,25,32,37,39,57,71,73,76,83,86	8,20,24,29,49,52,58,62,81,87	Information on local hazards, regulations and any special features such as proximity of ferry routes or water-ski lanes, to be posted on signs at launching ramps and fuel berths.



No.	Risk Control Measure Intent	Risk Control Measure Description	Hazards mitigated Top 40 ranked	Hazards mitigated Lower 40 ranked	Remarks
21	Yacht Racing Management to Minimize Conflict with Shipping Traffic.	<p>Yacht clubs encouraged to liaise with the changed Picton Harbour Radio prior to any race or event commencing, and on completion of event. In event of unusual traffic flows, i.e. greater than usual number of large movements, the Harbourmaster may require the start time to be postponed, or the race course modified to minimise conflict with shipping movements. Yacht clubs would need to provide flexibility to adjust start times of races to reduce conflict with shipping movements.</p> <p>Liaison with Clubs to introduce a race penalty points scheme for yachts which are recorded to impede the passage of a ferry when racing.</p>	60		<p>Details to be passed to PHR should include type and number of yachts involved, the race course and contact details for the race safety craft or race officer.</p> <p>This information passed through PHR to transiting vessels (RCM 2).</p> <p>Yacht races scheduled to minimise need to cross shipping fairway.</p> <p>Yacht race course set to minimise crossing of shipping fairway</p> <p>Linked to RCM 10 and 11, Education and Enforcement. Yacht clubs could impose penalties on members who impede the passage of vessels over 500GT.</p> <p>Yacht race management should include the Cook Strait Race, ie all races which start outside MDC Harbour Limits.</p>
22	Promote Deviation from Passage Plan as option for ferries or other large vessels to avoid other traffic	Direct communication between Harbourmaster and ships pilots and masters that deviation from their lodged Passage Plan is allowable under reasonable circumstances such as presence of racing yachts across the fairway.	60,15	7,19	There may be a common perception amongst ships officers and masters that no deviation is allowed without the Harbourmasters prior approval. Without this approval, a master may consider the options available for avoiding concentrations of other vessels, such as racing yachts, are limited.
23	Regular audit of Pilot and PEC holder currency.	Introduce a monitoring of the number of movements by each Pilot (or PEC Holder) and introduce minimum number of acts or movements per annum to maintain currency (or lose licence\exemption). Use of database technology. Consider annual interview.	38, 11, 12, 2, 33	27	<p>Simulator training may need to be considered. The pilotage system should be able to defend itself from claims and show a system of pilot training records and maintenance of competence. It should also be able to defend itself from a ferry PEC holder leaving the route and returning as a PEC holder after, e.g., a year.</p> <p>Rule 90 is subject to review by MSA.</p> <p>PEC holders should be on the bridge of the vessel when inside Harbour Limits and certainly when within Pilotage Limits.</p>

No.	Risk Control Measure Intent	Risk Control Measure Description	Hazards mitigated Top 40 ranked	Hazards mitigated Lower 40 ranked	Remarks
23.1	Reduce grounding risk for vessels proceeding to pilot station at the Northern Entrance	Consider moving pilot boarding station further out and away from the marine reserve. Tory Channel boarding station to be moved to seaward of channel entrance.  Consider removal of Bylaw 3.3.2 and allow ferry masters to use Tory Channel Entrance by General Direction.	38		
24	Harbour Patrols and Enforcement	Deployment of regular harbour patrols throughout the year to audit marine farm lighting and position by GPS, nav aid performance, mooring quality, public education.  Enhance patrols during fishing season.  Provide video camera for Patrol Vessel.	3,10,14,18,25,32,37,39,57,71,73,74,76,83,86	8,20,22,24,29,49,52,56,58,62,70,81,85,87	Harbour Patrols were recently introduced. Enforcement action should commence with the 200m and 50m transiting rules.
25	Marine Farm monitoring and Service vessels.	Develop a register of marine farm vessels operating in the Sounds. Monitor marine farm positions; provide Notices to Mariners; local information for recreational users and supply information for Linz charts.	73, 74		Mandatory Traffic reporting may be necessary for the approaches to Havelock, in particular for commercial vessels rounding Cullen Point, which is blind (ship to ship). A number of operators already have this in place.
26	Fuel Installations	Introduce savealls for all fuel delivery points to reduce contamination of water from the large number of minor spills occurring at present.  Drain petrol to sumps.  Educate users.  Publicise a spill response SMS policy to encourage reporting by public.  Investigate partial manning of fuel delivery points (probably expensive).	71		Fuel service is not manned in many places, with fuel being served by users from credit card details.  Liaison with fuel suppliers may be required.  Leisure brochure to include advice about auto bilge pump discharges.
27	Modifications to Mabel Island Anchorage.	Review the position of the Anchorage at Mabel Island to seek relocation to facilitate and clarify a Master's option to route behind the island.  Designate the area from the Snout to Wedge Point as a prohibited area for anchoring.	32,36,43	31,30,33	
28	Review speed restrictions on high speed craft in Outer Queen Charlotte Sound with a view to relaxing present requirements for that location.	Allow a high Speed craft taking the Northern entrance to maintain higher speed until passing a newly defined point in Queen Charlotte Channel, further inside the channel than the present limits. This makes the option to use the Northern Entrance (as opposed to Tory Channel) more viable for high speed craft in marginal weather conditions.			This is on the basis of no change in risk for a High Speed Craft maintaining speed for an increased time when inbound via the Northern Entrance.