

Marine Safety Risk

Marlborough Harbour

Marlborough Harbourmaster
GBT International

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Table of Contents

1	Executive Summary	5
2	Understanding Risk	5
2.1	International Good Risk Practice	6
2.2	Maritime Risk Standard	6
2.3	Scope	7
2.4	Marlborough Harbour	7
2.5	Compliance	7
2.6	Internal Context	7
2.7	External Context	7
2.8	Criteria	8
3	Risk Assessment	9
3.1	Previous Risk Assessments	9
3.2	Risk Review	9
3.3	Risk Analysis	10
3.4	Risk Evaluation	10
3.5	Risk Control	11
3.6	Further Detailed Risk Assessments	11
3.7	Monitoring and Review	11
3.8	Communication	11
3.8.1	Stakeholders	12
3.8.2	Consultation	12
3.8.3	Cooperate and Coordinate	12
4	Safety Management System	13
4.1	Objective	13
4.2	New and Improved SMS	13
4.3	Continually Improving	13
5	Conclusion	14
5.1	Safety Management System	14
5.2	Risk Process	14
5.3	Risk Assessment Review	14
5.3.1	Risk Control	14

5.3.2	Clarity	14
5.3.3	Emerging Risks	14
5.3.4	Risk Tolerance	15
5.3.5	Further Consultation	15
6	Recommendations	16
6.1	New Controls	16
6.2	Control Validation	16
6.3	Activity Plan	16
6.4	BowTie	16
6.5	Further Risk Assessments	17
6.6	Further Consultation	17
Attachment 1 Coarse Risk Assessment Register		18
Attachment 2 MDC Maritime Risk Standard		18
Attachment 3 MDC Harbour Safety Management System		18

The Port and Harbour Marine Safety Code requires Marlborough District Council (MDC) to coordinate a shared understanding of marine-related risks across Marlborough harbour, and ensure they are effectively managed. GBT International was engaged to review the existing harbour risk assessments, risk management processes and Safety Management System (SMS) and then recommend appropriate improvements.

1 Executive Summary

Marlborough District Council (MDC), through the Harbourmaster function, holds responsibility for safe navigation within its harbour which extends from Willawa Point, north of Kekerengu, across to Point Soucis, and includes all the waters of the Marlborough Sounds. GBT International was engaged to review the existing harbour risk assessment, risk management process, Safety Management System (SMS) and propose appropriate improvements. Accordingly, a new Maritime Risk Standard was developed in consultation with the Harbourmaster. The previous risk assessments were reviewed using the new Maritime Risk Standard to provide a good, current, snap-shot-in-time of harbour risk. The improved SMS is consistent with the Port and Harbour Marine Safety Code (PHMSC) and, once implemented, will serve as a good practice administrative tool to assure the continuous improvement of risk management. The following are the key recommendations.

Table 1-1: Key Recommendations

Risk Area	Recommendation
New Risk Controls	Review the new controls identified during this risk assessment and then, using the prioritization tools identified in Section 3, assign resources, responsibility and deadlines in the Harbour's Group Activity Plan
Control Validation	Implementation and effectiveness of each risk control be verified. Where controls are found to be either ineffective or missing, remedial actions be added to the Harbours Group Activity Plan
Further Detail Risk Assessment	The following existing risks were identified as requiring more detailed risk assessment: <ul style="list-style-type: none"> • Ship losing critical equipment • Wake from Cook Strait Ferries • Mooring of large ships at Waitohi Wharf
Emerging Risks	These emerging risks are not fully understood and require assessment: <ul style="list-style-type: none"> • Cyber risk • Allision with cray or cod holding pots • Cruise ship tenders transporting passengers to/from Picton
BowTie Risk Assessments	BowTie risk assessment should be completed for all nine risk groups, drawing from the existing risk register
Harbours Group Activity Plan	All risk controls should be included in the Harbours Group Activity Plan. This plan should be consistent with good practice project management, i.e. tasks are specific, assigned to individuals, given achievable deadlines and progress is monitored
Risk Tolerance	MDC should consider setting their enterprise-wide risk criteria including levels of risk tolerance
Further Consultation	The SMS provides a number of forums for principle stakeholders to make the Harbourmaster aware of potential changes to this assessment and assure that it remains current

2 Understanding Risk

One objective of this project was to ensure that a robust risk assessment process is developed and used to identify actions that will result in reducing marine-related risk in Marlborough. This included working with the Harbourmaster to create a simple yet robust risk assessment framework that assessed all previously identified harbour risks. The risk assessment framework aligns with the international risk management standard, ISO 31000:2018. Allocation of responsibility for shared risk is essential. This means that for every identified risk, the risk source along with the person/ organisation responsible for controlling the risk shall be identified.

2.1 International Good Risk Practice

The purpose of risk management is the creation and protection of value. Good risk management practices improve performance, encourages innovation and supports the achievement of objectives. ISO 31000's objectives include the provision of guidance on effective and efficient risk management, communicating its value and explaining its intention and purpose. This set of generic guidelines assists organisations in the development of their risk management framework and processes as illustrated in Figure 2-1:

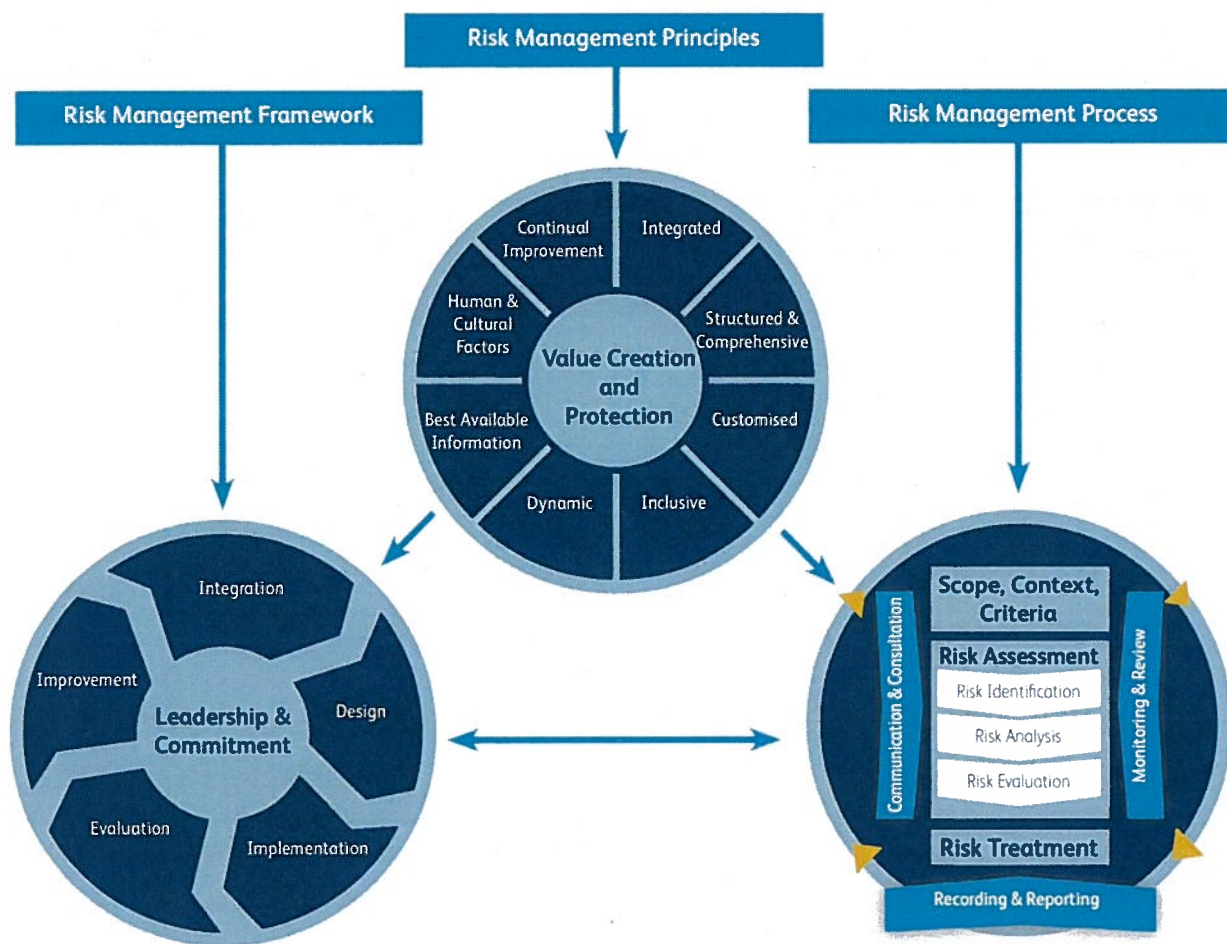


Figure 2-1: ISO31000:2018 Risk Management

2.2 Maritime Risk Standard

An output from this project was the development of a new “Maritime Risk Standard” for the Harbourmaster. This standard includes the ISO31000 risk management principles and framework and documents a robust set of processes intended for the specific use of the Harbourmaster in the management of risk (including but not limited to risk assessment). These processes were used in the review of risk and the identification of risk management controls.

2.3 Scope

The scope of this risk assessment included:

- Safe operating environment within Marlborough harbour
- Movement of ships entering, leaving and navigating within Marlborough harbour
- Marine safety within Marlborough harbour

2.4 Marlborough Harbour

Marlborough District Council (MDC), through the Harbourmaster function, holds responsibility for marine safety within Marlborough harbour. The MDC Harbour extends from Willawa Point, north of Kekerengu, across to Point Soucis north of Nelson, and includes all the waters of the Marlborough Sounds.

2.5 Compliance

In preparing this risk assessment and supporting suggested improvements to marine safety in Marlborough Harbour, the following have been taken into account:

- Requirements of the Maritime Transport Act
- Requirements of the Port and Harbour Marine Safety Code
- Shared roles in managing marine risk within Marlborough Harbour

2.6 Internal Context

Establishing context facilitates a comprehensive understanding of the internal and external issues that influence MDC's ability to manage risk. Internal context is anything within the MDC's organisation that can influence the way in which it manages its risk. Understanding MDC's internal context is essential to understanding the ability of the Harbourmaster to control marine risk in the region. Key internal context issues identified, and taken into account, are:

- MDC's structure and the Harbourmaster's position in this
- Resources available to the Harbourmaster and his ability to control or influence their use
- Harbourmaster's ability to control or influence the control of risks shared with other entities

2.7 External Context

External context issues are those matters outside of MDC's direct control. These issues introduce uncertainty and need to be taken into account as they influence how decisions are made and risks are managed. Understanding the external context is key to Marlborough harbour marine safety as there are a large number of stakeholders in marine-related risks in the 13 ports that are included in Marlborough harbour, each sharing the responsibility for the control of overall risk. Accordingly, shared risk management requires wide stakeholder engagement to ensure a good understanding of all foreseeable marine risks.

The key changes to the external environment since the last Marlborough harbour risk assessment are:

- Revision of the ISO31000
- Revision of the Port and Harbour Marine Safety Code and supporting guidelines
- TAIC putting Navigation in Pilotage Areas on its Watch List
- Azamara Quest findings
- Elimination of cruise ship passage through Tory Channel
- Increasing sizes of cruise ships
- Increasing size and use of marine farms (often close to navigation routes)
- Results of Harbourmaster canvassing stakeholders on their perception of risk within Marlborough
- Emerging Cyber Threats

2.8 Criteria

ISO31000:2018 guides MDC to specify the amount and type of risk that it may or may not take, relative to objectives. To assist MDC to deliver a consistent approach to risk management, the Council should define criteria to evaluate the significance of risk and to support decision-making processes. Risk criteria should be aligned with the risk management framework and customized to the specific purpose and scope of the activity under consideration, marine safety is one of many activities under MDC's control. Noting that this is missing from the broader MDC organization, marine safety-specific risk criteria have been developed. A new document, titled "Maritime Risk Management Standard", documents the following:

- Consistent definition (Likert scales) of consequences (both positive and negative) and likelihoods
- Consistent use of measurements
- How the level of risk is determined
- Responsibility for management of different risk levels

3 Risk Assessment

This section describes the process undertaken to build a snapshot-in-time of the Marlborough harbour marine safety risk and how this can be used in the dynamic management of marine safety risk.

3.1 Previous Risk Assessments

Three risk assessments have previously been completed, the first in 2005, followed by another in 2009/10 and most recently in 2013/14. The most recent risk assessment identified 102 hazard scenarios. When printed on A4 paper size, the hazard list runs to 52 pages. The point being that although significant effort has been expended in compiling these extensive documents, it is difficult to distil useful information from them.

The second important point is that these documents primarily provided only a snapshot-in-time with regard to the assessed risk. The issue is that the assessment does not provide direct outputs that lead to the control of assessed risk i.e. this is a static document that does not contribute to dynamic risk control decisions.

3.2 Risk Review

Regardless of the limitations identified above, the pre-existing risk registers provide detailed data from multiple stakeholder workshops. Risks identified during previous risk assessments were placed into a new risk register and re-grouped to enable the better understanding of existing risk. Through careful analysis, the existing 102 hazardous scenarios were able to be reduced down to 30 common themes. These themes were then scrutinised through the lenses of ships, small commercial operators, divers and recreational boaties.

The new risk register was reviewed by the Harbourmaster and Deputy Harbourmaster in October and then again scrutinised in a Harbours Group workshop held in Picton on December 4th, 2018. This workshop also identified three new risks which were also analysed during the workshop. These new risks are:

- Cyber risk
- Allision with cray or cod holding pots
- Cruise ship tenders transporting passengers to/from Picton

In addition, further insight into existing risks was brought to light during the Harbours Group workshop and is captured in Table 3-1 below.

Table 3-1: Harbours Group Risks

#	Group	Risk	Comment
1	Ship	Hot Work	Revising Navigation Safety Bylaws to limit to >500GT
2	Ship	Loss of power in approaches to Tory Channel	Do passage plans include contingency planning for this scenario?
3	Ship	D-Urville Island	Will there be adequate AtoNs if the compulsory pilotage area is changed/ removed
4	Ship	Use of Dynamic Positioning	Cruise ships do not use actual DP systems as used in offshore operations but rely on a similar level of precision when holding position instead of anchoring
5	Small Commercial	Marine farms	<ul style="list-style-type: none"> • Getting bigger • Extending into navigable areas

			<ul style="list-style-type: none"> • Screw anchors may not be effective • Certification of mooring arrangements • Located close to known navigation routes • Towing salmon cages
6	Small Commercial	Water Taxi speed	
7	Small Commercial	Use of barges within the Sounds	<ul style="list-style-type: none"> • Stability • Diggers • Overloading • Logs being dropped into the sea
8	Small Commercial	Gangway access to fishing boats	Waitohi Wharf
9	Small Commercial	Vessels using Havelock are getting larger	<ul style="list-style-type: none"> • Consider compulsory arrival/ departure reporting • AtoN (lights) arrangements
10	Small Commercial	AtoNs within Marlborough	<p>No lights in Keneparu but there are marine farms all the way up to the head of the Sound</p> <p>Okiwa Bay – no mark near oyster farms (but is required by resource consent)</p> <p>Geo-fencing AIS – alerts when certain ship-types enter predetermined areas</p>
11	Recreational	Small Boat Moorings	<ul style="list-style-type: none"> • Available best practices • Separation
12	Recreational	Multiple conflicting users	<ul style="list-style-type: none"> • Throughout the Sounds but of greatest threat in Queen Charlotte especially Picton • Hotspots in Keneparu • 5-knot speed buoys and signage widely used

It was also noted during the risk review that the potential causes and controls for foundering were the same as for collision. Accordingly, the existing controls and risk rating were the same and should be bundled into one group in future risk assessments.

3.3 Risk Analysis

The purpose of risk analysis is to comprehend the nature of risk and its characteristics including, where appropriate, the level of risk. Risk analysis involves detailed consideration of uncertainties, risk sources, consequences, likelihood, events, scenarios, controls and their effectiveness. Considerable effort was taken to simplify the pre-existing data contained in previous risk assessments, largely by consolidating similar scenarios into a smaller number of risk groups. This helped facilitate better visibility of the issues in play.

The risk workshop used the new Maritime Risk Standard to analyse the:

- Nature and magnitude of worst credible consequences
- the likelihood of events and consequences
- Effectiveness of the existing controls

The risk analysis considered different opinions, noting that in some cases the risk viewed through different lenses resulted in differing perspectives on the level of risk. These risks were debated until a common view was established, with the agreed conclusion documented in the risk register.

Note that at the completion of the workshop, the group were invited to review the results of the risk analysis using “common sense” to ensure that the practical perspective was not lost. As a result, in two cases risks previously assessed as tolerable are now recommended to undertake detailed risk assessments to ensure they are controlled *so far as is reasonably practicable*.

3.4 Risk Evaluation

Risk evaluation involves comparing the results of the risk analysis with the risk criteria documented in the new Maritime Risk Standard to determine the adequacy of risk control. This can lead to a decision to:

- Do nothing further
- Consider new risk control options
- Undertake further analysis to understand the risk better
- Maintain existing controls
- Reconsider objectives

Of the 80 risks evaluated, 22 were rated “high” (no risk was evaluated as “very high”). In a majority of cases where the risk was evaluated as high, further risk controls were identified as requiring consideration, i.e. whether the controls are available, reasonable, practicable and pass the cost versus benefit test. All high risks are to be brought to the attention of the MDC Chief Executive in accordance with the elevation requirement in the Risk Standard.

3.5 Risk Control

The selection of the most appropriate risk control options involves balancing the potential benefits against sacrifice in terms of costs, effort and any disadvantages stemming from implementation. Risk control opportunities shall be prioritized in accordance with the hierarchy of risk controls identified in the Maritime Risk Standard and take into account the table below:

Table 3-2: Prioritising Controls

	Low Cost	High Cost
High Impact	Implement Immediately	Implement If Reasonable
Low Impact	Implement as part of continuous improvement	Do Not Implement

The new risk control options shall then be scheduled into the Harbours Group Activity Plan.

3.6 Further Detailed Risk Assessments

The following risks were identified as requiring a more detailed risk assessment:

- Ship losing critical equipment
- Wake from Cook Strait Ferries
- Mooring of large ships at Waitohi Wharf
- Cyber risk
- Cruise ship tenders transporting passengers to/from Picton

3.7 Monitoring and Review

The purpose of monitoring and review is to assure the effectiveness of risk management processes, implementation of controls, consistency with good practices and continuous improvement of Marlborough’s marine safety. As per ISO31000:2018, a dynamic risk management process relies on continuous monitoring and iterative management of risk, i.e. shifting from a static risk rating to a useful resource allocation/ decision-making tool.

One of the failings of the previous risk assessments was that they were static snap-shots-in-time of risk and did not directly influence continuously improving management of risk. It is vitally important that the ongoing monitoring and periodic review of the risk management process and its outputs are a planned element of the process, with responsibilities and deadlines defined for both the risk standard and individual control actions.

3.8 Communication

Management of Marlborough's marine risk is shared across multiple stakeholders, each with a responsibility for controlling or contributing to the control of the total risk. It is essential that there is a common view of risk and that stakeholders have all appropriate information.

3.8.1 Stakeholders

While not directly part of the regulatory context for this risk assessment, the Health and Safety at Work Act (2015) requires, *so far as is reasonably practicable*, that an organisation consult, cooperate and coordinate activities with all other PCBUs¹ which they share overlapping duties with. Such duties may include managing risks in shared workplaces or activities such as in Marlborough harbour. These principles may be considered good practices in the port and harbour context as multiple stakeholders share overlapping responsibility in managing risk across the whole harbour. This approach is being embraced by the Harbours Group.

Duties can overlap in a shared worksite, e.g. in a port, where more than one business and its workers control and influence the work on site. Duties can also overlap in a contracting chain, where contractors and subcontractors provide services to a head contractor or client and don't necessarily share the same worksite.

The Harbourmaster has identified the following stakeholders that share duties in managing Marlborough's marine risk:

- Port Marlborough Ltd
- Ferry operators Interislander and Bludebridge
- Picton Harbour Radio
- Boating clubs / recreational harbour users
- Aquaculture companies
- Commercial users such as water taxis and commercial fishers
- Coastguard
- Maritime New Zealand

3.8.2 Consultation

Marine risk stakeholders need to be consulted with, bearing in mind that the primary duty of care for the management of specific risks may not be the Harbourmaster but that the Harbourmaster is probably best placed to coordinate overall control. Where responsibility for marine risk control has been assigned, the context and objective of actions shall be communicated to those responsible and those potentially affected consulted.

In addition, marine risk is only one aspect of the Marlborough District Council's overall risk. It is important that the Harbourmaster clearly communicates with other parts of MDC organisation potentially affected by either the new understanding of risk or the implementation of new risk controls.

The Harbourmaster has developed an online survey tool, utilising the "Survey Monkey" platform, to solicit comment from the recreational boating community. As new risks are identified during the survey, the risk register shall be updated, potentially with new control actions scheduled in the Harbour Group Activity Plan.

3.8.3 Cooperate and Coordinate

The Marlborough Harbourmaster maintains a macro overview of risk across Marlborough harbour. He does not always create nor have the powers to control specific marine risks but can identify them and ensure that controls are implemented by other stakeholders to assure risk is maintained at tolerable levels. Eight different modes of communication, from regular meetings through to signage, have been identified in the new SMS that should facilitate a good level of collegial cooperation across stakeholders. Where risk control overlaps between stakeholders, the Harbourmaster coordinates the oversight of controls.

¹ Person Conducting a Business or Undertaking - a broad concept used throughout HSWA to describe all types of modern working arrangements which we commonly refer to as businesses.

4 Safety Management System

As stated in the New Zealand Port and Harbour Marine Safety Code (PHMSC) “The first step in developing an SMS is to formally identify hazards and make an assessment of risks relating to marine-related activities and navigation”. The Code goes on to state “The risk assessment forms an integral part of the SMS and informs its development and ongoing use.” Accordingly, the development of the new Marlborough Harbour Safety Management System (SMS) has proceeded hand-in-hand with the Harbour risk assessment.

4.1 Objective

A key output of this project was to review the existing Harbour SMS and provide guidance on the production of a revised SMS that complies with the PHMSC and demonstrates good practice.

4.2 New and Improved SMS

The PHMSC provides guidance to port operators and councils on recognised good practices required in the safe management of marine activities in New Zealand’s ports and harbours. The key elements are:

- Code Application Assessment
- Harbour Safety Policy
- Harbour Risk Assessment
- Memoranda of Understanding
- Harbours Group Activity Plan
- Harbour Standard Operating Procedures
- Navigation Safety Bylaws
- Emergency Response Plans
- Incident Management
- Delegations

Of particular importance to this report is the new Risk Standard developed for the Harbourmaster during this project. This Standard creates the framework to integrate risk management into the everyday management of marine activity in Marlborough Harbour. The SMS is attached (Attachment 3).

4.3 Continually Improving

The Harbourmaster should continually improve the effectiveness of the Harbour safety management system and the way that marine risk management is integrated into the day-to-day operations of the Harbours Group. As relevant improvement opportunities are identified, the Group should update the Activity Plan and assign accountability for their implementation. Once implemented, these improvements should contribute to the enhancement of marine management.

5 Conclusion

Integrating risk management into an organization is a dynamic and iterative process. The Marlborough Harbour SMS, which includes the Risk Standard developed in this project, took into account the special nature of marine activity in the region. Risk management is part of, and is not separate from, the Harbours Group's purpose, governance, leadership and commitment, strategy, objectives and operations.

5.1 Safety Management System

A new (draft) SMS has been developed and been reviewed by the Harbourmaster. The SMS is consistent with good practice and the Port and Harbour Marine Safety Code. The SMS should be reviewed by the other members of the Harbours Group before being issued for use. It is a living document and should be subject to continuous improvement.

5.2 Risk Process

The Maritime Risk Standard has been developed taking into account the framework recommended by:

- ISO31000:2018
- Port and Harbour Marine Safety Code
- PHMSC Risk Guidelines (including the draft risk guidelines)

This new Maritime Risk Standard has been reviewed by the Harbours Group and has, so far, been revised three times to take into account comments received and experiences gained during this project.

5.3 Risk Assessment Review

The pre-existing risk assessments were reviewed, re-grouped to enable the better understanding of existing risk and used to populate a new risk register. The pre-existing 102 hazardous scenarios were reduced to 30 common themes. These themes were then scrutinised through the lenses of ships, small commercial operators, divers and recreational boaties using the new Maritime Risk Standard.

5.3.1 Risk Control

This project has identified a number of controls that are thought to be in place and others that should be implemented to reduce risk to a more tolerable level. The implementation of existing controls should be verified to assure they are effective and fit-for-purpose.

It is also crucial that the Harbourmaster assures that, where other stakeholders have an overlapping responsibility for managing marine risk, controls assigned to other stakeholders are verified as having been executed and are effective and fit-for-purpose.

5.3.2 Clarity

One of the issues with the previous risk assessments was not the rigour involved in the assessment but, instead, there was too much dense data which made it difficult to distil useful information. With the new risk register, ten risk groups have been identified. Collision and Foundering should now be conflated into one group as their sources and controls have been found to be the same. The nine remaining groups should be subject to the BowTie risk assessment methodology. The output from a BowTie is illustrative and is very useful tool for quick and efficient assessment as to whether there are sufficient barriers implemented to prevent a risk from occurring and that satisfactory barriers exist to mitigate risks should they mature.

5.3.3 Emerging Risks

There are a satisfactory number of communication nodes that should, in most cases, allow the marine risk stakeholders to communicate to the Harbourmaster the emergence of new risks that need attention.

5.3.4 Risk Tolerance

To understand whether risk has been controlled *so far as is reasonably practicable*, MDC must:

- Comply with all rules and regulations
- Take into account applicable codes and guidelines

Once compliance has been achieved, it is essential to consider whether existing controls can and should be improved. There shall be a process for identifying risk control options and the criteria for assessing their suitability, i.e. evaluating the benefit (concerning risk reduction) against the necessary sacrifice. At present, the tolerance of marine risk is documented within the Risk Matrix in the Maritime Risk Standard. MDC should consider setting their enterprise-wide risk criteria.

5.3.5 Further Consultation

Creation of any harbour risk assessment requires comprehensive consultation with stakeholders. This consultation must be objective and rigorous and carried out in a manner that encourages a high level of participation and engagement from Harbour users. While the Harbour's Group collectively has a good understanding of a majority of risks, developed over multiple risk assessments and continuous contact with stakeholders, these stakeholders should be given the opportunity to contribute to this risk assessment.

The new SMS has identified four forums for continuous consultation with the principal stakeholders in marine risk. The Harbourmaster's use of Survey Monkey is a good initiative for reaching a broad cross-section of non-commercial stakeholders and facilitates a robust forum for airing observations and concerns.

6 Recommendations

This section provides a summary of recommended improvements to MDC’s marine safety risk management practices.

6.1 New Controls

Review the new controls identified during this risk assessment and then, using the prioritisation tools identified in Section 3, assign resources, responsibility and deadlines in the Harbour’s Group Activity Plan.

6.2 Control Validation

The risk register identifies a large number of risk controls that are thought to be in place. It is recommended that effective implementation is verified and, where controls are found to be either ineffective or missing, these actions are added to the Harbours Group Activity Plan.

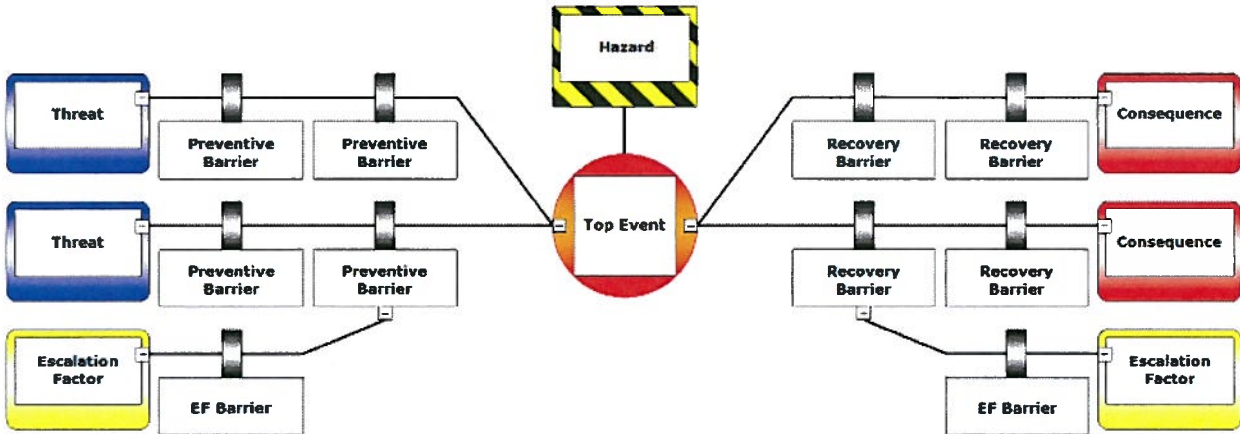
6.3 Activity Plan

Risk management must be integrated into Marlborough’s day-to-day marine activity. To facilitate this, all risk controls should be included in the Harbours Group Activity Plan. This plan should be consistent with good practice project management, i.e. risk control tasks are specific, assigned to individuals, given achievable deadlines and progress monitored.

6.4 BowTie

The BowTie risk assessment, which derives its name from its shape, is a diagram that allows non-experts to visualize risk in a simple picture. The diagram is shaped like a bow-tie, creating a clear differentiation between proactive and reactive risk. BowTie risk assessment should be completed for all remaining nine risk groups, drawing on the existing risk register.

Figure 6-1: Example BowTie



6.5 Further Risk Assessments

The following existing risks were identified as requiring more detailed risk assessment:

- Ship losing critical equipment
- Wake from Cook Strait Ferries
- Mooring of large ships at Waitohi Wharf

In addition the following emerging risks are not fully understood and require assessment:

- Cyber risk
- Allision with cray or cod holding pots
- Cruise ship tenders transporting passengers to/from Picton

6.6 Further Consultation

The attached risk assessment provides a snapshot-in-time of marine risk in Marlborough harbour. The SMS provides a number of forums for principle stakeholders to make the Harbourmaster aware of potential changes to this assessment and assure that it remains current. It is essential that the Harbourmaster maintains open and continuous consultation with stakeholders to ensure emerging risks are identified and acted on and that the effectiveness of controls are monitored.

Attachment 1 | Coarse Risk Assessment Register

Attachment 2 | MDC Maritime Risk Standard

Attachment 3 | MDC Harbour Safety Management System

Marlborough Maritime Safety Coarse Risk Register

Date: 4th December 2018

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Initial Risk Ranking		
						Consequence	Likelihood	Risk Ranking
Ship	Grounding	Access: Weather inhibits safe access to Marlborough due to: - Visibility e.g. Fog/Mist, - Adverse Wind - Strong Tide, - Wave - Sea conditions unsuitable for safe Transit of	Multiple Fatalities Loss of Vessel Tier 3 Pollution Response International Media Attention	People Property Environment Reputation	Weather Forecasting Tory Channel entrance may be closed to shipping in heavy weather. Harbour information	5-Catastrophic	B-Unlikely	B5
Ship	Grounding	Critical Equipment: Ferry loses steerage through, loss of power, mechanical or other systems failure. 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. Inappropriate reliance on technologically advanced electronic navigation systems.	Multiple Fatalities Loss of Vessel Tier 3 Pollution Response International Media Attention	People Property Environment Reputation	Statutory compliance Classification Planned Maintenance System Critical Equipment and Systems Identifications Performance Standards Audits and Inspections Port State Control Inspections Training Familiarisation and Induction o Crew	5-Catastrophic	B-Unlikely	B5
Ship	Grounding	Planning: Ferry off track Piloted cruise vessel grounding or contacting Wheki Rock or other rocks at Tory Channel's seaward entrance. Grounding situation in narrow passage with strong tidal flows Bulk carrier - log ship - grounds on approach to pilot station RoRo ferry grounds in Tory Channel or in Tory Channel approaches or entrance RoRo ferry grounds while manoeuvring to approach berth Vessel transiting Outer Queen Charlotte Sound grounds while proceeding to or from Pilot Station. RoRo ferry grounds on Awash Rock, The Brothers, Cook Rocks or similar while using Northern Cruise vessel - any size - contacts or grounds on rocks in outer Queen Charlotte Sound but inside Harbour Limits: example Awash Rocks; The Brothers; Cook Rock or others	Multiple Fatalities Loss of Vessel Tier 3 Pollution Response International Media Attention	People Property Environment Reputation	Hydrographic Surveys to MNZ Guidelines AtoNs to MNZ Guidelines AIS Bridge Resource Management Pilot Approved Pilot Training Program Competent Personnel Harbourmaster's Directions Admiralty Directions maintained up to date Port Entry Guide maintained up to date Navigational Charts Maintained NOTICE to Mariners issued as required SOPEP Tier 3 Oil Spill Response Plan Tier 3 Oil Spill Response Equipment in Picton	5-Catastrophic	B-Unlikely	B5

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Ship	Grounding	Time Pressure: Ferry schedule leads to corners Entrance for PEC Currency	Multiple Fatalities Loss of Vessel Tier 3 Pollution Response International Media Attention	People Property Environment Reputation	Competent Crew AIS Bridge Resource Management Pilot Exemption Certification Approved Pilot Exempt Training Program	5-Catastrophic	B-Unlikely	B5
Ship	Grounding	Competence Poor BRM (attention oversight) or training in integrated navigation equipment Loss of interface between navigators and control of vessel track. Decision taken by master to use Tory Channel entrance, when the Northern entrance would be more appropriate. Inexperienced Helmsman Poor positional awareness or failure to appreciate effect of tidal flow.	Multiple Fatalities Loss of Vessel Tier 3 Pollution Response International Media Attention	People Property Environment Reputation	Competent Crew AIS Bridge Resource Management Pilot Exemption Certification Approved Pilot Exempt Training Program	5-Catastrophic	B-Unlikely	B5
Ship	Foundering	Risk Awareness: Tug in potential loss situation while assisting larger vessel wishing to berth. Girting likely to occur.	Multiple Fatalities Loss of Vessel Tier 3 Pollution Response National Media Attention	People Property Environment Reputation	Competent Crew Approved Pilot Training Program Fit-for-purpose Tug Quick release for tow-line Pilot-Tug communications Standard Operating Procedure - towing/berthing	5-Catastrophic	B-Unlikely	B5
Ship	Collision	Critical Equipment: Ferry loses steerage through, loss of power, mechanical or other systems failure. 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. Inappropriate reliance on technologically advanced electronic navigation systems.	Multiple Fatalities Loss of Vessel Tier 3 Pollution Response National Media Attention	People Property Environment Reputation	Planned Maintenance System Critical Equipment Identification Critical Equipment Assurance Program Pre-Arrival Checks inc Critical Equipment MPX includes verifying Pre-Arrival Checks Pilot Contingency Plans Simulator Training includes Critical Failures	5-Catastrophic	B-Unlikely	B5

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Ship	Collision	<p>Safety System: Two RoRo Ferries in Collision Situation Generally Two ferries in developing collision situation within the Tory Channel Critical Navigation Zone Two Ships in close quarters in Sounds Ferry and recreational craft in key areas of ferry route or not expecting PEC at Northern Entrance. Vessels of any type approaching or departing Picton Harbour Ferry and small craft in Conflict - Tory Channel Ferry meets recreational in centre of channel on rounding Clay, Heaphy, or any blind headland Ferry, Cruise Vessel or any piloted vessel and fishing vessel in developing collision situation within the Tory Channel Critical Navigation Zone Passenger Vessel (RoRo or Cruise) exiting Tory Channel southern entrance, in conflict with an outbound cargo vessel at Dieffenbach Point. Two RoRo Ferries In Conflict At Dieffenbach Point Yacht engaged in racing in developing collision situation with a ship Cruise vessel conflict with small craft crossing or approaching too close for 'sight-seeing' purposes Ferry and fishing vessel in collision in Coastal harbour limits or the approaches to QC Sound. This includes where FVs regularly operate. Two RoRo Ferries at Arrowsmith Point Fishing vessel on passage vs ship RoRo Ferry outbound and a log ship inbound or vice versa near Long Island Narrows</p>	<p>Multiple Fatalities Significant Damage to Both Ships Tier 2 Pollution Response International Media Attention</p>	<p>People Property Environment Reputation</p>	<p>Hydrographic Surveys to MNZ Guidelines AtoNs to MNZ Guidelines AIS Bridge Resource Management Pilot Approved Pilot Training Program Competent Personnel Harbourmaster Directions - Mandatory Separation Harbourmaster Directions - Pilot, Pilot Exempt and Vessel Operating Requirements Admiralty Directions maintained up to date Port Entry Guide maintained up to date Navigational Charts Maintained Notice to Mariners issued as required SOPEP Tier 3 Oil Spill Response Plan Tier 3 Oil Spill Response Equipment in Picton</p>	5-Catastrophic	B-Unlikely	B5
Ship	Collision	<p>Risk Awareness: Tug and tow in developing collision situation with recreational craft. Kayak and RoRo Ferry Generally In Collision Situation Kayak in Conflict with Transiting Ferry in Outer Queen Charlotte Sounds</p>	<p>Fatality Significant Damage to Both Ships Tier 2 Pollution Response International Media Attention</p>	<p>People Property Environment Reputation</p>	<p>Bridge Resource Management Pilot Approved PEC Training Program Competent Personnel Signage Navigation Safety Bylaws Kayak operator briefing for clients hiring their kayaks</p>	4-Major	B-Unlikely	B4

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Ship	Collision	<u>Competence:</u> Pilot boat suffers damage coming alongside ship during pilot transfer operation. Berthing Tug in Collision with Berthing Vessel Ferry and Vessel Engaged in Fishing in Conflict in Darkness	Fatality Significant Damage to Both Ships Tier 2 Pollution Response International Media Attention	People Property	Bridge Resource Management Pilot Approved Pilot/ PEC Training Program Competent Personnel Pilot Boat Skipper Training Program Pilot Boat Fit-For-Purpose Enforcement AIS	4-Major	B-Unlikely	B4
Ship	Allision	<u>Planning:</u> Passage planning does satisfactorily not cover passage	Major Damage to Ship >\$1M Major Damage to Wharf >\$1M National Publicity	Property Reputation	Bridge Resource Management MPX Pilot Approved Pilot/ PEC Training Program Competent Personnel Port State Control Harbourmaster Directions - Pilot, Pilot Exempt and Vessel Operating Requirements	4-Major	B-Unlikely	B4
Ship	Allision	<u>Competence:</u> Cruise vessel reversing in or out loses control and makes heavy contact with berth, either at Shakespeare Bay or Waitohi West. Ferry contacts berth during berthing operations in Picton Harbour East. Bulk Carrier (Log, Salt or Cement) contacts wharf during berthing in Picton	Major Damage to Ship >\$1M Major Damage to Wharf >\$1M National Publicity	Property Reputation	Bridge Resource Management MPX Pilot Approved Pilot/ PEC Training Program Competent Personnel Port State Control Flag State/ Class Audits Harbourmaster Directions - Pilot, Pilot Exempt and Vessel Operating Requirements	4-Major	B-Unlikely	B4
Ship	Allision	<u>Violation:</u> Failure to follow passage plan	Major Damage to Ship >\$1M Major Damage to Wharf >\$1M National Publicity	Property Reputation	Bridge Resource Management MPX Pilot Approved Pilot/ PEC Training Program Competent Personnel Port State Control Flag State/ Class Audits Harbourmaster Directions - Pilot, Pilot Exempt and Vessel Operating Requirements Enforcement	4-Major	B-Unlikely	B4

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Ship	Allision	Error: Ship in contact with marine farm while navigating Ship contacts a moored or anchored vessel or barge whilst underway.	Major Damage to Ship >\$1M Major Damage to Wharf >\$1M National Publicity	Property Reputation	Bridge Resource Management MPX Pilot Approved Pilot/ PEC Training Program Competent Personnel AtoNs Harbourmaster Directions - Pilot, Pilot Exempt and Vessel Operating Requirements Enforcement	4-Major	B-Unlikely	B4
Ship	Fire/Explosion	Safety System: Fire or explosion on board RoRo ferry Fire or explosion during bunkering	Major Damage to Ship <\$1M Tier 2 Resonse	Property Environment	Ship SOLAS Chapter 2 compliant Ship Class compliant Ship Fire Fighting system Bunkering SOPs Port Emergency Response Plan Ship Emergency Resposne Plan Cargo stowage plans (DG)	3-Moderate	C-Possible	C3
Ship	Natural Hazard	Natural Hazard: Serious earthquake, seismic event or underwater slippage causes series of surge waves or tsunami affecting Sounds	Multiple Fatalities Loss of Vessel Tier 3 Pollution Response International Media Attention	People Property Environment	Tsunami Alarm System MDC Emergency Response Plan Program of Emergency Drills	5-Catastrophic	C-Possible	C5
Ship	Health and Safety	Isolation: Passenger falls or jumps overboard while ferry transiting Marlborough Sounds.	Single Fatality	People	MDC Emergency Response Plan MDC Program of Emergency Drills Ship Emergency Response Plan Ship Program of Emergency Drills Coastguard Emergency Response Plan Coastguard Program of Emergency	4-Major	0-Eliminated	0
Ship	Health and Safety	Access: Personal injury situation during operation of embarking / picking up pilot from ship	Single Fatality	People	Pilot Approved Pilot/ PEC Training Program Competent Personnel Pilot Boat Skipper Training Program Pilot Boat Fit-For-Purpose Compliant Pilot Ladder	4-Major	C-Possible	C4
Small Commercial	Wake	Safety Culture: Wash causes heavy rolling of a small commercial vessel or tug with tow alongside.	Medical Treatment Injury	People	MDC Navigation Safety Bylaws Enforcement	3-Moderate	C-Possible	C3
Ship	Health and Safety	Contractor Management: Personal injury to divers operating at a commercial berth in Picton harbour or Shakespeare Bay.	Lost Time Injury	People	Project planning Competent divers Standby vessel Notice to Mariners	5-Catastrophic	B-Unlikely	B5

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Ship	Wake	Fast Ferry Wake Ship travelling fast in Sounds causes wash leading to coastal erosion	Remediation \$1M - \$10M Loss of amenity value Multiple fatalities	Property Environment People	MDC Navigation Safety Bylaws Enforcement Signage	5-Catastrophic	0-Eliminated	B
Ship	Wake	Regular Ferry Wake Ship travelling fast in Sounds causes wash leading to coastal erosion	Remediation <\$100K Loss of amenity value Medical Treatment	Property Environment People	MDC Navigation Safety Bylaws Enforcement Signage	2-Minor	D-Likely	D2
Ship	Moorings	Resources: Moored cruise vessel overhangs berth at Waitohi Wharf restricting available manoeuvring room for RoRo ferries approaching their berths	Major Damage to Ship >\$1M	Property	Moorings arrangements Fit-For-Purpose Ship specific risk assessment Ship specific mooring plan Operation parameters	4-Major	B-Unlikely	B4
Ship	Moorings	Safety System: A large cruise vessel (high windage) breaks mooring lines in adverse winds at Shakespeare Bay. Cruise vessel breaks mooring lines in high winds at Waitohi wharf, Picton East Mooring breakout of RoRo ferry in high winds at Picton	Major Damage to Ship >\$1M Major Damage to Wharf >\$1M	Property	Moorings arrangements Fit-For-Purpose Ship Mooring Analysis Picton Wind Analysis Weather Forecasting Weather Monitoring Contingency Planning	4-Major	B-Unlikely	B4
Ship	Moorings	Resources: Large Commercial Barge drags anchor from either of the two designated anchoring areas.	Major Damage to Ship >\$1M	Property	MDC Navigation Safety Bylaws - Designated Anchorages Picton Wind Analysis Weather Forecasting Weather Monitoring Contingency Planning	4-Major	B-Unlikely	B4
Ship	Environmental Impact	Emergency Preparedness: Pollution at Fuel Berth Internal transfer of oil / bunkers	Tier 3 Pollution Response	Environment	Bunkering SOPs Port Emergency Response Plan Tier 1, 2 and 3 Plans Tier 1, 2 and 3 Equipment in Picton Ship Emergency Response Plan	4-Major	B-Unlikely	B4
Ship	Environmental Impact	Risk Awareness: Changes to emission standards and availability of low sulphure fuels	Compliance	Environment	Harbourmaster Monitoring Regulatory Environment	1-Low	C-Possible	C1

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Small Commercial	Grounding	<u>Access:</u> Weather inhibits safe access to Marlborough due to: - Visibility e.g. Fog/Mist, - Adverse Wind - Strong Tide, - Wave - Sea conditions unsuitable	Medical Treatment Injury Moderate Damage <\$100K Tier 2 Response	People Property Environment	Weather Forecasting	2-Minor	C-Possible	C2
Small Commercial	Grounding	<u>Critical Equipment:</u> Small commercial vessel in grounding situation in the Sounds in General, the scenario being more likely in a passage with strong tidal flows Small Commercial Vessel Grounds in Tory Channel or Approaches Vessel loses steerage through mechanical or other systems failure Fishing vessel in grounding situation in the Sounds, excluding Tory Channel, most likely scenario being in a tidal passage with strong tidal flow Charter Vessel Grounds in Narrow Area or High Current Area Tug and Tow Grounding in Narrow Tidal Channel Fishing vessel grounds within Controlled Navigation Zone or in Tory Channel	Medical Treatment Injury Moderate Damage <\$100K Tier 2 Response	People Property Environment	Coastguard Education MDC Navigation Safety Bylaws MDC Marine Patrols Picton Wind Analysis Weather Forecasting Weather Monitoring Contingency Planning	2-Minor	C-Possible	C2
Small Commercial	Grounding	<u>Planning:</u> Water taxi or similar (sight seeing/dolphin watch/charter fishing etc) grounds while navigating close to shore	Medical Treatment Injury Moderate Damage <\$100K Tier 2 Response	People Property Environment	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols Picton Wind Analysis Weather Forecasting Weather Monitoring Contingency Planning	2-Minor	C-Possible	C2
Small Commercial	Grounding	<u>Competence:</u> Small Commercial Vessel & Recreational Craft	Medical Treatment Injury Moderate Damage <\$100K Tier 2 Response	People Property Environment	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols Picton Wind Analysis Weather Forecasting Weather Monitoring Contingency Planning	2-Minor	C-Possible	C2

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Small Commercial	Foundering	Awareness: Fishing vessel founders on encountering heavy weather while transiting Tory Channel Controlled Navigation Zone or approaches; vessel capsizes from weather, broaching, loss of hull integrity or instability.	Single Fatality Moderate Damage Tier 2 Response	People Property Environment	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols Picton Wind Analysis Weather Forecasting Weather Monitoring Contingency Planning	5-Catastrophic	B-Unlikely	B5
Small Commercial	Collision	Safety System: Commercial and Recreational Craft in Havelock Channel Water taxi or similar sight-seeing charter vessel meets group of kayaks, particularly on rounding a headland Small Craft (Hire or Charter) in Conflict with Other Vessel PEC Ferry (RoRo) vessel and Water Taxi/Dolphin Watch or similar small commercial within Queen Charlotte Sound	Fatality Significant Damage to Both Ships Tier 2 Pollution Response International Media Attention	People Property Environment	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols Picton Wind Analysis Weather Forecasting Weather Monitoring Contingency Planning Kayak operators briefing for clients hiring their kayaks	4-Major	B-Unlikely	B4
Small Commercial	Collision	Risk Awareness: navigating close to shore at excessive speed with limited sea room available to manoeuvre. Poor lookout.	Multiple Fatalities Moderate Damage Tier 1 Response	People Property Environment	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols AIS Enforcement Contingency Planning	5-Catastrophic	C-Possible	C5
Small Commercial	Collision	Competence: Fishing vessel vs small commercial vessel Fishing vessel and recreational vessel meet on rounding a blind headland or in poor visibility Small Commercial Vessel and Ship - Poor positional or spatial awareness	Multiple Fatalities Moderate Damage Tier 1 Response	People Property Environment	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols AIS Enforcement Contingency Planning	5-Catastrophic	C-Possible	C5
Small Commercial	Collision	Violation Lack of obvious compliance with Collision Regulations by recreational vessels is reported by commercial operators	Multiple Fatalities Moderate Damage Tier 1 Response	People Property Environment	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws Maritime Rules Speed Cameras MDC Marine Patrols AIS Enforcement Cooperation between MDC and MNZ	5-Catastrophic	B-Unlikely	B5

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Small Commercial	Collision	Risk Awareness: Launchmaster unaware of ferry routes and operation	Multiple Fatalities Moderate Damage Tier 1 Response	People Property Environment	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols AIS Enforcement MDC Communications Signage	5-Catastrophic	B-Unlikely	B5
Small Commercial	Collision	Error: Failure by lookout on commercial vessel to detect other vessels	Multiple Fatalities Moderate Damage Tier 1 Response	People Property Environment	Competent Crew MOSS Compliance Navigation Aids	5-Catastrophic	B-Unlikely	B5
Small Commercial	Allision	Safety System: Small vessel, recreational or commercial in contact with marine farm while navigating Small Commercial Vessel in Contact With Anchored Vessel	Moderate Damage to Farm <\$1M Moderate Damage to vessel / barge >\$100K	Property	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols AtoNs	3-Moderate	B-Unlikely	B3
Small Commercial	Allision	Work Conditions: Small commercial vessel or leisure craft in contact with partly submerged object (e.g. Logs) during navigation Small commercial in contact situation with Marine Farm or fixed object (aids to navigation), debris or semi-submerged object	Medical Treatment Injury Damage to boat <100K Damage to Farm <\$100K	People Property	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols AtoNs Notice to Mariners Planned Maintenance of AtoNs MNZ AtoN Guidelines	2-Minor	C-Possible	C2
Small Commercial	Allision	Competence: Small passenger vessel (e.g. Water Taxi or charter service) lands heavily alongside during passenger service Small commercial vessel lands heavily on wharf while berthing.	Medical Treatment Injury Moderate Damage	People Property	Competent Crew MOSS Compliance Building Standards for Marine Structures	3-Moderate	B-Unlikely	B3
Small Commercial	Fire/Explosion	Emergency Preparedness: Fire/Explosion during refuelling of small commercial or recreational vessel alongside a fuel berth. Fire in engine space or food preparation space of passenger vessel, water taxi or other commercial floating asset.	Single Fatality Moderate Damage Tier 1 Response	People Property Environment	Competent Crew MOSS Compliance Emergency Response Plan Onboard Fire Fighting Equipment	3-Moderate	C-Possible	C3

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Small Commercial	Health and Safety	Violation: Small Passenger vessel (or Cruise Liner Tender) operating outside advisable weather limits in adverse conditions and personnel injured	Medical Treatment Injury Moderate Damage <\$100K	People Property	Competent Crew MOSS Compliance MDC Navigation Safety Bylaws MDC Marine Patrols Picton Wind Analysis Weather Forecasting Weather Monitoring Contingency Planning	3-Moderate	B-Unlikely	B3
Small Commercial	Wake	Violation: Ship travelling fast in Sounds causes wash leading to coastal erosion	Remediation <\$10K Loss of amenity value First Aid	Property Environment People	MDC Navigation Safety Bylaws Enforcement Signage	2-Minor	D-Likely	D2
Small Commercial	Moorings	Critical Equipment: Small commercial or recreational user mooring fails and vessel drifts away	Low Damage <10K	Property	Competent Crew	3-Moderate	B-Unlikely	B3
Small Commercial	Environmental Impact	Emergency Preparedness: Pollution occurs through fuel spill at small commercial / recreational vessel fuel berth	Medical Treatment Injury Moderate Damage >\$100K	People Property	Bunkering Arrangement on Wharf Port Emergency Response Plan Tier 1 and 2 Plans Tier 1 and 2 Equipment in Picton Ship Emergency Response Plan	3-Moderate	C-Possible	C3
Recreational	Grounding	Risk Awareness: Recreational craft in grounding situation in the Sounds overall, this being more likely in a narrow passage with strong tidal flow. French Pass, Stephens Passage, Cape Jackson, Greville Harbour, Cullen Point are mentioned, but hazard relates to Sounds area generally. Recreational craft grounds on rocks within the Tory Channel Critical Navigation Zone.	Medical Treatment Injury Moderate Damage <\$100K Tier 2 Response	People Property	Competent Crew Weather Forecasting Weather Monitoring Signage	2-Minor	C-Possible	C2
Recreational	Grounding	Critical Equipment: Leisure vessel in grounding situation at Havelock and approaches. Leisure craft or mussel barge loses steerage through mechanical or other systems failure	Medical Treatment Injury Moderate Damage <\$100K Tier 2 Response	People Property	Competent Crew	2-Minor	C-Possible	C2
Recreational	Foundering	Risk Awareness: Recreational craft floods in area providing wind over tide conditions. Recreational craft is swamped by large steep swell when attempting to cross Wairau Bar. Recreational vessel tender (dinghy) takes on water while taking persons and gear out to moored craft	Medical Treatment Injury Moderate Damage >\$100K	People Property	Competent Crew Weather Forecasting Weather Monitoring Signage MNZ Information on Bar Crossing Signage	5-Catastrophic	B-Unlikely	B5

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Recreational	Collision	Risk Awareness: Two Recreational Craft in Conflict - Sounds Generally Kayak and power driven recreational craft in developing collision Ferry and recreational craft or small commercial vessel in developing collision situation on approach to Picton Harbour by night	Medical Treatment Injury Moderate Damage >\$100K	People Property	MDC Navigation Safety Bylaws MDC Marine Patrols AIS Enforcement MDC Communications Signage Education Skippers Training Program Kayak operators briefing for clients hiring their kayaks	5-Catastrophic	B-Unlikely	B5
Recreational	Collision	Conflicting Activities: PWC operating at high speed in Conflict with Other Vessel Personal water craft (PWC) operating at speed in close proximity to persons in the water	Single Fatality Moderate Damage >\$100K	People Property	MDC Navigation Safety Bylaws Reserved Areas Ski Lanes MDC Marine Patrols AIS Enforcement MDC Communications Signage Buoyage Education Skippers Training Program	5-Catastrophic	B-Unlikely	B5
Recreational	Collision	Violation: Reserved Areas A craft towing a water skier or other recreational object (frequently a 'biscuit') in developing contact situation with other vessel or object	Medical Treatment Injury	People	MDC Navigation Safety Bylaws Reserved Areas Ski Lanes MDC Marine Patrols AIS Enforcement MDC Communications Signage Buoyage Education Skippers Training Program	5-Catastrophic	B-Unlikely	B5
Recreational	Allision	Competence: Recreational craft makes contact with jetty during berthing or makes contact with moored vessel during final berthing manoeuvres Recreational vessel in contact with moored/anchored vessel or AtoN.	Damage to Jetty <\$1M Damage to Vessel <\$100K	Property	Competent Crew	3-Moderate	B-Unlikely	B3
Recreational	Fire/Explosion	Emergency Preparedness: Fire/Explosion during refuelling of small commercial or recreational vessel alongside a fuel berth. Fire in engine space or food preparation space of passenger vessel, water taxi or other commercial floating asset.	Single Fatality Moderate Damage Tier 1 Response	People Property Environment	Bunkering Arrangement on Wharf Port Emergency Response Plan Tier 1 and 2 Plans Tier 1 and 2 Equipment in Picton Ship Emergency Response Plan	3-Moderate	C-Possible	C3

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Recreational	Collision	<u>Risk Awareness:</u> A craft towing a water skier or other recreational object (frequently a 'biscuit') in developing contact situation with other vessel or object	Single Fatality Moderate Damage >\$100K	People Property	Competent Crew Reserved Use Areas MDC Navigation Safety Bylaws MDC Marine Patrols Signage	4-Major	B-Unlikely	B4
Recreational	Collision	<u>Isolation:</u> Person in Water Run Over by Powered Vessel Vessel not aware of swimmers/divers operating more than 200m from shore or structure (Dive vessel not showing proper or any flag).	Single Fatality	People	Competent Crew Reserved Use Areas MDC Navigation Safety Bylaws MDC Marine Patrols Signage	4-Major	B-Unlikely	B4
Diver	Collision	<u>Risk Awareness:</u> Personal injury to recreational divers within the Sounds.	Fatality	People	Competent Crew MDC Navigation Safety Bylaws MDC Marine Patrols Signage A Flag	4-Major	C-Possible	C4
Ship	Foundering	As per Collision: Critical Equipment Availability: Safety System: Risk Awareness Training Violation Error Conflicting Activities	Multiple Fatalities Loss of Vessel Tier 3 Pollution Response National Media Attention	People Property Environment Reputation	Hydrographic Surveys to MNZ Guidelines AtoNs to MNZ Guidelines AIS Bridge Resource Management Pilot Approved Pilot Training Program Competent Personnel Harbourmaster Directions - Mandatory Separation Harbourmaster Directions - Pilot, Pilot Exempt and Vessel Operating Requirements Admiralty Directions maintained up to date Port Entry Guide maintained up to date Navigational Charts Maintained Notice to Mariners issued as required SOPEP Tier 3 Oil Spill Response Plan Tier 3 Oil Spill Response Equipment in Picton	5-Catastrophic	B-Unlikely	B5

Stakeholder Group	Risk Group	Potential Causes (Marico Scenarios Considered)	Worst Credible Potential Impacts	People Property Environment Reputation	Existing Controls	Consequence	Likelihood	Risk Ranking
Ship	Cyber	Risk Awareness: Electronic Chart Display and Information System (ECDIS), Automatic Identification System (AIS) and Global Positioning Systems (GPS) threatened by cyber attack Ship's cargo handling and management systems, propulsion and machinery management systems and power control and communications systems Malware Phishing Water holing Scanning Denial of service	Lost of navigation system (Navicom, ECDIS, AIS or GPS)	Property Reputation	Shipboard fire walls	4-Major	D-Likely	D4
Ship	Tendering	Access: Passenger falls from tender to sea Passenger falls between tender and ship Passenger falls between tender and wharf	Single fatality International media attention	People Reputation	Competent Crew Weather Forecasting Weather Monitoring Signage	4-Major	C-Possible	C4
Small Commercial	Allision	Access: Holding cray-ports or cod-pots restrict navigation Holding pots drift into navigiable channel	Ship forced to deviate from planned course Ship runs aground	Property		4-Major	B-Unlikely	B4

Ship	Grounding
Small Commercial	Foundering
Recreational	Collision
Marine Farm	Allision
Divers	Fire/Explosion
	Natural Hazard
	Health and Safety
	Coastal Damage
	Moorings
	Environmental Impact

5-Catastrophic	0-Eliminated
4-Major	A-Rare
3-Moderate	B-Unlikely
2-Minor	C-Possible
1-Low	D-Likely
	E-Frequent