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Pacific Safety of Navigation Project

Risk assessment for the Port of Honiara, Solomon Islands



April 2019



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Pacific Safety of Navigation Project: Risk assessment for the Port of Honiara, Solomon Islands

April 2019

Francesca Pradelli, Satesh Kumar and Epele Waqavonovono
Geoscience, Energy and Maritime Division, Pacific Community



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Executive summary

The Solomon Islands is a signatory to the International Convention for the Safety of Life at Sea (SOLAS), of which Chapter V Regulation 13.1 requires the contracting governments to provide “such Aids to Navigation (AtoN) as the volume of traffic justifies and the degree of risk requires.”

The Solomon Islands is one of the 13 targeted Pacific Islands countries and territories of the Pacific Safety of Navigation Project implemented by the Pacific Community (SPC) and funded by the International Foundation for Aids to Navigation (IFAN), whose aim is to improve safety of navigation in the Pacific region through enhanced AtoN capacity and systems.

During the first project phase, in 2017, the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and SPC developed the simplified IALA risk assessment tool (SIRA), a simple qualitative tool to enable smaller states to meet their international obligation of providing AtoN by conducting waterways risk assessments.

As part of Phase 2 of the project, in September 2018 SPC conducted a risk assessment of the Honiara port area using the SIRA tool. This report details the risks identified, the foreseen costs in the event of an incident, risk control options suggested, and their costs.

Honiara is the major international port of Solomon Islands. The port has several domestic jetties, two international wharfs and a maritime police patrol wharf. Vessels frequenting the port include tankers, cargo vessels, cruise liners, military ships, fishing vessels and private crafts. The port can accommodate vessels with a maximum draft of 10.9 m alongside the international wharf; while the domestic wharf has very shallow depths alongside ranging from 0.1 to 5 m, and this poses a major challenge for domestic vessels in bad weather conditions.

Solomon Islands maritime stakeholders identified eight possible scenarios: three groundings in the area of Kua Bay and five allisions. For each scenario, the approximate cost of the incident was identified and a risk score was given, taking into account the probability of the incident happening and its potential impact on the country. Six risk control options were identified to address the eight scenarios, and the risk scores for the scenarios under the current situation were then compared with the new risk scores if the further risk control options were put in place.

Table 6. Risk control options for the port of Honiara, and changes in risk score.

Scenario	Risk score	Risk control option	New risk score
Grounding on the hard bottom by the domestic wharf, especially in bad weather	16	Dredge the domestic wharf area	12
Grounding on the soft bottom at the mouth of the Mataniko river	8	Dredge around the river mouth and place a cardinal mark to alert to the danger	4
Grounding on a wreck	4	Remove the wreck or place an isolated danger mark	2
Allision with the jetty and other ships (consequence 1)	6	Put extra fenders on the jetty; inform the ship masters by written communication to always check engine manoeuvrability before approaching the jetty	4

Scenario	Risk score	Risk control option	New risk score
Allision with the jetty and other ships (consequence 2)	12	Put extra fenders on the jetty; inform the ship masters by written communication to always check engine manoeuvrability before approaching the jetty	8
Allison with an international vessel moored at dock 1 (consequence 1)		SIPA allows only certain categories of ships to access the copra wharf when an international vessel is at dock 1	
Allison with an international vessel moored at dock 1 (consequence 2)		The harbour department ensures no movement of vessels when an international vessel is operating (propellers on) at dock 1	
Allision with the three mooring buoys in front of the oil pipeline, or with the buoy marking the end of the pipeline	6	The three buoys are clearly marked with reflective tape, and the buoy marking the end of the oil pipeline is lit.	3

The main outcome of the risk assessment process in Honiara was six recommendations, plus an additional recommendation made following a site visit, which aim to reduce the risks to safety of navigation to an acceptable level for the stakeholders. The recommendations and costs of their implementation are as follows.

Recommendation 1

To reduce the risk of groundings at the very shallow domestic wharf, it is recommended to dredge the wharf to 5 m.

Cost

No costing was provided for the dredging of the shallow areas, but a suggestion to use an excavator was made by the Solomon Islands Port Authority (SIPA) Engineering Department, with an approximate cost of SBD 4 million.

Recommendation 2

To reduce the risk of groundings at the Mataniko river mouth, it is recommended to install a north cardinal mark to alert to the danger, and the safe area.

Cost

Cardinal mark	SBD 3170
Annual maintenance	SBD 159

Recommendation 3

To reduce the risk of grounding on a submerged wreck, it is recommended to remove the wreck, or to place an isolated danger mark to mark the wreck.

Cost

Removal of wreck	SBD 1 million
Isolated danger mark	SBD 2432
Annual maintenance	SBD 122

Recommendation 4

To reduce the risk of allision at the domestic wharf, it is recommended that SIPA installs extra fenders on the wharf.

Cost

New jetty with eight fenders

SBD 641,000

Annual maintenance

SBD 64,100

Recommendation 5

To reduce the risk of allision when international vessels are at berth, it is recommended that SIPA amends port procedures when international vessels are operating at the wharf.

Cost

There is no capital cost to implement this recommendation. Port security procedures should be amended to include this.

Recommendation 6

To reduce the risk of allision with unlit buoys at night, it is recommended that the three mooring buoys be fitted with reflective tape and the buoy marking the end of the oil pipeline be lit.

Cost

Lights for buoys

SBD 10,224

Reflective tapes

SBD 1400

Recommendation 7

To reduce the risk of the flashing red light on the western end of the international wharf confusing mariners, it is recommended that the light be changed to a fixed white light marking the wharf, or removed.

Cost

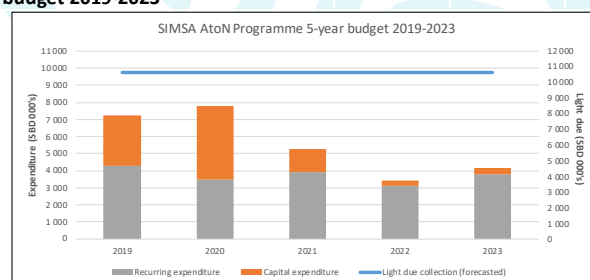
There is no capital cost to implement this recommendation.

As part of the Pacific Safety of Navigation Project's work on supporting the Solomon Islands Maritime Authority (SIMA), a 5-year budget plan has been drawn up with SIMA (Annex E), which includes forecasted light dues collected, capital expenditure and recurring expenditure.



SIMSA AtoN Programme 5-year budget 2019-2023

	Light due collection (forecasted)	Capital expenditure	Recurring expenditure	Total
2019	\$10 640 565,00	2 954 056	4 295 812	7 249 868
2020	\$10 640 565,00	4 342 670	3 480 959	7 823 629
2021	\$10 640 565,00	1 339 500	3 928 268	5 267 768
2022	\$10 640 565,00	339 500	3 111 068	3 450 568
2023	\$10 640 565,00	339 500	3 828 268	4 167 768
	\$53 202 825,00	9 315 226	18 644 375	27 959 601



* Light forecasted amount is 2016 Actuals obtained from 2018 Recurrent Budget Book

* Costings Risk control options covered under Honiara Safety of Navigation Risk Assessment have been factored in:

- In 2019, installation of new fenders at the domestic vessel berth to mitigate risk of allisions; installation of an isolated danger mark to mitigate risk of grounding on wreck
- In 2020, dredging of port area in front of domestic berth to mitigate risk of grounding; installation of cardinal north mark near Mataniko River mouth to alert vessels of shallow water
- In 2021, removal of wreck marked with 2019 isolated danger mark

1 Background

In early 2016, with support from the International Foundation for Aids to Navigation (IFAN), the Pacific Community (SPC) started the Pacific Safety of Navigation Project in 13 Pacific Island countries and territories (PICTs)¹. The project aims to improve safety of navigation in the Pacific region through enhanced aids to navigation (AtoN) capacity and systems, and hence support economic development, shipping and trade in the Pacific region through safer maritime routes managed in accordance with international instruments and best practices.

During Phase 1, which ended in July 2018, SPC worked in close collaboration with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) to conduct technical, legal and economic assessments in the 13 PICTs, to identify needs and gaps in these areas. Another significant output of Phase 1 was the development of a new tool for risk assessment in small island developing states, the simplified IALA risk assessment tool (SIRA). In June 2018, IALA trained personnel in 12 of the 13 PICTs on the use of SIRA to conduct AtoN risk assessments in their countries.

Phase 2 of the project builds on the Phase 1 assessments and tools developed, to further assist in building capacity to develop and maintain AtoN in PICTs. Activities include conducting risk assessments (as required by Regulation 13 of the International Convention for the Safety of Life at Sea – SOLAS); developing safety of navigation policy and a legal framework; improving budgetary management; and supporting regional coordination related to safety of navigation in the Pacific.

In September 2018, the Solomon Islands Maritime Authority (SIMA) invited SPC to assist in conducting a risk assessment of the port of Honiara, which is the country's most visited port, by both international and domestic vessels. This report describes the risk assessment, which was carried out using the SIRA methodology.

Solomon Islands is a maritime nation, with a large percentage of citizens working in or around the maritime industry. Shipping is critical to the economic and social welfare of the people of Solomon Islands, and safe navigation is vital to secure this welfare and to protect the environment.

Solomon Islands is a signatory to the International Maritime Organization (IMO) SOLAS Convention. Regulation 13 of Chapter V of the 1974 SOLAS Convention (as amended) states that "each Contracting Government undertakes to provide, as it deems practical and necessary either individually or in co-operation with other Contracting Governments, such aids to navigation as the volume of traffic justifies and the degree of risk requires."

The SIRA risk management process comprises five steps that follow a standardised management or systems analysis approach:

1. identify hazards
2. assess risks
3. specify risk control options
4. make a decision
5. take action.

¹ Cook Islands, Kiribati, Federated States of Micronesia, Marshall Islands, Nauru, Niue, Palau, Samoa, Solomon Islands, Tonga, Tokelau, Tuvalu and Vanuatu.

SIRA is intended as a basic tool to identify risk control options for potential undesirable incidents that Solomon Islands should address as part of its obligation under SOLAS Chapter V Regulations 12 and 13. The assessment and management of risk is fundamental to the provision of effective AtoN services.

The assessment involved a stakeholder meeting as a first step, to gather the views on hazards and risks in the Honiara port area from those directly involved with or affected by AtoN service provision. Information provided by this step was then used by the Solomon Islands AtoN manager and SPC to complete a full risk assessment matrix based on eight identified possible scenarios.

2 Description of the waterway

Honiara is the major international port of Solomon Islands, and was therefore identified by SIMA as a priority for risk assessment. The port of Honiara consists of several domestic jetties, two international wharfs and a maritime police patrol wharf. There are 14 AtoNs around the port.

Vessels that frequent this port include tankers, cargo vessels, cruise liners, military ships, fishing vessels and private crafts. The port can accommodate vessels with a maximum draft of 10.9 m alongside the international wharf. The domestic wharf has very shallow depths alongside ranging from 0.1 to 5 m, and this poses a major challenge for domestic vessels in bad weather conditions. Visibility can be reduced to 0.2 nautical miles in bad weather, which normally occurs between the months of November and April. There are several hazards such as mooring buoys, wrecks, shoals and an oil-refuelling pipeline that can pose problems for maritime traffic.

Chart SLB101_3 shows Honiara port at a scale of 1:5000 (Figure 1).

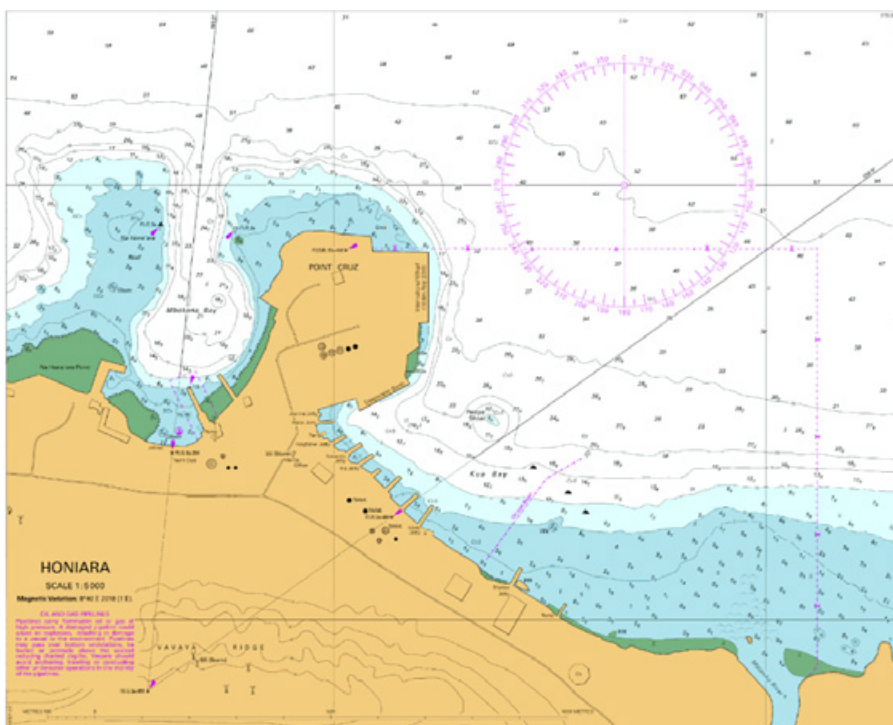


Figure 1. Chart of Honiara port at 1:5000 scale.

3 Stakeholder meeting

As the first step of the SIRA process, a stakeholder meeting was organised in Honiara on 4 September 2018, which aimed to gather the points of view of individuals, groups and organisations involved with or affected by AtoN service provision in Honiara port. The stakeholders included the Solomon Islands Ports Authority (SIPA), shipping agents, maritime police, maritime safety administration, fishers and others (Annex A). During the workshop the participants were divided into four groups according to their experience and background. They then helped identify potential hazards and possible scenarios in the port of Honiara using the latest chart of the port, other tools such as marine traffic data, and their experience.

4 Hazards and risks

A hazard is something that may cause an undesirable incident. Risk is the chance of injury or loss as defined as a measure of ‘probability or likelihood’ and ‘severity or impact’. Examples of injury or loss include an adverse effect on health, property, the environment or other areas of value.

The purpose of the stakeholder meeting was to generate a prioritised list of hazards specific to the port of Honiara. For the risk assessment, SPC and the SIMA AtoN officer worked together to discuss the risks associated with the identified hazards and identify risk control options and recommendations.

A list of hazards identified for the port of Honiara is given in Annex B.

4.1 Types of hazards

Twelve hazards were identified that were grouped into the following six categories:

- natural hazards such as floods, storms, earthquakes, biological hazards and other natural phenomena;
- economic hazards such as inflation, depression, and changes in tax and fee levies;
- technical hazards such as system or equipment failure, fire, explosion, obsolescence, air/water pollution, failure of communications systems and degradation of data quality;
- human factors such as errors or omissions by poorly trained, fatigued or stressed persons, linguistic challenges, violations, sabotage and terrorism;
- operational hazards such as groundings, collisions, striking and other unwanted events; and
- maritime space hazards, such as competing uses for maritime space leading to increasingly crowded waterways.

The above six types of hazard have the capability to generate seven different types of losses:

- health losses including death and injury;
- property losses including real and intellectual property;
- economic losses leading to increased costs or reduction of revenues;

- liability loss resulting when an organisation is sued for an alleged breach of legal duty; such cases must be defended even if no blame is assigned. Liability losses are capable of destroying or crippling an organisation;
- personnel loss when services of a key employee are lost;
- environmental losses (negative impact on land, air, water, flora or fauna); and
- loss of reputation or status.

4.2 Risk factors

Any risk analysis needs to consider the range of factors that contribute to the overall risk exposure. Table 1 lists some of the factors that could be taken into consideration when identifying hazards for waterways and ports.

Table 1. Risk factors relating to marine navigation.

Ship traffic	Traffic volume	Navigational conditions	Waterway configuration	Short-term consequence	Long-term consequence
Quality of vessels	Deep draught	Night/day operations	Depth/draft/under-keel clearance	Injuries to people	Health and safety impacts
Crew competency	Shallow draught	Sea state	Channel width	Oil spill	Lifestyle disruptions
Traffic mix	Commercial fishing vessels	Wind conditions	Visibility obstructions	Hazardous material release	Fisheries impacts
Traffic density	Recreational boats	Currents (river, tidal, ocean)	Waterway complexity	Property damage	Impacts on endangered species
Nature of cargo	High speed craft	Visibility restrictions	Bottom type	Denial of use of waterway	Shoreline damage
Participation rate in routing systems, such as VTS	Passenger ships	Ice conditions	Stability (siltation)		Reef damage
		Background lighting	AtoN mix and configuration		Economic impacts
		Debris	Quality of hydrographical data		

Risk is evaluated to allow attention to be focused on high-risk areas, and to identify and evaluate factors which influence the level of risk. Once all the risks have been assessed, they are then evaluated in terms of the documented needs, issues and concerns of the stakeholders, and the benefits and costs of the activity, to determine the acceptability of the risk.

Zero risk is not often realised, unless the activity generating the risk is abandoned. Rather than striving to reduce the risk to zero, authorities should reduce the risk to 'as low as reasonably practicable' (ALARP; Figure 2).

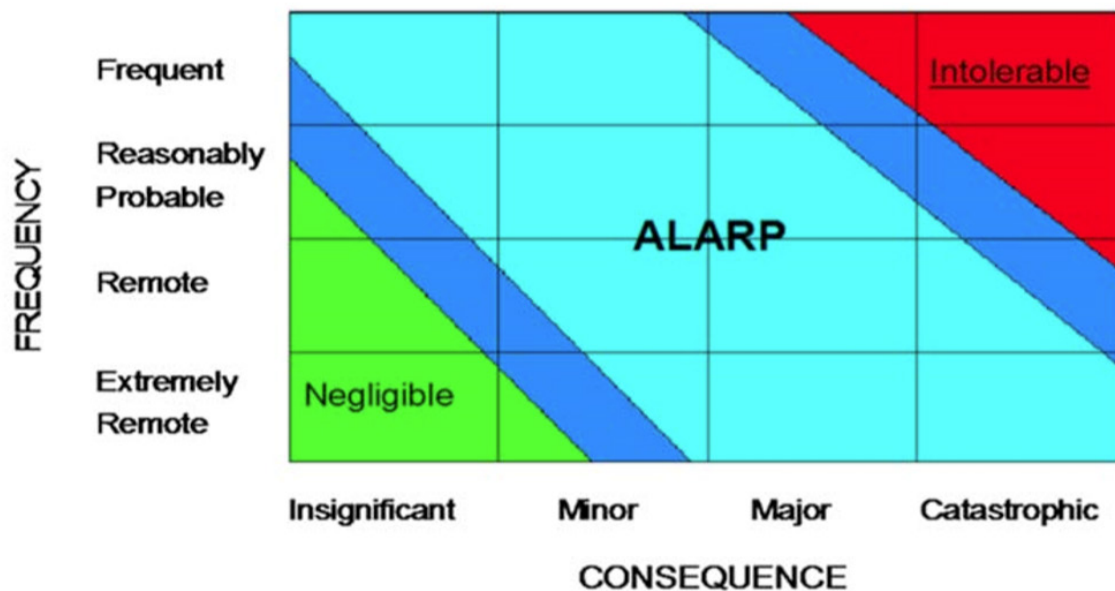


Figure 2. Graphical representation of the levels of risk. The risk level boundaries (negligible/ALARP/intolerable) are purely illustrative.

It is important to remember that, when communicating with stakeholders about risk, perception is usually different to reality. People make judgements of the acceptability of a risk based on their perceptions, rather than on scientific factors such as probability. The public's perception of a risk may be influenced by many things, including age, gender, level of education and previous exposure to information on the hazard. Public perceptions of risk may therefore differ from those of technical experts.

5 Scenarios

During the stakeholder meeting and discussions with the AtoN officer, 12 hazards were identified which could lead to a number of different incidents or scenarios. Each hazard was considered carefully and the scenarios it could cause were identified and recorded.

From the 12 main hazards identified, two different categories of scenario were identified: grounding and allision. Annex C lists the identified scenarios.

5.1 Grounding

There were three different grounding scenarios identified for the port of Honiara. The risk of grounding depends on several factors, such as the bathymetry around the port area, draft of the vessels and meteorological conditions such as wind speed and direction. Grounding on the hard bottom alongside the domestic wharf was one possible scenario. The shallow depths pose a greater risk in bad weather conditions, when the pounding of

a ship's hull against the hard bottom can cause serious damage to the hull, as well as breaking the anchor ropes. Another scenario was grounding on the soft bottom by the mouth of the Mataniko river. Grounding on wrecks was the third scenario, because of unmarked wrecks near the jetty.

5.2 Allision

Vessels may strike fixed human-made objects such as the wharf or mooring buoys, depending on positioning of these structures and the density of traffic. Five different allision scenarios were identified for the port of Honiara. These included allision with the unlit mooring buoys in front of the pipeline when ships were trying to berth at night at the domestic wharf; allision of vessels with the domestic wharf; allision with another vessel due to bad weather conditions; and allision with vessels moored at international dock 1.

6 Probability and impact

SIRA specifies five levels of probability (Table 2) and five levels of impact that each type of scenario would create (Table 3). Each scenario is allocated a score for both probability and impact, and the risk value is calculated from the product of these scores. In this step of the process, the probability and consequences associated with each scenario were estimated and discussed with the SIMA AtoN officer.

Table 2. Levels of probability specified for the simplified IALA risk assessment tool (SIRA).

Classification	Score	Probability
Very rare	1	Very rare or unlikely, will occur only in exceptional circumstances and not more than once in 20 years
Rare	2	Rare, may occur every 2-20 years
Occasional	3	Occasional, may occur every 2 months to 2 years
Frequent	4	Frequent, may occur once every week to every 2 months
Very frequent	5	Very frequent, may occur at least once every week

Table 3. Levels of impact specified for the simplified IALA risk assessment tool (SIRA).

Description	Score	Service disruption criteria	Human impact criteria	Financial criteria	Environment criteria
Insignificant	1	No service disruption apart from some delays or nuisance	No injury to humans; possible significant nuisance	Loss, including third-party losses, of less than USD 1000	No damage
Minor	2	Some non-permanent loss of services such as closure of a port or waterway for up to 4 hours	Minor injury to one or more individuals, may require hospitalisation	Loss, including third-party losses, of USD 1000–50,000	Limited short-term damage to the environment
Severe	3	Sustained disruption to services such as closure of a port or waterway for 4–24 hours	Injuries to several individuals requiring hospitalisation	Loss, including third-party losses, of USD 50,000–5,000,000	Short-term damage to the environment over a small area
Major	4	Sustained disruption to services such as closure of a major port or waterway for 1–30 days or permanent or irreversible loss of services	Severe injuries to many individuals or loss of life	Loss, including third-party losses, of USD 5,000,000–50,000,000	Long-term to irreversible damage to the environment over a limited area
Catastrophic	5	Sustained disruption to services such as closure of a major port or waterway for months or years	Severe injuries to numerous individuals and/or loss of several lives	Loss, including third-party losses, of over USD 50,000,000	Irreversible damage to the environment over a large area

7 The acceptability of risk

Having determined probability and impact scores by consensus, the risk values are calculated by multiplying these scores, as shown in the matrix in Table 4. To determine whether the risks are acceptable or not, SIRA specifies four colour-banded levels of risk (Table 5). These colours are superimposed on the matrix in Table 4.

Table 4. Risk value matrix.

		PROBABILITY / (LIKELIHOOD)				
		Very Rare (1)	Rare (2)	Occasional (3)	Frequent (4)	Very frequent (5)
CONSEQUENCE (IMPACT)	Catastrophic (5)	5	10	15	20	25
	Major (4)	4	8	12	16	20
	Severe (3)	3	6	9	12	15
	Minor (2)	2	4	6	8	10
	Insignificant (1)	1	2	3	4	5

Table 5. Categories of risk, and action required.

Risk Value	Risk Category	Action Required
1 – 4	Green	Low risk not requiring additional risk control options unless they can be implemented at low cost in terms of time, money and effort.
5 – 8	Yellow	Moderate risk which must be reduced to the “as low as reasonably practicable” (ALARP) level by the implementation of additional control options which are likely to require additional funding.
9-12	Amber	High risk for which substantial and urgent efforts must be made to reduce it to “ALARP” levels within a defined time period. Significant funding is likely to be required and services may need to be suspended or restricted until risk control options have been actioned.
15-25	Red	Very high and unacceptable risk for which substantial and immediate improvements are necessary. Major funding may be required and ports and waterways are likely to be forced to close until the risk has been reduced to an acceptable level.

8 Risk control options

The objective of the risk assessment was to identify risk mitigation options for each undesirable incident that would, if implemented, reduce the risk to a level as low as reasonably practicable (ALARP) and which would be acceptable to stakeholders. Before any risk control decisions were made, they were communicated through the stakeholder consultation process. The risks were evaluated in terms of the overall needs, issues and concerns of the stakeholders. The mitigation options include:

- new or enforcement of existing rules and procedures;
- improved and charted hydrographical, meteorological and general navigation information;
- enhanced AtoN service provision;

- improved radio communications; and
- improved decision support systems.

Table 6 shows the risk scores for the scenarios under the current situation, and the new risk scores after mitigating the risk. The detailed risk control options for the port of Honiara are shown in the risk control matrix in Annex D.

Scenario	Risk score	Risk control option
Grounding on the hard bottom by the domestic wharf, especially in bad weather	16	Dredge the domestic wharf area
Grounding on the soft bottom at the mouth of the Mataniko river	8	Dredge around the river mouth and place a cardinal mark to alert to the danger
Grounding on a wreck	4	Remove the wreck or place an isolated danger mark
Allision with the jetty and other ships (consequence 1)	6	Put extra fenders on the jetty; inform the ship masters by written communication to always check engine manoeuvrability before approaching the jetty
Allision with the jetty and other ships (consequence 2)	12	Put extra fenders on the jetty; inform the ship masters by written communication to always check engine manoeuvrability before approaching the jetty
Allision with an international vessel moored at dock 1 (consequence 1)		SIPA allows only certain categories of ships to access the copra wharf when an international vessel is at dock 1
Allision with an international vessel moored at dock 1 (consequence 2)		The harbour department ensures no movement of vessels when an international vessel is operating (propellers on) at dock 1
Allision with the three mooring buoys in front of the oil pipeline, or with the buoy marking the end of the pipeline	6	The three buoys are clearly marked with reflective tape, and the buoy marking the end of the oil pipeline is lit.

9 Costing the risk control options

The outcomes of the risk assessment are essentially qualitative and subjective, based on the expert opinions of the stakeholders. The next step is to reach consensus on which risk control options to action. The risk control options are prioritised to facilitate the decision-making process.

Costing of the options is part of the decision-making process. Most of the control options identified require funding. Costs must cover capital, labour and other resources needed for planning and implementation, as well as costs of operation and maintenance throughout the life cycle under consideration. Maintenance is important to ensure that AtoN equipment and systems continue to perform at the levels required for mariners to safely navigate the waterways.

The control measures need to be both effective in reducing risk, but also cost-effective. The cost of the measures should not normally exceed the reduction in the expected value of the loss.

The cost of the options should be evaluated over a time frame equivalent to the economic or useful life of the facilities and assets associated with the option.

10 AtoN programme 5-year budget plan (2019–2023)

For SIMA to provide excellent AtoN services in Solomon Islands, an adequate level of resources needs to be allocated to AtoN installment, maintenance and management. The SIRA team held meetings with key stakeholders to support resource allocation planning. In consultations with the Ministry of Finance and Treasury, it was emphasised that vital investment in the upkeep and management of AtoNs will help achieve the development priorities of the Solomon Islands.

In 2018, SIMA had an allocated budget of SBD 11 million that covered staffing costs, ship and equipment hire, communications and travel costs. This allocation funds all SIMA's work in the areas of domestic ship standards and compliance, search and rescue coordination, marine environmental protection, hydrography, and AtoN services. The current configuration of SIMA's budget does not have a dedicated allocation for its AtoN section. SIMA is currently in a transition period and will become an authority, allowing it to autonomously manage its own operations and finances. It will then be able dedicate resources to AtoN maintenance and installation, although this will have to be prioritised alongside other costs. Until then it will continue to be funded via the national budget through its line ministry, the Ministry of Infrastructure Development.

Light dues (marine navigation dues) are collected from foreign and domestic vessels that call at the port. These are deposited in the government's consolidated fund and used to finance projects across the whole of government. Approximately SBD 10 million are collected annually from these dues.

To support resource planning for AtoNs, an AtoN programme 5-year budget plan (2019–2023) was drawn up, in consultation with SIMA Deputy Director Mr Brian Aonima and Principal Marine Officer Mr Patrick Wamahe. The budget takes into account new instalments, maintenance work and future AtoN risk assessments in Noro, Gizo and Munda. It also includes the costed risk control options from the risk assessment above. These have been staggered over 5 years to spread the costs. The AtoN programme 5-year budget plan can be used to assist SIMA in its own budget planning and discussions for funding in the national budget.

A summary and detailed tables comprising the AtoN programme 5-year budget plan are given in Annex E.

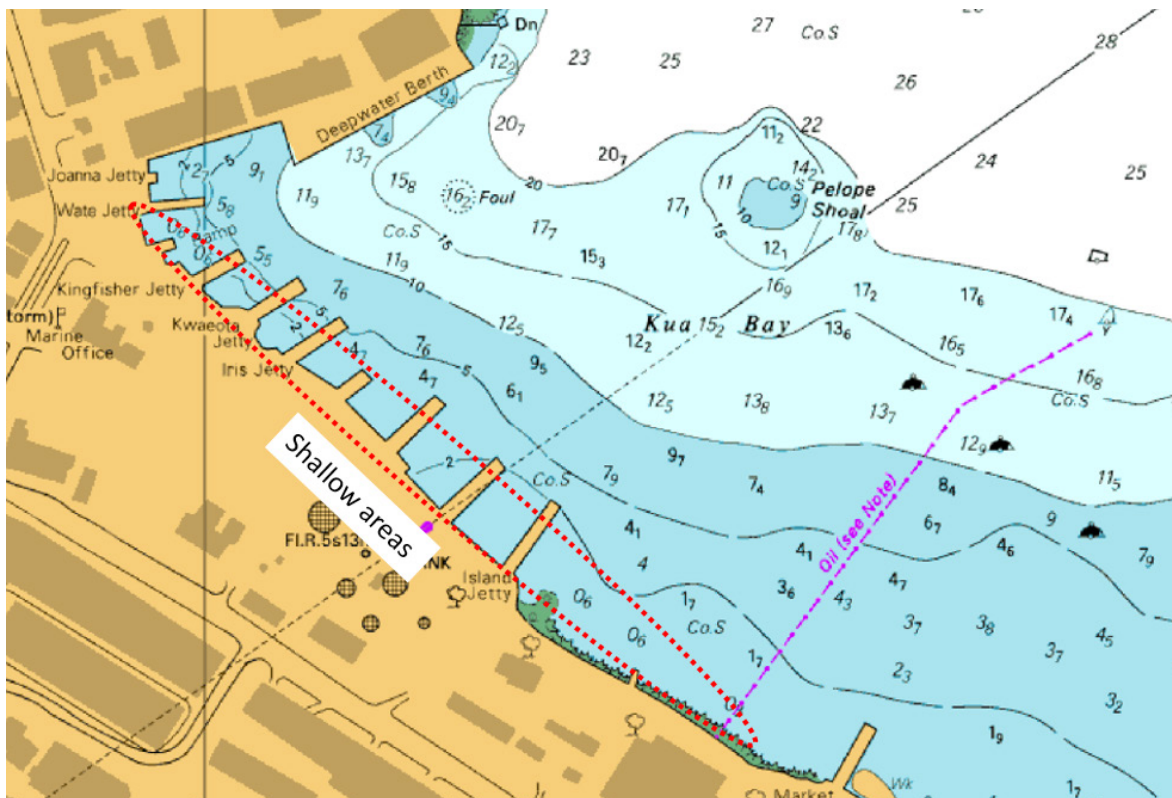
11 Recommendations

A key outcome of the risk assessment undertaken in the port of Honiara is six recommendations that aim to reduce the risks to safety of navigation to an acceptable level for stakeholders. An additional recommendation resulted from a site visit to look at the AtoN in Honiara port.

Recommendation 1 (addressing grounding scenario)

The domestic wharf area is very shallow along the shoreline. This causes domestic ships to ground, and also damages them through pounding against the hard bottom, especially during bad weather conditions.

It is recommended that SIPA dredges the shallow areas of the domestic wharf to 5 m (as vessels accessing the domestic wharf have drafts less than 5 m).

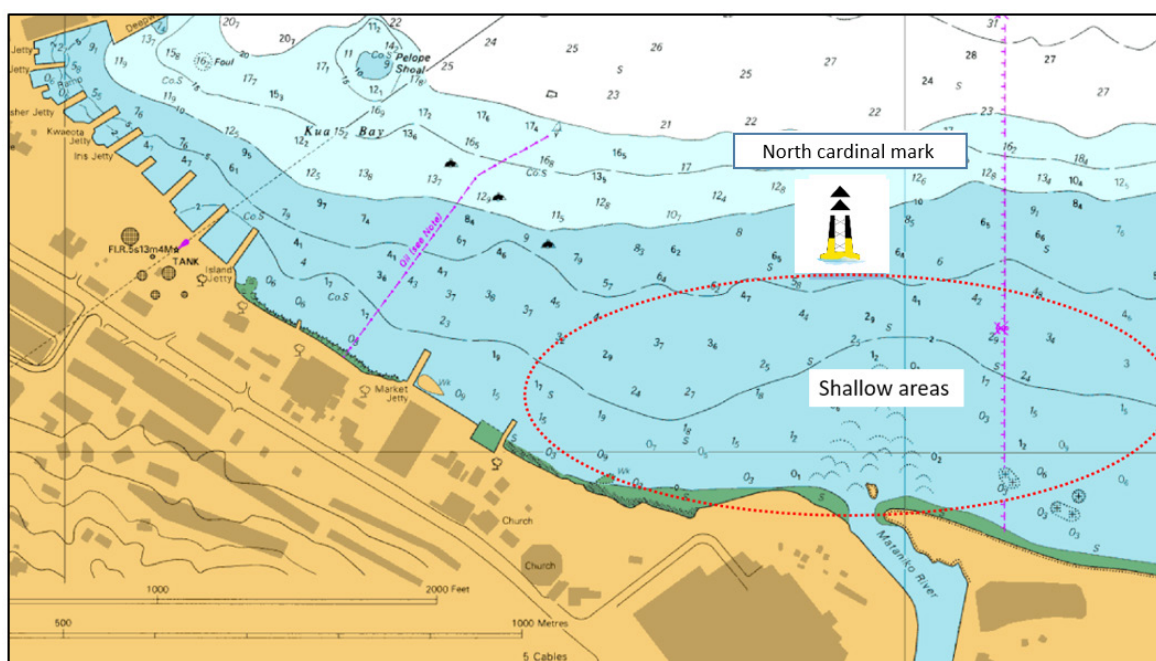


No costing was supplied for the dredging of the shallow areas, but a suggestion to use an excavator was made by the SIPA Engineering Department, with an approximate cost of SBD 4 million.

Recommendation 2 (addressing grounding scenario)

The Mataniko river mouth located to the east of the domestic wharf is very shallow. During rainy seasons, debris flows from the river and causes siltation around the approaches to the domestic wharf, in the manoeuvring area.

It is recommended to install a north cardinal mark to alert to the danger, and the safe area. A second option is to dredge the manoeuvring area down to at least 4 m so that local vessels accessing the area can safely manoeuvre without grounding.



No cost was provided for dredging. The cost for a cardinal mark was provided by SIMA as follows:

Recommendation	Amount (SBD)
Cardinal mark	3170
Annual maintenance	159 (see Annex E for detailed calculation)

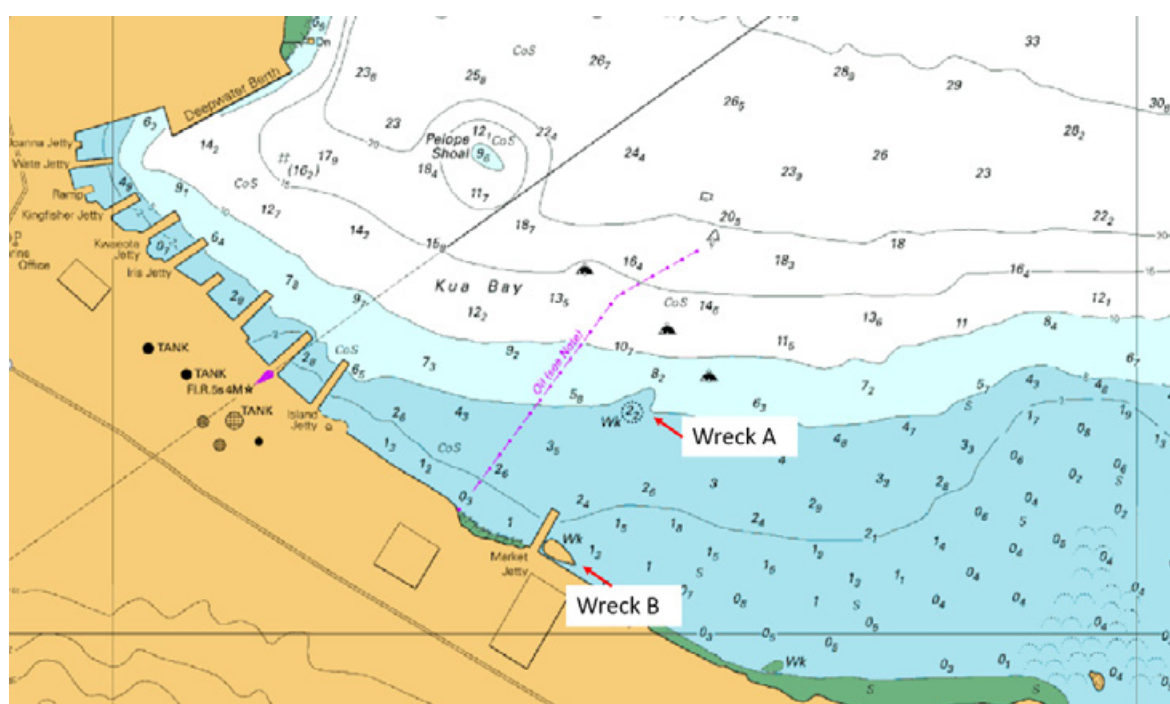
Recommendation 3 (addressing grounding scenario)

There is a shipwreck charted at position 09°25'56"S latitude and 159°57'44"E longitude at 2.2 m depth (wreck A in the chart below), directly in line with the market jetty, which is not marked. Another wreck (wreck B in the chart below) is located at the market jetty, at position 09°25'58"S latitude and 159°57'43"E longitude. SIPA has advised boat owners not to use the market jetty due to the presence of wreck B. However, boats still navigate around wreck A to access the domestic wharf.

It is recommended that wreck A is removed. Alternatively, an isolated danger mark should be placed to mark wreck A. Annual maintenance costs should be included to ensure that the AtoN equipment and systems continue to perform at the levels required by mariners to safely navigate the waterways. These are included in the 5-year budget plan for SIMA.

The costs to implement this recommendation were provided by SIMA as follows:

Recommendation	Amount (SBD)
Removal of wreck	1 million
Isolated danger mark	2432
Annual maintenance of danger mark	122 (see Annex E for detailed calculation)



Recommendation 4 (addressing allision scenario)

The domestic wharf is shallow close to the shoreline, and vessels docking alongside the jetties are likely to hit the wharf, especially during bad weather conditions.

It is recommended that SIPA installs extra fenders on the wharf. It is also recommended that SIPA improves its communications with masters of domestic vessels, to ensure they check engine manoeuvrability before approaching the wharf.

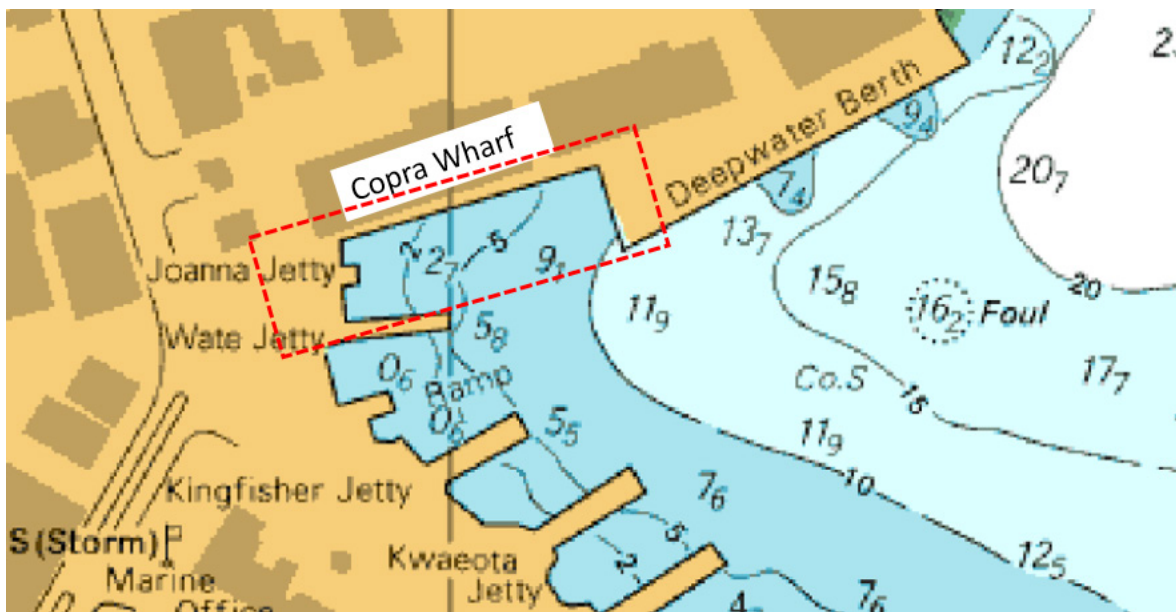
The costs to implement this recommendation are as follows:

Recommendation	Amount (SBD)
A new jetty with eight fenders	641,000
Annual maintenance	64,100 (see Annex E for detailed calculation)

Recommendation 5 (addressing allision scenario)

When international vessels are docked at Wharf 1, it is hazardous for vessels to access the copra wharf. It is particularly hazardous when the large vessels have their propellers running.

It is recommended that SIPA allows only certain categories of ships to access the copra wharf when international ships are docked at Wharf 1. The harbour department should also ensure no movement of vessels when an international vessel is operating. Awareness campaigns could help local users of the copra wharf to understand the hazard.

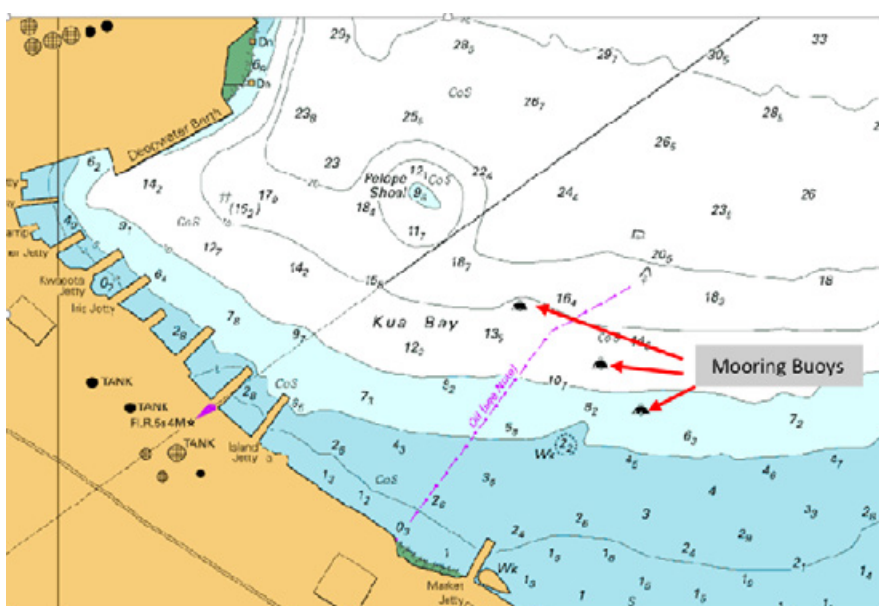


There is no capital cost to implement this recommendation. These measures can be part of the port security operations when international vessels are at berth. Port security procedures should be amended to include this.

Recommendation 6 (addressing allision scenario)

There are three mooring buoys near the oil pipeline, around the manoeuvring area to and from the domestic wharf, which are not lit and therefore not visible at night. There is also a small buoy marking the end of the oil pipeline that is not lit. These represent a hazard during night navigation.

It is recommended that the three mooring buoys are fitted with reflective tape and the buoy marking the end of the oil pipeline is lit.



The costs to implement this recommendation were supplied by SIMA as follows:

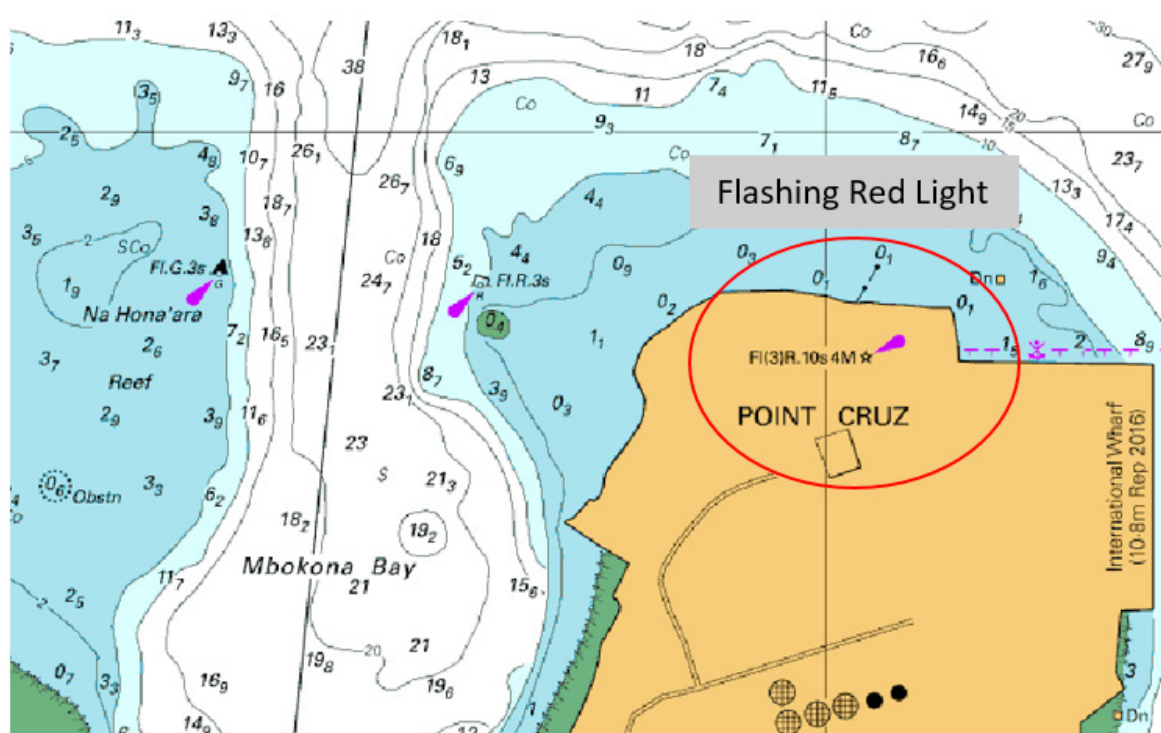
Recommendation	Amount (SBD)
Light for buoys	10,224
Reflective tape	1400
Annual maintenance	None (provision for spares budgeted for in succeeding years)

Recommendation 7 (AtoN)

A site visit was organised by SIMA with the pilot boat from SIPA, to look at all AtoN in the port for their compliance with IALA standards. A flashing red light was located on the western end of the international wharf that did not comply with IALA standards. This AtoN can be confused by mariners with the port-hand buoy marking Mbokona Bay.

It is recommended that this light be changed to a fixed white light marking the wharf, or removed.

There is no capital cost to implement this recommendation.



Annex A. Stakeholders in the port of Honiara risk assessment

Stakeholder List			
Representing	Name	Gender	Contact email
Solomon Islands Port Authority	Judah Kulubule	M	jkulubule@sipa.com.sb
Isabel Development Company (IDC) Shipping	Walter Legunau	M	w.legu@idc.com.sb
Royal Solomon Islands Police – Maritime	Fatima Deirdre Aoraunisaka	F	tahuniu@gmail.com
Solomon Islands Maritime Safety Administration	Ernest Legumana	M	elgumana@mid.gov.sb
Solomon Islands Maritime Safety Administration	Cathy Talua	F	ctalua@mid.gov.sb
Island Sun Newspaper	Ellison Vahi	M	ellisionvahi@gmail.com
Solomon Islands Maritime Safety Administration	Gundry Paleka	M	gpaleka@gmail.com
Anolpha Enterprises (Shipping Company)	David Faradatolo	M	dfaradatolo@gmail.com
Solomon Islands Maritime Safety Administration	Rachel Kosalu Bare-Anita	F	ranita@mid.gov.sb
Ministry of Fisheries and Marine Resources	Rieka Alarii Kwalai	F	rkwalai@fisheries.gov.sb
Vatate Investment and Development Ltd	Sebastian Tatanga	M	sebastiantatanga@gmail.com
Police Maritime Unit	Kornelius Chowiey	M	kornley.choniey11@gmail.com
MV Avaiki Maine	Diana Hill Su'ulisau	F	dsuulisau@gmail.com
VTA Shipping Company Limited	Philip Malana	M	reservation@rockhaveninn.com.sb
Vatate Investment and Development Ltd	Maurice Vaqalo	M	vataateinvest@gmail.com
Solomon Islands Maritime Safety Administration	John Dalomae	M	jdalomae@mid.gov.sb
Solomon Islands Maritime Safety Administration	Patrick Wamahe	M	Pwamahe@mid.gov.sb
Solomon Sun Newspaper	John Laungi Atai	M	atai.john2@gmail.com

Annex B. Hazards identified in the port of Honiara

	Hazard	Remarks
Natural	Siltation	Siltation from the Mataniko River builds up at the domestic jetty
	Shallow waters	Shallow waters at (1) Mataniko River mouth, (2) edge of point Cruz, (3) Nahonara Point, (4) domestic wharf
Economic	Insufficient AtoN funding issues	
Technical	Unlit mooring buoys	
	Unreliable nautical chart	(1) Pelope Shoal on the nautical chart has a depth of 9.6 m but the actual depth is 11 m. (2) Patrol boat jetty light character not specified
	Heading light Yacht Club	It should be raised higher to avoid background lights
Human	Pollution from the Mataniko river	
	Crew distraction due to drunkenness	
Operational	Poor response to marking new danger	
Maritime space	The existence of wrecks and new dangers	Wrecks outside the Honiara market and the yacht club are not marked
	Underwater oil pipe	The oil pipe is not marked
	Copra wharf is difficult to access when container ship is at dock 1	The copra wharf

Annex C. Possible scenarios identified for the port of Honiara

	Scenario	Remarks
Groundings	Grounding on soft bottom	In front of the mouth of the Mataniko river (a North cardinal mark could be installed)
	Grounding on wrecks	In front of the marked jetty there is an unmarked wreck where vessels can ground
	Grounding on hard bottom	When domestic vessels berth alongside the domestic wharf. This happens during bad weather usually lasting up to a week. Usually from 10am to mid-afternoon during the south-east trade winds.
Allisions	With domestic jetty	Due to: wind conditions, sea, ship technical problems. This would be a scenario involving domestic ships, around 300 GT. That might happen once every two months.
	With a moored vessel	When a vessel is berthed at number 1 dock, the stern might cover the entrance to the copra wharf. Smaller boats accessing the copra wharf might still try to moor and hence can damage the berthed vessel or damage their structure with the stern lines of the berthed ship
	With a moored vessel about to leave with propeller on	When a vessel is berthed at number 1 dock and is about to leave, the wash from the propeller might flush a small boat passing behind, on to the shore/ another boat.
	With the 3 mooring buoys in front of the oil pipeline or the buoy marking the end of the pipeline	A vessel entering the domestic wharf at night collides with the unlit mooring buoys; or the propellers get tangled in the pipeline buoy

Annex D. Risk assessment matrix for the port of Honiara

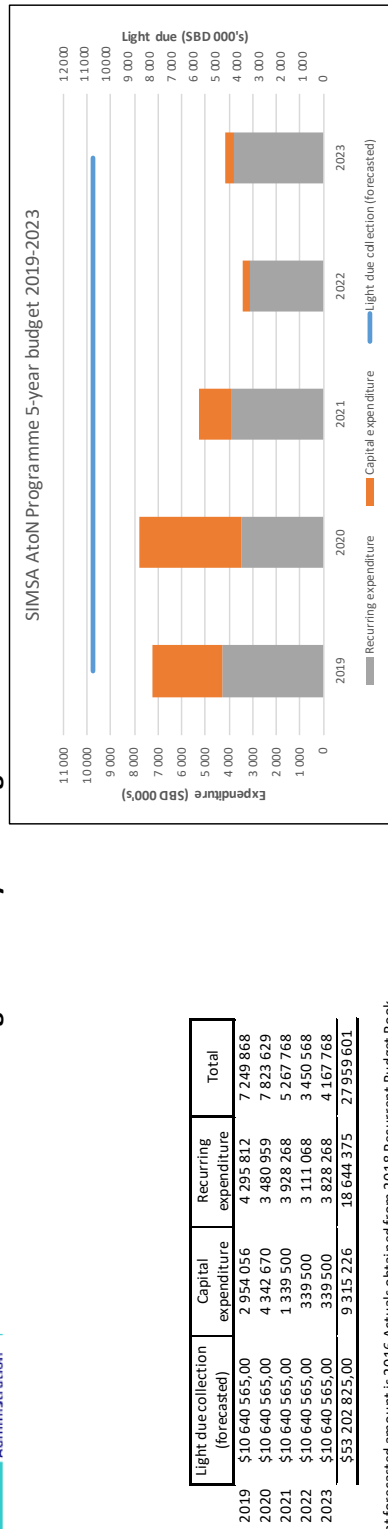
Scenario	Description of incident	Root cause (hazard)	Consequences (short and long term)	Existing risk control measures	Probability score	Consequence score	Risk score	Cost of incident (SBD)	Further risk control options	New probability score	New consequence score	New risk score	Cost of risk control option	Remarks
1. GROUNDINGS														
1.1 Grounding on rock in front of the mouth of the Mataniko river	Grounding of domestic vessels at berth (hard bottom)	Shallow water berths (from 0.6 to 5 m)	Short term: (1) suction of dirt to ship cooling system, causing damage to ship's engine; (2) damage to ship's hull due to constant pouding into hard bottom during rough weather and mooring ropes breaking when at berth	Ships try not to be at berth during rough weather to avoid such incidents happening, thus delaying services	4	4	16	430,000	Dredging can help prevent ships from sucking up dirt and prevent frequent pounding on the hard bottom	3	4	12	No costing supplied for dredging the domestic wharfs but excavator can be used to dredge the shallow end of the domestic jetties at approx. SBD 4 million	ALARP
1.2 Grounding on soft bottom in front of the mouth of the Mataniko river	Grounding of international vessels on soft bottom during turning into deep water berth	Shallow water around the Mataniko river mouth	Short term: delay in cargo/services due to grounding. Long term: ships can remain stranded until other salvage operations can take place	Tug boat services are provided for berthing and unberthing. Pilot services are always available	2	4	8	3.9 million	Dredging of shallow water around the river mouth and placing cardinal marks to alert to dangers	1	4	4	Cardinal north mark SBD 3170	ALARP
1.3 Grounding on wreck	Vessels accessing the domestic port ground on the unmarked wreck in front of the marked jetty due to the wreck being shallow (2.2 m)	Shallow water and unmarked wreck	Short term: damage to the vessel hull. Long term: vessel sinking	The wreck is marked on the chart. SIPA advises shipowners not to use the market jetty because of the wreck at the bottom of the jetty	2	2	4	430,000	Remove the wreck or put an isolated danger mark	1	2	2	Removing wreck SBD 1 million. Isolated danger mark SBD 2432	ALARP
2. ALLISIONS														
2 Allision with the jetty and other ships	A domestic ship berthing at the domestic wharf hits the jetty or other ships at berth	Technical issues (engine failure), weather (strong winds, high swells), crew competency (not STCW qualified)	Vessel sinks and blocks the domestic jetty (one or more); loss of services to outer islands; loss of employment; damage to environment; damage to other ships	STCW qualified personnel enforced by SIMSA; basic ship safety course regularly conducted on all ships; when 15+ kits of wind, the harbour master advises via VHF to move away from the jetty and anchor further east from the river mouth	3	4	12	36.6 million	Put extra fenders on the jetty; Inform the ship masters by written communication to always check engine manoeuvrability before approaching the jetty	2	4	8	One new jetty with 8 fenders is approx. USD 1000 per piece (10 jetties x 8 fenders each = USD 80 000 = SBD 641,000)	ALARP

2	Allision with the jetty and other ships	A domestic ship berthing at the domestic wharf hits the jetty or other ships at berth	Technical issues (engine failure), weather (strong winds, high swells), crew competency (not STCW qualified)	Minor damage to vessels	STCW qualified personnel enforced by SIMSA: basic ship safety course regularly conducted on all ships; when 15+ kts of wind, the harbour master advises via VHF to move away from the jetty and anchor further east from the river mouth	3	2	6	430,00	Put extra fenders on the jetty; inform the ship masters by written communication to always check engine manoeuvrability before approaching the jetty	2	2	4	One new jetty with 8 fenders is approx. USD 1000 per piece (10 jetties x 8 fenders each = USD 80 000 = SBD 641,000)	ALARP
2.3	Allision with an international vessel moored at dock 1	When a vessel is berth at number 1 dock, the stern might cover the entrance to the copra wharf	The copra wharf is difficult to access/leave when a ship is at dock 1	Smaller boats entering and leaving the copra wharf might get damaged	Liasing with Harbour Department personnel to see if possible to access the copra wharf	2	2	4	430,00	SIPA assigns which category of ships can access the copra wharf when an international vessel is at dock 1	1	2	3	No capital cost involved	
2.4	Allision with an international vessel moored at dock 1	When a vessel is berth at number 1 dock and is about to leave, the wash from its propeller might	The copra wharf is difficult to access/leave when a ship is at dock 1	Smaller boats may get damaged; or there may be damage to jetty	International boats at dock 1 have signs at the stern when their propeller is on	3	4	12	430,00	The Harbour Department assigns security to the copra wharf to ensure no movement of vessels while propellers are on. Awareness training could	1	4	4	No capital cost involved	
2.5	Allision with the three mooring buoys in front of the oil pipeline or with the buoy marking the end of the pipeline	A vessel manoeuvring into the domestic wharf at night collides with the unit mooring buoys, or the propellers get tangled in the pipeline buoy	The mooring buoys and the buoy marking the end of the pipeline are unit	Damage to the vessel's underwater hull; minor or major oil spill; sinking of vessels; loss of service from oil tanker	Mooring buoys are painted white for night vision and clearly marked in the chart	2	3	6	4.1 million	Mooring buoys should be lit or clearly marked with blue or white reflective tape. The buoy marking the end of the pipeline should be large and clearly marked or lit.	1	3	3	Lighting up the mooring buoys SBD 10 224. Reflective tape SBD 1400	ALARP

Annex E. SIMA AtoN programme 5-year budget 2019–2023



SIMSA AtoN Programme 5-year budget 2019-2023



* Light forecasted amount is 2016 Actuals obtained from 2018 Recurrent Budget Book

* Costings Risk control options covered under Honiara Safety of Navigation Risk Assessment have been factored in:

- In 2019, installation of new fenders at the domestic vessel berth to mitigate risk of allisions; installation of an isolated danger mark to mitigate risk of grounding on wreck
- In 2020, dredging of port area in front of domestic berth to mitigate risk of grounding; installation of cardinal north mark near Mataniko River mouth to alert vessels of shallow water
- In 2021, removal of wreck marked with 2019 Isolated danger mark

2019 BUDGET				
	Unit cost	Estimated cost (SBD)	Estimated cost (SBD)	Notes
Capital expenditure				
Procurement				
New AtoN (lanterns)		2,020,000		Lanterns for (1) lighthouse construction in Lata entrance, Santa Cruz and (5) Marau Sound Lighthouse (4 transit and 1 harbour reef light) proposed for 2019
Consultancy fees (Australian Maritime System)		270,000		Consultancy fee includes: design, commissioning, on-site supervision of sector light; meals and accommodation
Freight/customs		9,000		Freight and customs clearance cost of new AtoN equipment
New fenders		641,000		- As part of recommendations in the Honiara risk assessment, installation of new fenders of the domestic vessel berth to mitigate the risk of allision between docked ships with other vessels or the wharf - One new jetty with 8 fenders each is approx. USD 1000 per piece (10 jetties x 8 fenders each = USD 80,000 = SBD 641,000)
Mooring buoy light		10,224		- As part of recommendations in the Honiara risk assessment, installation of a light on the buoy at the end of oil pipeline
Reflective tape		1,400		- As part of recommendations in the Honiara risk assessment, application of reflective tape on oil pipeline to mitigate the risk of allision between vessels and the oil pipeline
Isolated danger mark AtoN		2,432		- As part of recommendations in the Honiara risk assessment, installation of an isolated danger marker will alert vessels of wreck in the area
Total capital expenditure			2,954,056	
Recurring expenditure				
Maintenance				
Maintain - specialised equipment (spares)		750,000		An order for spares carried out every 2-3 years (2021 and 2023)
Maintenance - isolated danger mark AtoN		122		Maintenance costs specifically for isolated danger mark installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a manufacturer's recommended maximum life-cycle of 20 years for such an asset, an RAV of 5% is taken
Maintenance - fenders		64,100		Maintenance costs specifically for local vessel berth installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a recommended maximum life-cycle of 10 years for such an asset, an RAV of 10% is taken
Paint etc.		100,000		Following painting needs: Anti-rust Undercoat Ocean guard white Ocean guard red Ocean guard green Ocean guard yellow Ocean guard black Thinner Rollers and paint brushes
Hire of ships		2,295,000		Three trips are carried out every year: Western region - 22 days Central region - 16 days Eastern region - 16 days *Any needed installation work is also carried out during maintenance trips
Risk assessment				
				Two risk assessments earmarked for 2019 to happen one after the other: Noro and Gizo
Boat fare		2,000		Boat fare between Noro and Gizo (2px)
Airfares		12,366		Airfare from Honiara to Noro (SBD 2970*2px), and from Gizo to Honiara (3213*2px)
Taxi fees		200		Taxi fares from airport to town in Noro
Venue costs		6,000		Noro - 1 day Gizo - 2 days
Accommodation		6,000		Noro - 600*2px*2 nights Gizo - 600*2px*3 nights
Catering		12,000		Catering in Noro and Gizo for workshop participants
Projector				Single purchase on 1st year
Laptop		15,400		Single purchase on 1st year
Other				
Land rent		240,000		55 lighthouses under customary land lease agreement
Advertising - awareness materials		40,000		Printing of awareness materials: posters, notices for mariners
Training - Level 1 AtoN Manager training		49,000		Approximately EUR 7,000 to send SIMSA staff for training (next training in 2022)
Training - Level 2 AtoN Technician training		49,000		Approximately EUR 7,000 to send SIMSA staff for training (next training in 2022)
Contingency (10%)		654,624		10% of all other costs
Total recurring expenditure			4,295,812	
Total budgeted expenses			7,249,868	

2020 BUDGET					
		Unit cost	Estimated cost (SBD)	Estimated cost (SBD)	Notes
Capital expenditure					
Procurement					
	New AtoN (lanterns)		60,500		Planned installation of 1 lighthouse
	Consultancy fees (Australian Maritime System)		270,000		Consultancy fee includes: design, commissioning, on-site supervision of sector light; meals and accommodation
	Freight/customs		9,000		Freight and customs clearance cost of new AtoN equipment
	Dredging works		4,000,000		- As part of recommendations in the Honiara risk assessment, dredging of the domestic vessel berth to mitigate the risk of grounding - Works to be done by local contractor via use of excavator - Cost was approximated based on estimates of local contractor hire and fees
	Cardinal north mark		3,170		- As part of recommendations in the Honiara risk assessment, installation of cardinal north mark around Maraniko river mouth will alert vessels of shallow water in the area
Total capital expenditure				4,342,670	
Recurring expenditure					
Maintenance					
	Paint etc.		100,000		Following painting needs: Anti-rust Undercoat Ocean guard white Ocean guard red Ocean guard green Ocean guard yellow Ocean guard black Thinner Rollers and paint brushes
	Maintenance - isolated danger mark AtoN		122		Maintenance costs specifically for isolated danger mark installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a manufacturer's recommended maximum life-cycle of 20 years for such an asset, an RAV of 5% is taken
	Maintenance - fenders		64,100		Maintenance costs specifically for local vessel berth installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a recommended maximum life-cycle of 10 years for such an asset, an RAV of 10% is taken
	Maintenance - cardinal north mark		159		Maintenance costs specifically for cardinal north mark installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a manufacturer's recommended maximum life-cycle of 20 years for such an asset, an RAV of 5% is taken
	Hire of ships		2,295,000		3 trips are carried out every year: Western region - 22 days Central region - 16 days Eastern region - 16 days *Any needed installation work is also carried out during maintenance trips
Risk assessment					1 risk assessment earmarked for 2020: Munda
	Airfares		5,940		Airfare from Honiara to Munda, and back SBD (2970*2px)
	Taxi fees		400		Taxi fares from airport to town in Munda (\$200 one way)
	Venue costs		6,000		2 days risk assessment workshop in Munda
	Accommodation		6,000		3 nights in Munda
	Catering		12,000		
Other					
	Land rent		240,000		55 lighthouses under customary land lease agreement
	Advertising - awareness materials		40,000		Printing of awareness materials: posters, notices for mariners
	Contingency (10%)		711,239		10% of all other costs
Total recurring expenditure				3,480,959	
Total budgeted				7,823,629	

2021 BUDGET					
		Unit cost	Estimated cost (SBD)	Estimated cost (SBD)	Notes
Capital expenditure					
Procurement					
	New AtoN (lanterns)		60,500		Planned installation of 1 lighthouse
	Consultancy fees (Australian Maritime System)		270,000		Consultancy fee includes: design, commissioning, on-site supervision of sector light; meals and accommodation
	Freight/customs		9,000		Freight and customs clearance cost of new AtoN equipment
	Removal of wreck		1,000,000		Removal of wreck marked in 2019 with an isolated danger mark
Total capital expenditure				1,339,500	
Recurring expenditure					
Maintenance					
	Maintain - specialised equipment (spares)		750,000		An order for spares carried out every 2-3 years
	Maintenance - isolated danger mark AtoN		122		Maintenance costs specifically for isolated danger mark installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a manufacturer's recommended maximum life-cycle of 20 years for such an asset, an RAV of 5% is taken
	Maintenance - fenders		64,100		Maintenance costs specifically for local vessel berth installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a recommended maximum life-cycle of 10 years for such an asset, an RAV of 10% is taken
	Maintenance - cardinal north mark		159		Maintenance costs specifically for cardinal north mark installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a manufacturer's recommended maximum life-cycle of 20 years for such an asset, an RAV of 5% is taken
	Paint etc.		100,000		Following painting needs: Anti-rust Undercoat Ocean guard white Ocean guard red Ocean guard green Ocean guard yellow Ocean guard black Thinner Rollers and paint brushes
	Hire of ships		2,295,000		3 trips are carried out every year: Western region - 22 days Central region - 16 days Eastern region - 16 days *Any needed installation work is also carried out during maintenance trips
Other					
	Land rent		240,000		55 lighthouses under customary land lease agreement
	Advertising - Awareness materials				Printing of awareness materials: posters, notices for mariners
	Contingency (10%)		478,888		10% of all other costs
Total recurring expenditure				3,928,268	
Total budgeted				5,267,768	

2022 BUDGET					
		Unit cost	Estimated cost (SBD)	Estimated cost (SBD)	Notes
Capital expenditure					
Procurement					
	New AtoN (lanterns)		60,500		Planned installation of 1 lighthouse
	Consultancy fees (Australian Maritime System)		270,000		Consultancy fee includes: design, commissioning, on-site supervision of sector light; meals and accommodation
	Freight/customs		9,000		Freight and customs clearance cost of new AtoN equipment
Total capital expenditure				339,500	
Recurring expenditure					
Maintenance					
	Paint etc.		100,000		Following painting needs: Anti-rust Undercoat Ocean guard white Ocean guard red Ocean guard green Ocean guard yellow Ocean guard black Thinner Rollers and paint brushes
	Maintenance - isolated danger mark AtoN		122		Maintenance costs specifically for isolated danger mark installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a manufacturer's recommended maximum life-cycle of 20 years for such an asset, an RAV of 5% is taken
	Maintenance - fenders		64,100		Maintenance costs specifically for local vessel berth installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a recommended maximum life-cycle of 10 years for such an asset, an RAV of 10% is taken
	Maintenance - cardinal north mark		159		Maintenance costs specifically for cardinal north mark installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a manufacturer's recommended maximum life-cycle of 20 years for such an asset, an RAV of 5% is taken
	Hire of ships		2,295,000		3 trips are carried out every year: Western region - 22 days Central region - 16 days Eastern region - 16 days *Any needed installation work is also carried out during maintenance trips
Other					
	Land rent		240,000		55 lighthouses under customary land lease agreement
	Advertising - awareness materials				Printing of awareness materials: posters, notices for mariners
	Training - Level 1 AtoN Manager training		49,000		Approximately EUR 7,000 to send SIMSA staff for training
	Training - Level 2 AtoN Technician training		49,000		Approximately EUR 7,000 to send SIMSA staff for training
	Contingency (10%)		313,688		10% of all other costs
Total recurring expenditure				3,111,068	
Total budgeted				3,450,568	

2023 BUDGET					
		Unit cost	Estimated cost (SBD)	Estimated cost (SBD)	Notes
Capital expenditure					
Procurement					
	New AtoN (lanterns)		60,500		Planned installation of 1 lighthouse
	Consultancy fees (Australian Maritime System)		270,000		Consultancy fee includes: design, commissioning, on-site supervision of sector light; meals and accommodation
	Freight/customs		9,000		Freight and customs clearance cost of new AtoN equipment
Total capital expenditure				339,500	
Recurring expenditure					
Maintenance					
	Maintain - specialised equipment (spares)		750,000		An order for spares carried out every 2-3 years
	Maintenance - isolated danger mark AtoN		122		Maintenance costs specifically for isolated danger mark installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a manufacturer's recommended maximum life-cycle of 20 years for such an asset, an RAV of 5% is taken
	Maintenance - fenders		64,100		Maintenance costs specifically for local vessel berth installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a recommended maximum life-cycle of 10 years for such an asset, an RAV of 10% is taken
	Maintenance - cardinal north mark		159		Maintenance costs specifically for cardinal north mark installed as part of 2019 risk control options. Amount is estimated as a percentage of replacement asset value (RAV). Given a manufacturer's recommended maximum life-cycle of 20 years for such an asset, an RAV of 5% is taken
	Paint etc.		100,000		Following painting needs: Anti-rust Undercoat Ocean guard white Ocean guard red Ocean guard green Ocean guard yellow Ocean guard black Thinner Rollers and paint brushes
	Hire of ships		2,295,000		3 trips are carried out every year: Western region - 22 days Central region - 16 days Eastern region - 16 days *Any needed installation work is also carried out during maintenance trips
Other					
	Land rent		240,000		55 lighthouses under customary land lease agreement
	Advertising - awareness materials				Printing of awareness materials: posters, notices for mariners
	Contingency (10%)		378,888		10% of all other costs
Total recurring expenditure				3,828,268	
Total budgeted				4,167,768	

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