

Pacific Safety of Navigation Project Risk Assessment – Tarawa, Kiribati



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1 Executive Summary

Kiribati is signatory to the International Convention for the Safety of Life at Sea (**SOLAS**), whose 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*”.

Kiribati is one of the 13 targeted Pacific Islands Countries and Territories of the **Pacific Safety of Navigation Project** implemented by the Pacific Community 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 Aids to Navigation (AtoN) capacity and systems. Kiribati has maritime regions in which the environmental conditions, volume of traffic and degree of risk varies.

Betio is one of the major international ports in Kiribati, thus this port was identified as a priority by the Ministry of Information Communication Transport Tourism and Development (MICTTD) for the initial AtoN risk assessment to be carried out. The port of Betio consists of one domestic jetty, one patrol boat jetty and one international jetty.

The Betio Anchorage during peak fishing season accommodates around 15 fishing vessels, including motherships. Most of these ships stay at the anchorage area and do not come alongside the wharf. There are 10 domestic ferry service providers in the Kiribati. The Police Marine division operates the Pacific-class patrol boat. There are no Cruise Vessels that calls at Betio Port and usually around 1 yacht per year visits the port.

As part of the Phase 2 of the project, in September 2018 SPC conducted an **AtoN risk assessment** of the Betio port area using the **Simplified IALA Risk Assessment (SIRA) tool**: this report details the risks identified, the estimated costs in case of incident, the potential risk control options suggested and their costs. Kiribati’s maritime stakeholders identified ten possible **scenarios**: four “**groundings**” in the vicinity of Betio port, two “**allisions**”, one “**foundering**”, two “**structural failure**” and one other scenario. Upon discussion with the AtoN officer, from the ten possible scenarios, **six** were **further assessed** for risk control options. 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.

Scenarios	Risk Score	Risk Control Options	New Risk Score
Grounding on the fairway buoy	6	To install a port hand buoy on 8 m shoal at the entrance of the channel	2
Domestic vessels accessing the old KPA wharf always grounding on sand/mud	15	To dredge old KPA wharf and channel that will allow ships to access wharf at all times	3
Vessels grounding between the entrance and Bikeman point	10	To reinstall leading light at Bikeman island	5
Domestic vessels dragging anchor during strong North Easterly wind can aground on the wreck	6	To place wreck marking buoy on existing wreck	2
Vessels colliding with AtoN and also while vessels are towed	6	To enlarge or extend anchorage area away from the channel	3
Ships at anchor drifting or dragging at high wind and colliding with wharf/Jetty,	6	To install fenders on the domestic wharf; KFL to reduce background lighting	2

The outcome of the risk assessment process undertaken in Kiribati involves **six main recommendations** which aim to reduce the risks to safety of navigation to an acceptable level for the stakeholders and the costs needed for their implementation.

Recommendations 1	Amount (AUD)
Install a port hand lit buoy on the 8 m shoal at the entrance of the channel	
Cost of Buoy (including installation)	40,000.00
Annual maintenance cost	603.00 ¹

Recommendations 2	Amount (AUD)
Dredge the channel and berthing area	
Cost of dredging	150,000.00
Annual maintenance cost (no maintenance dredging required for the first 5 years)	none

Recommendation 3	Amount (AUD)
Install leading light at Bikeman Island	
Cost of leading light (including installation)	20,000.00
Annual maintenance cost	603.00 ²

Recommendation 4	Amount (AUD)
Install a wreck marking buoy	
Cost of buoy (including installation)	40,000.00
Annual maintenance cost	603.00 ³

Recommendation 5	Amount (AUD)
Change/enlarge anchorage area	
Cost	200,000.00
Annual maintenance cost	none

Recommendation 6	Amount (AUD)
Install fenders and reduce intensity of light from KFL building	
Cost of fenders (including installation)	100,000.00
Cost of reducing KFL light intensity	none
Annual maintenance cost (estimated at 1% annually of the total cost)	1,000.00

¹ Maintenance costs include labour allowances, boat hire and materials costs. These costs have been factored in to the AtoN Programme 5-year Budget Plan (2020-2024) in Annex E.

² ditto

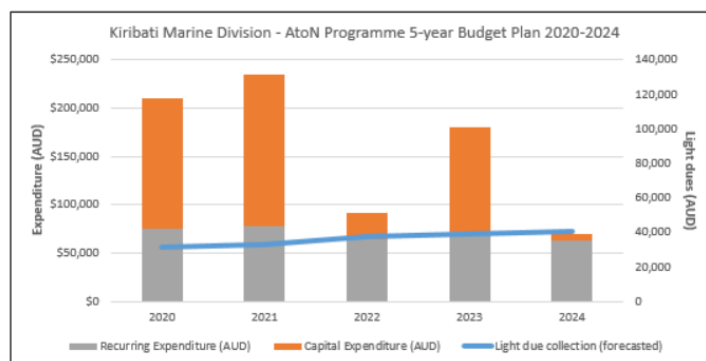
³ ditto

As part of the Pacific Safety of Navigation's work on supporting the Ministry of Information Communication Transport Tourism and Development (MICTTD), a **AtoN Programme 5 year Budget plan** has been drawn up to assist in their budget planning (Annex E), which includes the capital expenditure and the recurring expenditure.



Kiribati Marine Division (MICTTD) - AtoN Programme 5-year Budget Plan 2020-2024

	Light due collection (forecasted)	Capital Expenditure (AUD)	Recurring Expenditure (AUD)	Total (AUD)
2020	\$31,530	\$134,850	\$75,637	\$210,487
2021	\$32,800	\$157,325	\$77,884	\$235,209
2022	\$37,832	\$27,325	\$64,884	\$92,209
2023	\$39,362	\$107,325	\$72,884	\$180,209
2024	\$40,954	\$7,325	\$62,884	\$70,209
	\$182,477.38	\$434,150	\$354,175	\$788,325



- * Light dues forecasted amount is taken from 2018 Kiribati National Budget Book
- * Costings of risk control options covered under Tarawa Safety of Navigation Risk Assessment have been factored in:
 - In 2020, procurement and installation of a Port Hand Buoy, Wreck Mark and Leading Light to mitigate the risk of groundings
 - In 2021, dredging of old KPA wharf to mitigate groundings
 - In 2022, extending of anchorage area to mitigate allisions
 - In 2023, procurement and installation of fenders for wharf to mitigate allisions
- * Maintenance costs for new procured equipment have been factored into the maintenance costs under recurring expenditure

2 Background

In early 2016, with the **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)⁴, with the aim to improve safety of navigation in the Pacific region through enhanced Aids to Navigation (AtoN) capacity and systems and hence support the economic development, shipping and trade in the Pacific region, through safer maritime routes managed in accordance with international instruments and best practices.

In the undertaking of the Phase 1, that ended in July 2018, SPC worked in **close relationship with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)** to conduct technical, legal and economic assessment missions that led IALA World Maritime Academy (IALA) to pull out the 13 PICTs from its target list in the scope of the IALA four-stage capacity-building process.

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

In June 2018, IALA trained 12 staff of the 13 targeted countries on the Simplified IALA Risk Assessment (SIRA) tool to conduct AtoN risk assessments in the respective countries.

In September 2018, the Ministry of Information Communication Transport and Tourism development (MICTTD) invited SPC to assist in conducting the **risk assessment of Betio Port**, the country's most visited port, both by international and domestic vessels. The assessment involved a stakeholders meeting, to gather the views on risks and hazards of the selected area of those able to affect or be affected by a decision or activity related to AtoN service provision. This insightful information allowed Kiribati AtoN officer and IALA SIRA certified officer, Mr Eritaia Tauro and SPC to complete the full risk assessment matrix (in Annexes A-D), with six different main possible scenarios.

2.1 Process

This report describes the risk assessment undertaken in the Port of Betio (Tarawa), Kiribati.

Kiribati is a true maritime nation, with a strong percentage of citizens working on or around the maritime industry. Shipping is critical to the economic and social welfare of the citizens of Kiribati. The ability for vessels to navigate safely in and around the islands is essential to ensure safe shipping and protection of the environment.

Kiribati is signatory to the International Maritime Organization (IMO) Safety of Life at Sea (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

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

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 assessment and management of risk is therefore fundamental to the provision of effective marine aids to navigation (AtoN) services. To address this, the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) in partnership with SPC has developed IALA Risk Management Tools, including the Simplified IALA Risk Assessment tool (SIRA).

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

1. Identify hazards
2. Assess risks
3. Specify risk control options
4. Make a decision
5. Take action

SIRA is intended as a basic tool to consider risk control options covering the potential undesirable incidents that Kiribati should address as part of its obligation under SOLAS Chapter V Regulation 12 and 13. The assessment and management of risk is therefore fundamental to the provision of effective marine aids to navigation (AtoN) services.

3 Description of the Waterway and Traffic

Kiribati has maritime regions in which the environmental conditions, volume of traffic and degree of risk varies. Betio is the major international port in Kiribati, thus it was identified as a priority by MICTTD for the initial risk assessment to be carried out. The port of Betio consists of one domestic wharf, one international wharf and a Maritime police patrol wharf.

Access to the wharfs is through a shallow and winding channel. Chart BA729_1 covers the Betio Anchorage at a scale of 1:25 000 (Figure 1). There are 11 AtoNs around the port. Vessels that frequent this port range from large energy carriers, warships, fishing vessels and private crafts. The international wharf can accommodate vessels with a maximum draft of 7m alongside.

The Betio Anchorage during peak fishing season accommodates around 15 fishing vessels, including motherships. Most of these ships stay at anchorage area and do not come alongside the wharf. There are 10 domestic ferry service providers in Kiribati. The Police Marine division operates the Pacific-class patrol boat. There are no cruise vessels that calls at Betio Port and usually 1 yacht calls the port each year.

The domestic wharf has very shallow depths alongside, ranging from 5 m to less than 2 m, thus this poses a major challenge for domestic vessels accessing the wharf at low tide. Visibility can be reduced to 0.2 nautical miles in bad weather conditions, around the months of November to April. There are several hazards such as buoys, wrecks, shoals and narrow and shallow passage that can pose problems for maritime traffic.

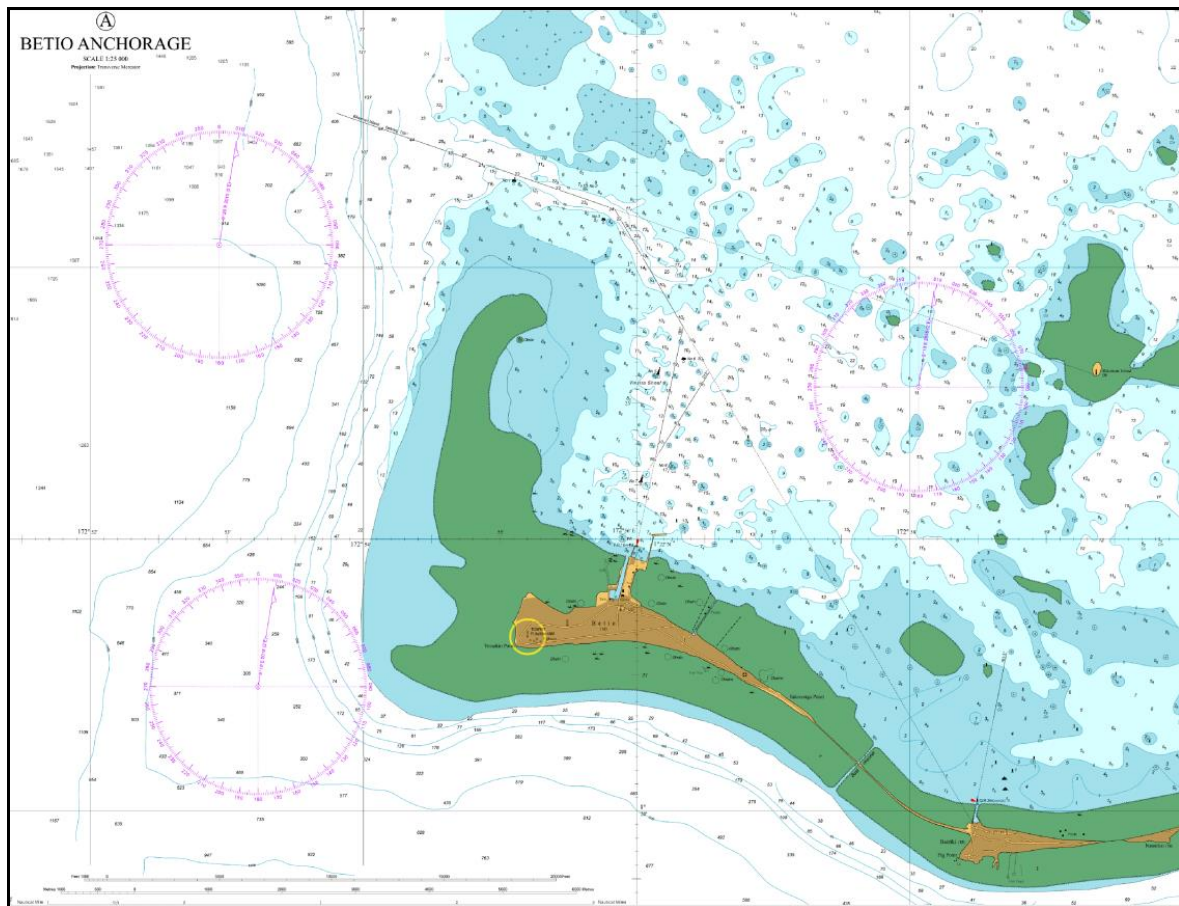


Figure 1. Chart of Betio Anchorage 1:25 000 scale.

4 Stakeholders

As part of the SIRA process, a **maritime stakeholders meeting** was organised in Tarawa on the 25th September 2018, with the aim to gather the points of view of the individuals, groups or organisations able to affect or be affected by a decision or activity related to AtoN service provision. The Kiribati stakeholders included the Kiribati Ports Authority, shipping agents, maritime police, maritime safety administration, fisheries and many more. During the workshop, the participants were divided into four different groups according to their experience and background. They helped identify the potential hazards and possible scenario in the port of Betio, using the latest chart of the port and other tools such as the marine traffic data and their experiences.

The stakeholder list is provided in annex A.

5 Hazards and risks

A **“hazard”** is something that may cause an undesirable incident, a **“risk”** is the chance of injury or loss as defined as a measure of **“probability or likelihood”** and **“severity or impact”** of an adverse effect to health, property, the environment or other values. The purpose of gathering all the maritime stakeholders was to generate a **prioritized** list of hazards, specific to the Port of Betio. During the course of the mission, SPC and MICTTD AtoN officer worked together to discuss the risks associated with the identified hazards and risk control options and recommendations.

A list of hazards identified in the Port of Betio is included in the annex B.

5.1 Types of Hazards

In general, 24 different hazards were identified that were grouped into the following categories:

1. **Natural** hazards such as floods, windstorms, earthquakes, biological hazards, and other natural phenomena.
2. **Economic** hazards such as inflation, depression, and changes in tax and fee levies.
3. **Technical** hazards such as system or equipment failure, fire, explosion, obsolescence, air/water pollution, failure of communications systems, degradation of data quality.
4. **Human** factors such as errors or omissions by poorly trained, fatigued or stressed persons, linguistic challenges, violations, sabotage or terrorism.
5. **Operational** hazards such as groundings, collisions, striking and other unwanted events.
6. **Maritime space** hazards, such as competing uses for maritime space leading to increasingly crowded waterways.

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

1. Health losses including death and injury.
2. Property losses including real and intellectual property.
3. Economic losses leading to increased costs or reduction to revenues.
4. Liability loss resulting when an organization 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 organization.
5. Personnel loss when services of a key employee are lost.
6. Environmental losses (negative impact on land, air, water, flora or fauna).
7. Loss of reputation or status.

5.2 Risk Factors

A **risk analysis** associated with the waterway or port approach might consider a range of factors that contribute to the overall risk exposure. Table 1 below provides an indication of the factors that could be taken into consideration when identifying hazards.

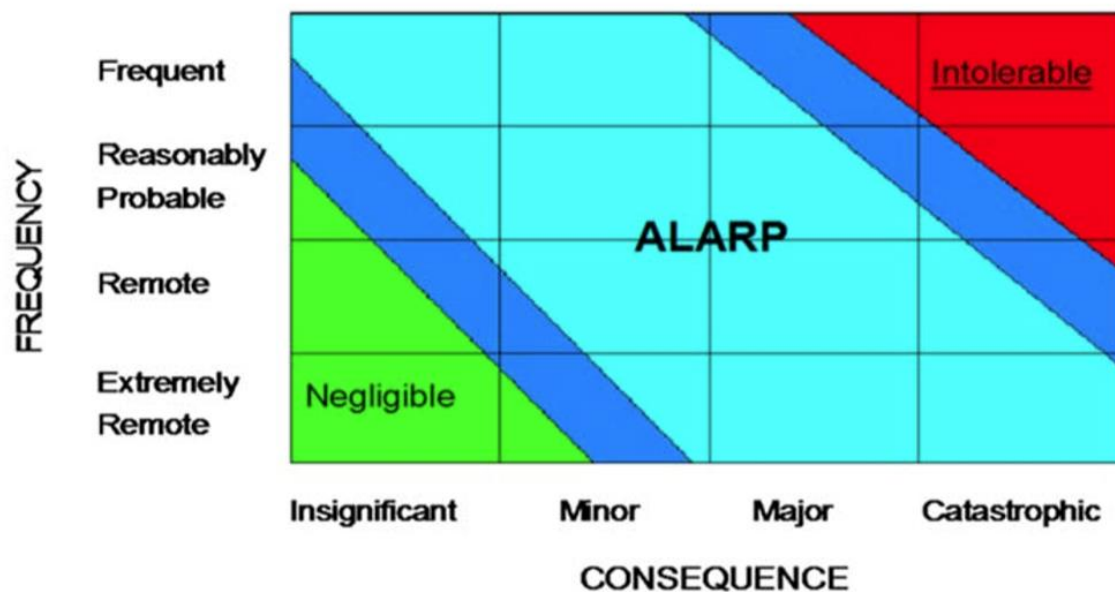
Table 1. **Indicative risk factors** relating to marine navigation.

Ship Traffic consideration	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 impact
Traffic density	Recreational boats	Currents (river, tidal, ocean)	Waterway complexity	Property damage	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 focussed upon **high-risk areas**, and to identify and evaluate the factors which influence the level of risk. The risk is evaluated in terms of the needs, issues, and concerns of stakeholders, the benefit of the activity, and its costs.

Once all the risk are assessed they are then evaluated in terms of the documented needs, issues, and concerns of the stakeholders, and the benefits of the activity, to determine the **acceptability of the risk**.

Zero risk is something that is not often realized, 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'**. This concept is known as ALARP (see Figure below)



Note. The Risk level boundaries (Negligible/ALARP/Intolerable) are purely illustrative.

It is important for the Authority to remember that, when communicating with stakeholders about the risk issues, perception is reality. The public will make judgements of the acceptability of a risk based on its perceptions of the consequences of the risk, rather than on scientific factors like probability.

The **public's perception of the risk** may be influenced by many things, including age, gender, level of education, region, values, and previous exposure to information on the hazard or activity of interest. Public perceptions of risk may differ from those of technical experts. Discrepancies may result from differences in assumptions, conceptions, and the needs, issues, and concerns of stakeholders as they relate to the hazard or activity under discussion.

6 Scenarios

During the stakeholders' meeting and during the discussions with the AtoN officer, a number of hazards were identified which could lead to a number of different incidents and scenarios. Each hazard was considered carefully and discussed thoroughly and the possible scenarios it may cause were identified and recorded.

From all the **24 identified hazards** identified, **ten different scenarios** were categorised: grounding, allisions, foundering, structural failure and one other scenario. All the ten scenarios are discussed

below but only six between grounding and allision scenarios were further assessed for the risk assessment in consultation with the AtoN Officer of MICTTD.

6.1 Grounding

There were four different grounding scenarios identified for the Port of Betio. The probability of grounding depended on many factors, such as the **bathymetry around the port area, draft of the vessels accessing the port and meteorological conditions** such as prevailing wind speed and direction during certain periods of the year. Grounding on wrecks was also considered due to the presence of unmarked wrecks near the jetty. Grounding on hard bottom can also be due to narrow passage at the entrance at the fairway buoy. Grounding on hard bottom due to the unavailability of transit light on Bikeman Island is a major concern as well as visibility affected during sunset hours were also a concern. Grounding was also a concern during Navigational Aids failure on board the vessels.

Grounding on soft bottom was also a major concern for local vessels accessing the old KPA wharf. The wharf has depths ranging from 5 to less than 2 meters. This is due to the siltation of the wharf that has an adverse effect on the vessels accessing the wharf at low tides. Most local vessels can only access the wharf at high tide.

6.2 Allisions

The possibility of a vessel striking a fixed man-made object such as the wharf or mooring buoy depends on the existence of such structures along the routes and density of traffic. Two different allision scenarios were identified for the Port of Betio: allision with the AtoNs and allision with the wharf.

Allision with AtoNs usually occur when AtoNs are unlit or when vessels pass too close to them. Allision with AtoNs also occur when vessels are towed out through the passages with very little room for manoeuvrability due to the narrow and winding channels.

One of the causes for vessels' allision with the wharf is due to the glare from the background lights from the KFL wharf. This usually occur while ships are trying to come alongside. Another cause of allision with the wharf was identified when ships drift at anchor close to the wharf during strong winds.

6.3 Foundering

Foundering is defined as "the sinking of a vessel that is not the result of an earlier collision". For example, a vessel might founder if its cargo has shifted during bad weather.

Foundering at Betio wharf was identified due to ship quality together with the inexperience of the crew operating the vessels. Foundering because of heavy weather, springing leaks and eventually breaking apart of vessels were also identified during the stakeholder consultation. This was a very rare or unlikely event, which would only occur in exceptional circumstances and not more than once every 20 years.

6.4 Structural failures

Structural failure could be a failure of the vessel itself or a feature external to the vessel. This can be caused by extreme environmental conditions, poor maintenance or even malicious interference. Local domestic vessels in Kiribati are usually of wooden structure and thus are prone to failures. Structural failures of external features of substandard ships such as improper navigation aid can cause grounding of these ships on port approaches to Betio. This was a very rare or unlikely event, which would only occur in exceptional circumstances and not more than once every 20 years.

6.5 Other scenarios

Technical hazards such as fire was a scenario that was also discussed for the Betio port.

Human involvement is a significant factor, since the root cause of many unwanted scenarios can be related to human error. As such, human factors must form an important consideration in the overall risk assessment. Annex C list examples of possible scenarios.

7 Probability and Impact

SIRA specifies five levels of probability and five levels of impact that each type of undesired incident or scenario would create. Each scenario is allocated a score from which a risk value is calculated from the product of probability and impact. In this step of the decision process, the probability and consequences associated with each scenario selected for analysis were estimated and discussed with the AtoN Officer. Impact scores were assessed against the criteria in the tables below:

Classification	Score	Probability
Very rare	1	Very rare or unlikely, will occur only in exceptional circumstances and not more than once every 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 weekly to every 2months.
Very Frequent	5	Very frequent, may occur at least once every week.

Table 2. descriptions of probability

Description	Score	Service Disruption Criteria	Human Impact Criteria	Financial Criteria	Environment
Insignificant	1	No service disruption apart from some delays or nuisance.	No injury to humans, perhaps significant nuisance	Loss, including third party losses, less than US\$1.000	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 hospitalization	Loss, including third party losses, US\$ 1.000 – 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 hospitalization	Loss, including third party losses of \$50.000-\$5.000.000	Short term damage to the environment in 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 \$5.000.000 - \$50.000.000	Long term to irreversible damage to the environment in 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 \$50.000.000	Irreversible damage to the environment in a large area

Table 3. Description of impact.

8 The acceptability of risk

Having determined probability and impact scores by consensus, the risk value was calculated in accordance with the matrix in the table 4 below:

		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 4. Risk Value Matrix

The next step was to determine whether those risks were acceptable or not. SIRA specifies **four** colour-banded **levels of risk**. These are shown in the table 5 below:

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.

Table 5. Action required for risk categories

9 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) which is acceptable to stakeholders. Before any risk control decisions were made, they were communicated through the stakeholder consultation process. The risk were evaluated in terms of the overall needs, issues, and concerns of the stakeholders. Some of the **mitigation options** included:

- new or enforcement of existing rules and procedures,
- improved charted hydrographical, meteorological and general navigation information,

- enhanced aids to navigation service provision,
- improved radio communications,
- improved decision support systems

The table 6 below shows the risk score for the current hazards and scenarios and the new risk score after mitigating the risk with further risk control options.

Scenarios	Risk Score	Risk Control Options	New Risk Score
Grounding on the fairway buoy	6	To install a port hand buoy on 8 m shoal at the entrance of the channel	2
Domestic vessels accessing the old KPA wharf always grounding on sand/mud	15	To dredge old KPA wharf and channel that will allow ships to access wharf at all times	3
Vessels grounding between the entrance and Bikeman point	10	To reinstall leading light at Bikeman island	5
Domestic vessels dragging anchor during strong North Easterly wind can aground on the wreck	6	To place wreck marking buoy on existing wreck	2
Vessels colliding with AtoN and also while vessels are towed	6	To enlarge or extend anchorage area away from the channel	3
Ships at anchor drifting or dragging at high wind and colliding with wharf/Jetty,	6	To install fenders on the domestic wharf; KFL to reduce background lighting	2

Table 6. Risk control options

The detailed Risk control options for the Betio Port is shown in the Risk management Matrix in Annex D.

10 Costing Risk Control Options

Due to the nature of the process, the outcomes of the risk assessment is qualitative/subjective, but the aim is to reach consensus on each risk control option so that the necessary arguments can be put forward to ensure that the most appropriate measures are considered and possible funding addressed. The above **risk control options** are **prioritized** to facilitate the authority in the decision-making process.

The control options identified above are intended to **reduce the risks** and in most cases would require **funding to be implemented**. Option costs must cover capital, labour and other resources needed for planning and implementation, as well as costs related to the maintenance and operation of the option throughout the life cycle period under review. **Maintenance** is required to ensure that AtoN equipment and systems continue to perform at the levels required by mariners to safely navigate the waterways. A maintenance system should be adopted to ensure that AtoN assets deliver the desired performance.

Not only should the control measures be effective in reducing risk, but they should also be cost effective. The **cost of the control 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.

11 AtoN Programme 5-year Budget Plan (2020-2024)

As part of the Pacific Safety of Navigation's work on supporting MICTTD, a 5 year budget plan has been drawn up with MICTTD to assist in their budget planning (Annex E). Discussions were held with a range of stakeholders to improve the allocation of resources and management of the Marine division's AtoN budget.

For Ministry of Information Communication Transport and Tourism Development to provide **excellent AtoN services** in Kiribati, it is important that an **adequate level of resources** be allocated towards AtoN installment, maintenance and management.

Currently, the MICTTD has an **allocated budget for its navigation section**. In 2018, this amounted to AUD 95,811 which covers staffing costs, plant and equipment hire, communications and travel costs. This allocation funds the Ministry's mandated work around AtoN services. AtoN budget submission of the Division is scrutinised according to the Ministry's priorities as decided by the Secretary and his senior staff.

Light dues⁵ are **collected** from foreign ships that call at Betio port and are deposited into the general **Government consolidated fund**. Interestingly, MICTTD handles two "ring-fenced" accounts; namely, the Civil Aviation Fund and the Highway Fund, both of which are special accounts separate from the Government's Consolidated Fund. The Civil Aviation Fund collects airport duty tax to be spent for upkeep costs of the airport, while the Highway Fund holds the road tolls collected at the Nippon Causeway for its maintenance. There is currently no "ring-fenced" account for AtoN.

In meetings with the Ministry of Finance & Economic Development (MFED) it was made clear that vital **investment in the upkeep and management of AtoNs** will help foster an enabling environment to **achieve the goals of the Kiribati Development Plan 2016-2019**. The MFED is interested in exploring how the ring fencing of light dues would contribute to this. The **Development Coordination Committee** which meets every year to deliberate over the national budget would be the forum where discussion of ring-fencing for AtoN could be presented.

To improve the Marine Division's budgetary planning management of its AtoNs, an **AtoN Programme 5-year Budget Plan (2020-2024)** was drawn up, in consultation with AtoN Officer and the AtoN Supervisor, Mr. Tioti Bateriki. A comprehensive costing of maintenance works and outer atolls visits already compiled by the Marine Division was built upon and consolidated along general spending items. Further to this, the Risk Control Options (RCOs) from the Betio risk assessment were costed and accounted for as well. The RCOs have been staggered over the 5 year period to ensure that the burden for any one risk option is not taken on in one budget year on its own.

It is suggested that the AtoN Programme 5 year Budget Plan be used to assist the Ministry of Information Communication Transport and Tourism Development in its own budget submission and discussions for funding in the National Budget. A summary and detailed tables with description of the AtoN programme 5 year Budget Plan can be found in Annex E.

⁵ Kiribati operates a "user-pays" system whereby owners of vessels calling at port pay a light due that is currently set at Net Tonnage x AUD 1, with a minimum charge of AUD 10.

12 Recommendations

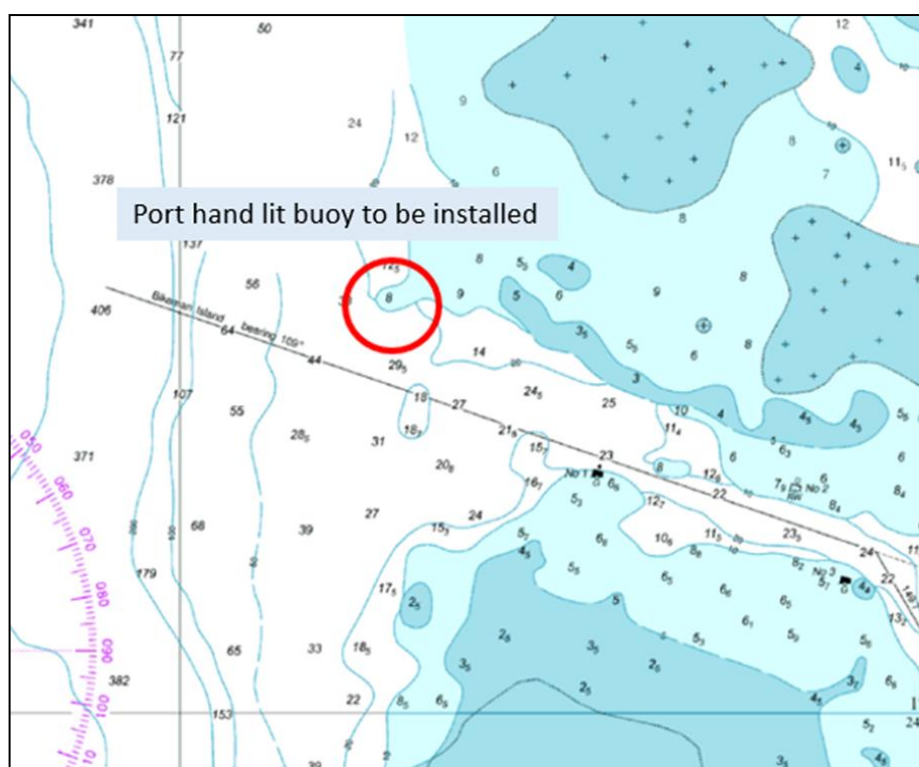
The **outcome of the risk assessment** process undertaken in Betio involves **six main recommendations** which aim to reduce the risks to safety of navigation to an acceptable level for the stakeholders.

12.1 Recommendation 1 (Grounding scenario)

There is an 8 meter unmarked shoal at the port hand side of the entrance channel. Currently foreign vessels are only allowed to access the port during daylight hours due to the lack of lit marks at the entrance passage.

Therefore, **it is recommended that a port hand lit buoy be installed on the 8 m shoal at the entrance of the channel.**

It is also recommended that an annual maintenance costs be included to ensure that the AtoN equipment and systems continue to perform at the levels required by mariners to safely navigate the waterways. This is included as part of the AtoN programme 5 year Budget Plan for MICTTD.



The costs to implement this recommendation were provided by MICTTD and are as follows:

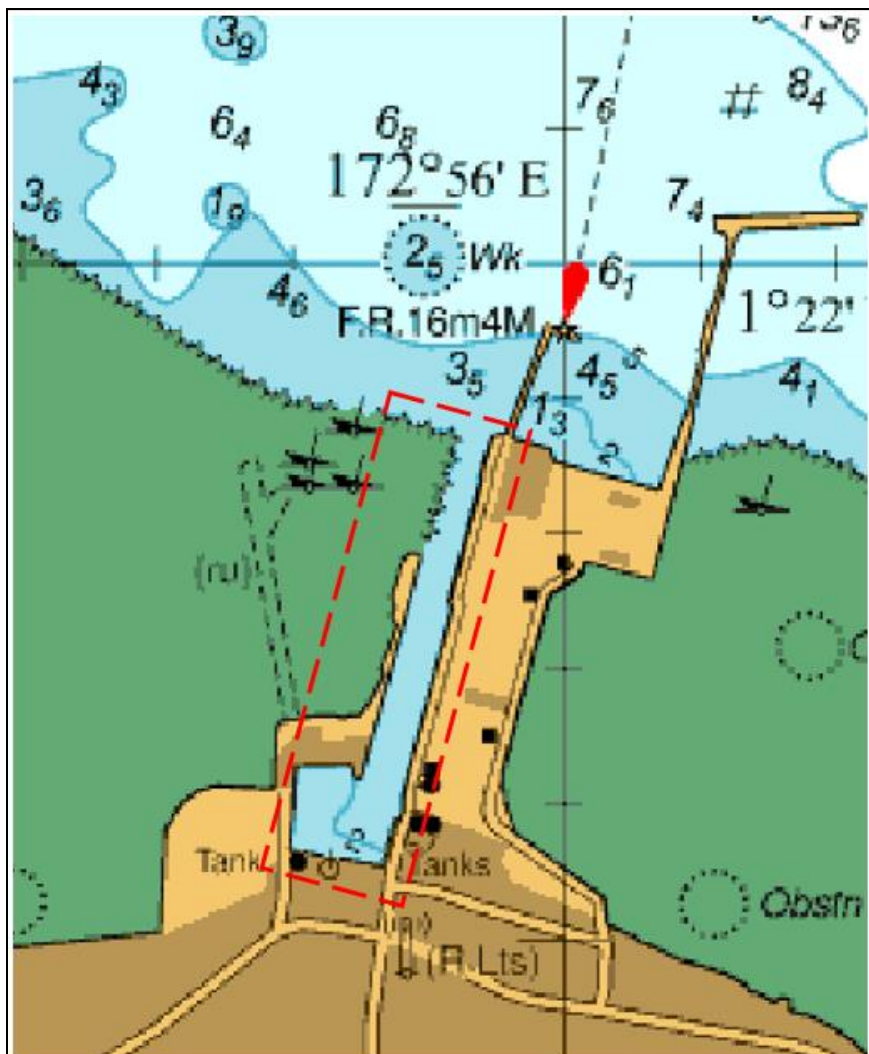
Recommendations 1	Amount (AUD)
Install a port hand lit buoy on the 8 m shoal at the entrance of the channel.	
Cost of Buoy (including installation)	40,000.00
Annual maintenance cost	603.00 ⁶

⁶ Maintenance costs include labour allowances, boat hire and materials costs. These costs have been factored in to the AtoN Programme 5-year Budget Plan (2020-2024) as detailed in Annex E.

12.2 Recommendation 2 (Grounding scenario)

The old KPA wharf is very shallow at the entrance and the berthing area has water depths of less than 2 m as shown below. Local vessels accessing this wharf and the slipway at the end of the old KPA wharf prefer to come alongside at high tide to avoid grounding.

Therefore, it is **recommended to dredge the entire length of the channel to 4 m** so that all domestic ships can access this wharf at all times. This will help prevent ships' grounding, engine damage and thus will help reduce ship downtime.



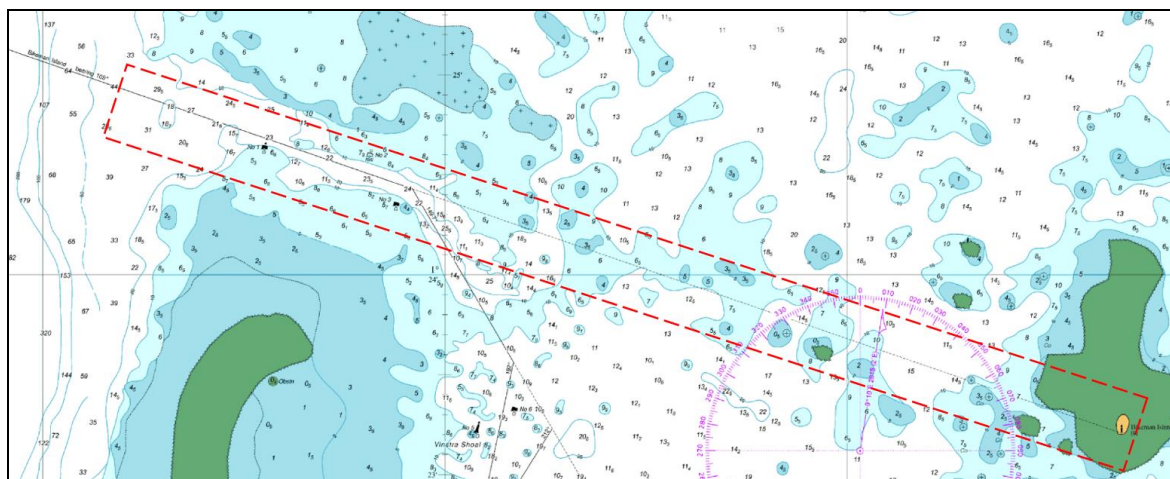
The costs to implement this recommendation were provided by MICTTD and are as follows:

Recommendations 2	Amount (AUD)
Dredging of the channel and berthing area	
Cost of dredging	150,000.00
Annual maintenance cost (no maintenance dredging required for the first 5 years)	none

12.3 Recommendation 3 (Grounding scenario)

The transit light at Bikeman Island is destroyed, thus foreign vessels cannot access the Betio port at night. The destroyed leading light can cause vessels to ground while on route to the port at night.

Therefore, **it is recommended to re-install the leading light on Bikeman Island**. This will enable all vessels to come into port at all times and will significantly reduce the risk of vessels running aground.



The costs to implement this recommendation were provided by MICTTD and are as follows:

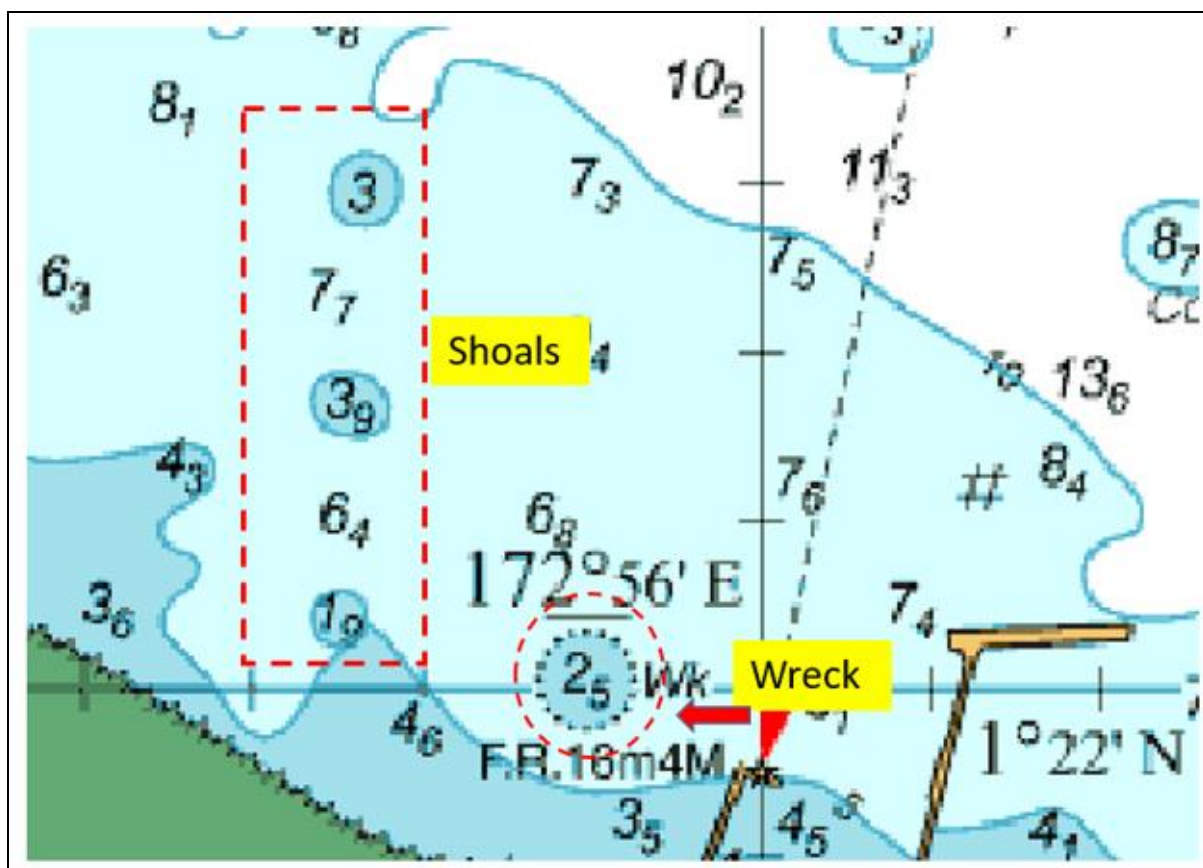
Recommendations	Amount (AUD)
Approximate cost of light	20,000.00
Annual maintenance cost	603.00 ⁷

12.4 Recommendation 4 (Grounding scenario)

There is an unmarked wreck in the vicinity of domestic vessel anchorage area at latitude 01°22' 00.067861"N and longitude 172°55'53.933349"E. During strong north easterly winds, vessels that are anchored near the wreck can drag anchor and can potentially ground on the wreck.

Therefore, **it is recommended that a wreck marking buoy be installed near the wreck** to warn the mariners of the danger.

⁷ ditto



The costs to implement this recommendation were provided by MICTTD and are as follows:

Recommendation 4	Amount (AUD)
Install a wreck marking buoy	
Cost of buoy (including installation)	40,000.00
Annual maintenance cost	603.00 ⁸

12.5 Recommendation 5 (Allision scenario)

The allision with AtoNs marking the channel of the Betio port have been an ongoing issue. This is mainly due to the bends in the channel. When vessels are towed in or out of the channel these AtoNs are mostly damaged. Another likely reason for allision with the AtoNs is due to the anchorage area being close to these AtoNs. It has been noticed that when ships drag anchor they tend to allide with the AtoNs. Some of the other common issues contributing to this scenario are lack of seamanship and technical issues on board the vessels, such as engine failures.

Therefore, it is recommended that MICTTD looks at enlarging the anchorage area and moving it away from the AtoNs.

Continuous awareness and further training for all local crews on the above will also reduce the allision risk significantly: this could be addressed through the MFAT funded Pacific Maritime Safety Programme (PMSP).

⁸ ditto

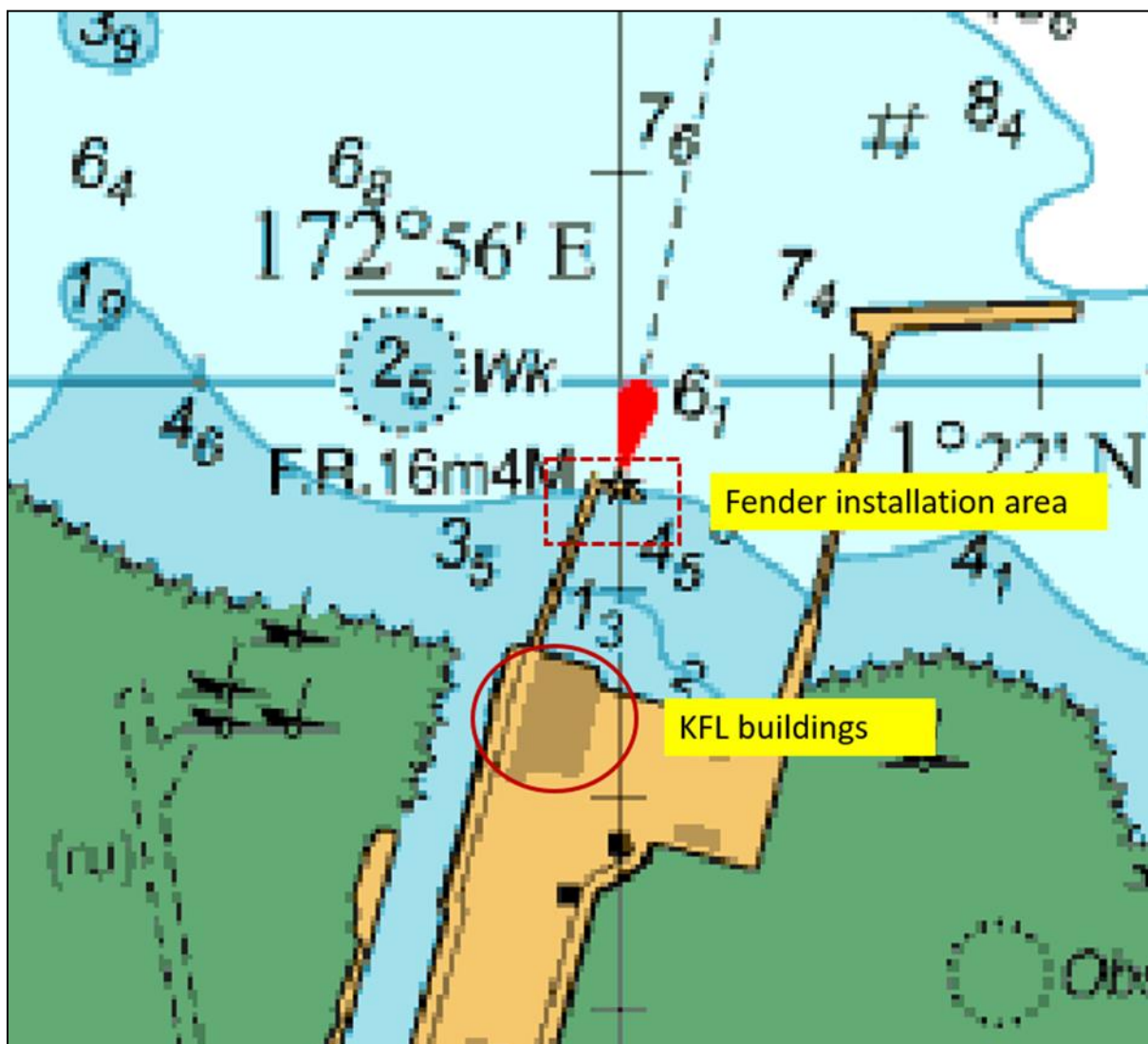
The costs to implement this recommendation were provided by MICTTD and are as follows:

Recommendations	Amount (AUD)
Anchorage area to be enlarged and extended away from the channel	200,000.00
Annual maintenance cost	none

12.6 Recommendation 6 (Allision scenario)

There have been occasions when ships have allided with the domestic wharf. This have been noticed during bad weather conditions when ships anchored close to the wharf drag anchor and allide with the domestic wharf. It has also been noticed that when ships try to come alongside the domestic wharf during bad weather conditions, they allide with it. Another contributing factor for this scenario is the intensity of the background lights from the Kiribati Fish Limited (KFL) building which affect the night vision when coming alongside the wharf.

Therefore, it is **recommended to install fenders on the domestic wharf and to reduce the intensity and direction of the background lights from the KFL buildings**. These measures will definitely reduce the risk to as low as reasonably practicable.



The costs to implement this recommendation were provided by MICTTD and are as follows:

Recommendations	Amount (AUD)
Cost of fenders and installation	100,000.00
Cost to reduce direction/intensity of KFL lights	none
Annual maintenance cost(estimated at 1% of total cost)	1,000.00

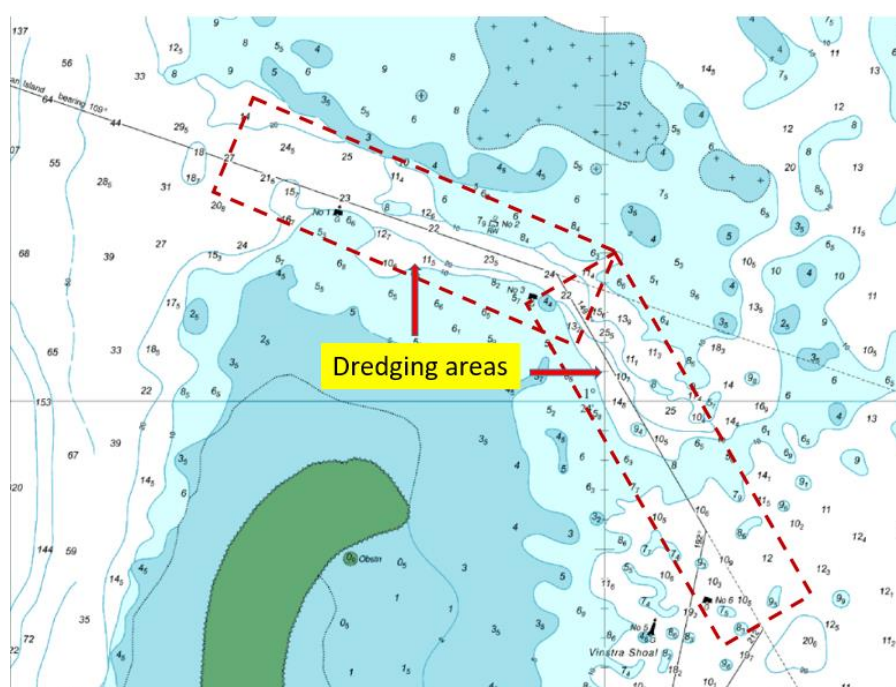
12.7 Additional Recommendation (AtoNs)

A site visit was organised by the Marine Division with the SAR boat, where by all the AtoNs in the Betio port were looked at for their compliance with IALA standards. It was noted that all the AtoNs needed major repair and maintenance. Currently the Marine Division doesn't have a dedicated vessel to carry out its tasks, including repair and maintenance of AtoN, but instead has to hire boats (both in Tarawa and in the outer islands).

Therefore, it is recommended that the Marine Division procures a suitable vessel to carry out all its activities.

No. 2 port lateral mark has been laid in shoal water about 100 metres north of the channel. Because pilotage is compulsory, this was not seen as an immediate problem, however there is a real risk that the master of a vessel might consider it safe to pass close to this buoy believing it to mark the edge of the channel⁹.

Therefore, it is recommended that the No. 2 port lateral mark should be repositioned so that it marks properly the edge of the approach channel into Betio Port. Considerations should also be given to the option of dredging and enlarging the channel into Betio Port.



A detailed summary of the findings are listed in Annex F.

⁹ IALA technical report 2016 (recommendation 33)

13 Conclusion

This report completes the risk assessment process as required by Regulation 13 of the International Convention for the Safety of Life at Sea (SOLAS convention). It is also meant to guide MICTTD in delivering compliant AtoN services and should be used in conjunction with the IALA Technical Report 2016.

SPC can provide further support in relation to capacity development, AtoN services and management, governance, and budget management to assist Kiribati in offering safe maritime routes and meeting the countries international obligations.

It is suggested that a consistent and wider approach is taken by Kiribati to include the delivery of hydrographic, marine meteorology, maritime safety information and maritime Search and Rescue services in its governance processes.

14 Annexes

14.1 Annex A. Stakeholder list

Safety of Navigation Risk Assessment Stakeholder Meeting (Phase II) - Betio, Kiribati, 25th September, 2018						
	Name	Job Title	Organisation	Gender	Telephone number	Email Address
1	Natara T Biribo	Manager	Reitiniroai Shipping	M	73001982	
2	Tetoma Uere	General Manager	Betio Fishermen Association	M	73014330	
3	Sekone Toua	Manager	Kiriwaru Fishermen Association	M	73087810	
4	Tibwe Iaribwebwe	Ship Captain	Oceanic Shipping Service	M	75125050	oceanicshipping@gmail.com
5	Barate Teuriaria	Marine Surveyor	MICTTD- Marine Division	M	7301962	marine.surveyor2@mcttd.gov.ki
6	Tamaroa Tawaia	Engineering Supervisor	Central Pacific Producers Limited (CPPL)	M	73015883	teikaueat@gmail.com
7	Ekueta Iereima	Manager	Naverevere Fishermen Association	M	73034282	
8	Aukitino Tokintekai	Port Control and Stevedoring Superintendent	Kiribati Ports Authority (KPA)	M	73018834	aukitinotauro@gmail.com
9	Tiaeki Kiaroro	Acting Maritime Administration Officer	Marine Training Centre (MTC)	M	75126086	lod.admin@mtc-tarawa.edu
10	Toromon Katua	Ship Captain	Kiribati Seas Company Limited (KSC)	M	73019094	kiriseaco@gmail.com
11	Rimon Tororo	Operations Manager	Kiribati National Shipping Limited	M	73049352	trtoror@gmail.com
12	Kireata Ruteru	Operations Manager	Mauri Marine Shipping	M	73013456	kireata.r6255@gmail.com
13	Abiete Tebuatei	Senior Marine Radio Officer	MICTTD- Marine Division	M		senior.radio@micttd.gov.ki
14	Timau Kaikai	General Manager	Te Matau Shipping	M	73008317	guadalupetimau@gmail.com
15	Tio Tamuera	Operations Manager	Butaritari Shipping	M	73075139	tamueratio@gmail.com
16	Taonikua Marewenteang	Assistant Operations Manager	Lu's Marine Shipping Services	M	73017849	stoverwindy@gmail.com
17	Tom Redfern	Commanding Officer - Patrol Boat	Police Maritime Unit	M	73045373	co-pmu@police.gov.ki
18	Teraakau Tii	Agent	Lykeit Shipping	F		lykeittrading@gmail.com
19	Ueneta Toorua	Director	Kiribati Meteorological Service	M		cmo@met.gov.fj
20	David Yeeting	Manager	DNY Shipping Services	M	73028784	
21	Riennang Ioane	MSI & SAR Coordinator	MICTTD- Marine Division	M	73097992	riennang.ioane@mcttd.gov.ki
22	Joyce Maria-Uan	Senior Mineral Compliance Officer	Ministry of Fisheries and Marine Resource Development (MFMRD) - Fisheries Division	F	73012167	joyceeu@mfmr.gov.ki
23	George Taoaba	Environment Inspector	(MELAD) - Environment & Conservation Division	M	73054845	georget@environment.gov.ki
24	Bonnari Baikir	Operations Manager	Coral Sea Shipping Services	M	73071859	buotanrouta@gmail.com
25	Tiroa Antonio	Operations Manager	Kiribati Oil Company Limited (KOIL)	M	73041955	tiroa@koil.net.ki
26	Tioti Bateriki	AtoN Supervisor	MICTTD- Marine Division	M	73004894	aton.supervisor@mcttd.gov.ki
27	Eritaia Tauro	AtoN Officer	MICTTD- Marine Division	M		
28	Bwebweteiti Tongaiaba	AtoN Hand	MICTTD- Marine Division	M	73017074	btseeroh05@gmail.com

14.2 Annex B. List of hazards identified in port of Betio

HAZARDS		Value	Remarks
Natural	Safe Minimum Depth (m)	0.5	Out of 4 groups of stakeholders, 2 mentioned that SMD was a hazard (both at the old jetty and the new jetty)
	Proximity of danger (NM)	0.5	Beacon # 3, 0.01NM, narrow passage, 8m contours
	Tide, wind, wave and tidal flow effect	1.33	Strong easterly wind combined with the tidal flow can have an effect on vessels entering/leaving the port
	Low sun issues	Y	Entering the channel, the sun reflects on the water. Sunset light can cause visibility issues too when leaving the channel
	Background lighting	Y	The background lights from KFL can cause issues
Economic	Insufficient AtoN funding issues	Y	Light dues are collected from all ships but they go to the government account and are not used for AtoN funding
Technical	Shipborne navaid failure	Y	Common issues with private and Domestic vessels
	Quality and validity of charted information	Y	Charts not updated
	Loss of vessel control	Y	Loss of vessel control(e.g.steering)
	AtoN failures	Y	Lack of maintenance, vandalism, allisions and not enough AtoNs
	Sub-standard ships	Y	Substandard ships
Human	Crew competency	Y	International vessels are not checked
	Fatigue	Y	International vessels are not checked
	Safety culture	Y	Not following standards/rules
	Influence of alcohol and/or drugs	Y	Common issues with crew/alcohol problems have caused groundings previously
	Availability and competency of pilotage	N	4 pilots are available in Tarawa
	Political issues?	Y	Control of vessel maintenance by government
	Culture or language issues	Y	Foreign national visiting the ports have issues (Chinese crew) with communications
Operational	Impact of small vessels	Y	Not compliant to port control procedures with vessel movement
	Fishing activities	Y	Can cause collisions
	Poor passage planning	Y	Vessels not complying to SOPs
	Poor promulgation of MSI	Y	Charts need to be updated
	Poor response to marking new danger	Y	Poor communication to shipping agencies
Maritime Space	The existence of wrecks and new dangers	Y	Wrecks and missing lights,
	Crowded waterway issues	Y	Limited anchorage for international vessels

14.3 Annex C: Possible Scenarios

SCENARIOS		Remarks
Groundings	Grounding on rock	Fishing vessels running aground near the fairway buoy, other vessels running aground due to unknown depths and shallow water / narrow passage on charts, grounding on rocks due to no transit light at Bikeman island. Grounding due to sunset affecting visibility
	Grounding on wreck	Vessels dragging anchor at anchorage grounds on wreck
	Grounding on soft bottom	Local vessels accessing the old KPA wharf ground on soft bottom, due to siltation.
	Others	Groundings due to Navaid failures on board
Allisions	Aids to Navigation	Vessels colliding to AtoNs, also while vessels are towed due to lack of manoeuvrability
	Wharf	Ships at anchor drift at high winds and collide with wharf, Background lighting from the KFL wharf can cause allision with wharf during berthing
Foundering	Sinking	Local vessels anchored at Betio port waiting for repairs/maintenance sinks (MV Mataraoi)
Structural Failure	Structural failure of vessel	Local domestic vessels of wooden structure are prone to failure
	Structural failure of external features	Substandard ships can ground on port approaches due to improper Navaid equipment
Other	Engine fire	Has occurred to one of the pilot boats and a local government owned fishing vessel

14.4 Annex D: Risk Assessment Matrix

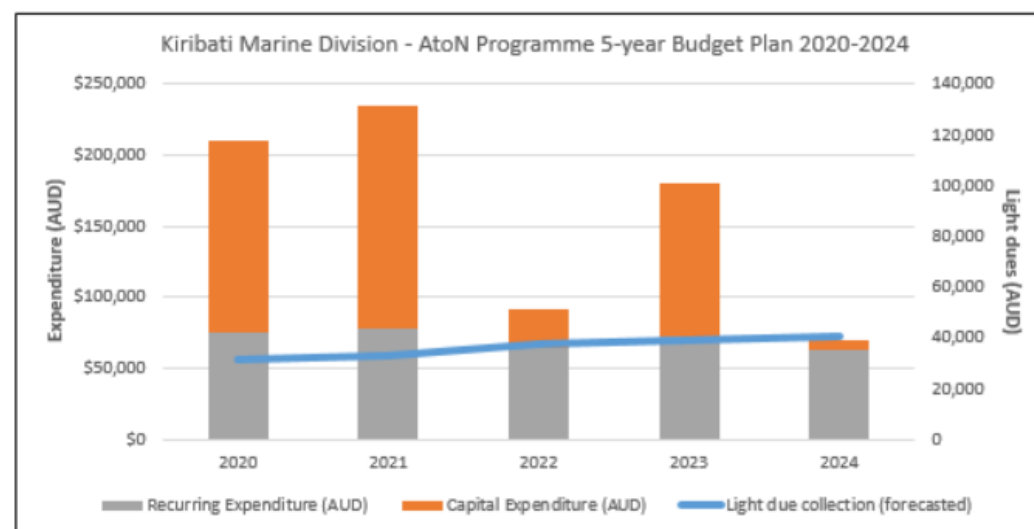
Scenario	Description of incident	Root Cause(s) (Hazards)	Description of Consequences (Short term and long term)	Existing Risk Control Measures	Probability Score	Consequence Score	Risk Score	Cost of Incident (AUD)	Further Risk Control Options	New Probability Score	New Consequence Score	New Risk Score	Cost of RCO (AUD)	Remarks	
1. GROUNDINGS															
1.1	Grounding on rock	Grounding at the Fairway buoy	Shallow water and narrow passage	Damage to ship's under water hull and engine cooling system	Vessels are not permitted to enter passage during night time	3	2	6	4 M	To install a port hand buoy on 8 m shoal at the entrance of the channel	1	2	2	40,000.00	ALARP
1.2	Grounding on sand	Domestic vessels accessing the old KPA wharf always ground on sand/mud	Too shallow inside and at the entrance of the channel of old KPA wharf	Engine suck dirt and cause problems to engine cooling system	Vessels prefer to access wharf during high tide	5	3	15	1.9 M	To dredge old KPA wharf and channel that will allow ships to access wharf at all	1	3	3	150,000.00	ALARP
1.3	Grounding on rocks and sand	Vessels grounding between the entrance and Bikeman point	Unlit transit light at Bikeman island	Damage under water hull due to hard bottom	Vessels are not accessing port during night time	2	5	10	36 M	To reinstall leading light at Bikeman island	1	5	5	20,000.00	ALARP
1.4	Grounding on wreck	Domestic vessels dragging anchor during strong north easterly wind and grounding on wreck	Unmarked wreck and shallow water of 3,9 m and 3 m	Damage to hull	none	3	2	6	500,000.00	To place wreck marking buoy on existing wreck	1	2	2	40,000.00	ALARP
2. ALLISIONS															
2.1	Allision with Aids to Navigation	Vessels alliding with AtoN and also while vessels are towed	Lack of shipmanship, Technical issues (engine failure) Vessel at anchor dragging	Damage to AtoN structure and also to the ships side	none	2	3	6	550,000.00	To enlarge or extend anchorage area away from the channel	1	3	3	200,000.00	ALARP
2.2	Allision with wharf/jetty	Vessels at anchor drift or drag during strong winds allide with wharf/jetty, Vessels coming alongside allide with the wharf /jetty	Strong wind and high swell; background light from KPA building	Damage to the ship side/hull and wharf/Jetty	Vessels prefer to access the wharf during calm water.	3	2	6	1 M	To install fenders on the domestic wharf;KPA to reduce background lighting	1	2	2	100,000.00	ALARP

14.5 Annex E. MICTTD AtoN Programme 5 Year Budget Plan (2020-2024)



Kiribati Marine Division (MICTTD) - AtoN Programme 5-year Budget Plan 2020-2024

	Light due collection (forecasted)	Capital Expenditure (AUD)	Recurring Expenditure (AUD)	Total (AUD)
2020	\$31,530	\$134,850	\$75,637	\$210,487
2021	\$32,800	\$157,325	\$77,884	\$235,209
2022	\$37,832	\$27,325	\$64,884	\$92,209
2023	\$39,362	\$107,325	\$72,884	\$180,209
2024	\$40,954	\$7,325	\$62,884	\$70,209
	<u>\$182,477.38</u>	<u>\$434,150</u>	<u>\$354,175</u>	<u>\$788,325</u>



- Light dues forecasted amount is taken from 2018 Kiribati National Budget Book
- Costings of risk control options covered under Tarawa Safety of Navigation Risk Assessment have been factored in:
 - In 2020, procurement and installation of a Port Hand Buoy, Wreck Mark and Leading Light to mitigate the risk of groundings
 - In 2021, dredging of old KPA wharf to mitigate groundings
 - In 2022, extending of anchorage area to mitigate allisions
 - In 2023, procurement and installation of fenders for wharf to mitigate allisions
- Maintenance costs for new procured equipment have been factored into the maintenance costs under recurring expenditure

2020

		Estimated Cost (AUD)	Estimated Cost (AUD)	Notes
Capital expenditure				
Procurement				
	Procure: Replacement buoy	30,000		Marine Division plans to procure a Navigational buoy as replacement
	Procure: Port Hand buoy	30,000		- As part of Tarawa SoN risk assessment, installation of port hand buoy to mitigate risk of grounding
	Procure: Wreck mark	30,000		- As part of Tarawa SoN risk assessment, installation of wreck mark to mitigate risk of grounding
	Procure: Marine lanterns	7,000		10 lanterns to be bought to replace current installations and keep as spares
	Procure: Leading light	20,000		- As part of Tarawa SoN risk assessment, installation of leading light at Bikeman island to mitigate risk of grounding
	Freight	10,650		Estimated cost of freight and customs clearance cost of new AtoN equipment - Freight from Aus only. Free on arrival in Kiribati (Approx \$765 per lantern / \$1,000 per buoy/mark)
	Bench drill	3,500		Currently, the AtoN team of the Division lack a proper workshop to work on AtoNs. This purchase will help in the installations of AtoNs
	Motorbike	3,700		Purchase of a new motorbike to assist the division in monitoring of AtoNs along the Taraqa coast.
Total Capital exp			134,850	
Recurring expenditure				
Labour costs				
	Allowances	1396.00		Inclusive of welding, painting and diving allowances in island visits to: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Overtime	13,000		Estimated overtime costs based on yearly expected sum
	Temporary Assistance - replacement personal	2,500		Costs for temporarily fill in when staff are on leave. Based on yearly expected sum
	Labourers	1,418		Hire of labourers during maintenance visits to atolls
Maintenance materials				
	Paint etc	2128.6		Following painting needs in Tarawa, Nonouti, Abemama, Kuria and Maiana: - Paint primer 4 ltrs - Paint green 4 ltrs - Paint red 4 ltrs
	Galvanised pipe, PVC pipes and rivets	6,942		Purchase of galvanised pipes, sheets, rivets and PVC pipes during maintenance trips in Nonouti, Abemama, Kuria, Maiana and Marakei
	Cement	550		Purchase of 40kg cement packs for maintenance of AtoNs in Arorae, Tamana, Nonouti, Abemama, Aranuka, Maiana and Marakei
Service & repairs				
	Old AtoN motorbike	500		Service of current motorbike
	Proposed new AtoN motorbike	1,000		Service of proposed AtoN motorbike
	Electronic tools repairs	500		Repairs to electronic tools
Office Supplies				
	New computer set	1,900		Proposal to purchase a new computer set in the first year to help with AtoN management
Travel and Accomodation				
	Airfare	3,844		Return fare for two officers to conduct maintenance checks in Arorae, Tamana, TabSouth, Nonouti, Aranuka, Abemama, Kuria and Maiana
	Airport tax	360		Airport tax to be paid when visiting atolls
	Fuel	41		Bike fuel on visits to: Arorae, Tamana, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Boat hire	3,950		Boat hire includes the cost of boat hire when carrying out scheduled maintenance works in: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Shipping cost of maintenance materials	6,700		Costs of shipping maintenance equipment to Nonouti, Abemama, Kuria, Maiana, Marakei
	Accomodation	6,772		Cost of accomodation during all 9 atoll visits
Other				
	Tranings	3,000		Estimated cost of training per year to send AtoN hand/superviosr to basic training e.g. welding or dive training
	Contingency (10%)	19,135		10% percent of all other costs
Total Recurring exp			75,637	
Total budgeted expenses			210,487	

2021

		Estimated Cost (AUD)	Estimated Cost (AUD)	Notes
Capital expenditure				
Dredging works				
	Dredging of old KPA wharf	150,000		- As part of Tarawa SoN risk assessment, dredging of old KPA wharf and channel to allow ships to access wharf at all times - Hire cost of dredging vessel: \$10,000/day 15 days x \$10,000 = \$150,000
Procurement				
	Marine Lanterns	3,500		5 lanterns to be bought to replace current installations and keep as spares
	Freight	3,825		Estimated cost of freight and customs clearance cost of new AtoN equipment - Freight from Aus only. Free on arrival in Kiribati (Approx \$765 per piece of equipment)
Total Capital exp			157,325	
Recurring expenditure				
Labour costs				
	Allowances	1396.00		Inclusive of welding, painting and diving allowances in island visits to: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Overtime	13,000		Estimated overtime costs based on yearly expected sum
	Temporary Assistance - replacement personal	2,500		Costs for temporarily fill in when staff are on leave. Based on yearly expected sum
	Labourers	1,418		Hire of labourers during maintenance visits to atolls
Maintenance materials				
	Paint etc	2128.6		Following painting needs in Tarawa, Nonouti, Abemama, Kuria and Maiana: - Paint primer 4 ltrs - Paint green 4 ltrs - Paint red 4 ltrs
	Galvanised pipe, PVC pipes and rivets	6,942		Purchase of galvanised pipes, sheets, rivets and PVC pipes during maintenance trips in Nonouti, Abemama, Kuria, Maiana and Marakei
	Cement	550		Purchase of 40kg cement packs for maintenance of AtoNs in Arorae, Tamana, Nonouti, Abemama, Aranuka, Maiana and Marakei
Service & repairs				
	Old AtoN motorbike	500		Service of current motorbike
	Proposed new AtoN motorbike	1,000		Service of proposed AtoN motorbike
	Electronic tools repairs	500		Repairs to electronic tools
Office Supplies				
	New computer set	1,900		Proposal to purchase a new computer set in the first year to help with AtoN management
Travel and Accommodation				
	Airfare	3,844		Return fare for two officers to conduct maintenance checks in Arorae, Tamana, TabSouth, Nonouti, Aranuka, Abemama, Kuria and Maiana
	Airport tax	360		Airport tax to be paid when visiting atolls
	Fuel	41		Bike fuel on visits to: Arorae, Tamana, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Boat hire	3,950		Boat hire includes the cost of boat hire when carrying out scheduled maintenance works in: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Shipping cost of maintenance materials	6,700		Costs of shipping maintenance equipment to Nonouti, Abemama, Kuria, Maiana, Marakei
	Accommodation	6,772		Cost of accommodation during all 9 atoll visits
Other				
	Tranings	3,000		Estimated cost of training per year to send AtoN hand/superviosr to basic training e.g. welding or dive training
	Contingency (10%)	21,383		10% percent of all other costs
Total Recurring exp			77,884	
Total budgeted expenses			235,209	

2022

		Estimated Cost (AUD)	Estimated Cost (AUD)	Notes
Capital expenditure				
Procurement				
	Extending of anchorage area	20,000		- As part of Tarawa SoN risk assessment, extending of anchorage area and crew trainings and awareness to mitigate risk of allisions between vessels and AtoNs
	Marine Lanterns	3,500		5 lanterns to be bought to replace current installations and keep as spares
	Freight	3,825		Estimated cost of freight and customs clearance cost of new AtoN equipment - Freight from Aus only. Free on arrival in Kiribati (Approx \$765 per piece of equipment)
Total Capital exp			27,325	
Recurring expenditure				
Labour costs				
	Allowances	1396.00		Inclusive of welding, painting and diving allowances in island visits to: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Overtime	13,000		Estimated overtime costs based on yearly expected sum
	Temporary Assistance - replacement personal	2,500		Costs for temporarily fill in when staff are on leave. Based on yearly expected sum
	Labourers	1,418		Hire of labourers during maintenance visits to atolls
Maintenance materials				
	Paint etc	2128.6		Following painting needs in Tarawa, Nonouti, Abemama, Kuria and Maiana: - Paint primer 4 ltrs - Paint green 4 ltrs - Paint red 4 ltrs
	Galvanised pipe, PVC pipes and rivets	6,942		Purchase of galvanised pipes, sheets, rivets and PVC pipes during maintenance trips in Nonouti, Abemama, Kuria, Maiana and Marakei
	Cement	550		Purchase of 40kg cement packs for maintenance of AtoNs in Arorae, Tamana, Nonouti, Abemama, Aranuka, Maiana and Marakei
Service & repairs				
	Old AtoN motorbike	500		Service of current motorbike
	Proposed new AtoN motorbike	1,000		Service of proposed AtoN motorbike
	Electronic tools repairs	500		Repairs to electronic tools
Office Supplies				
	New computer set	1,900		Proposal to purchase a new computer set in the first year to help with AtoN management
Travel and Accomodation				
	Airfare	3,844		Return fare for two officers to conduct maintenance checks in Arorae, Tamana, TabSouth, Nonouti, Aranuka, Abemama, Kuria and Maiana
	Airport tax	360		Airport tax to be paid when visiting atolls
	Fuel	41		Bike fuel on visits to: Arorae, Tamana, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Boat hire	3,950		Boat hire includes the cost of boat hire when carrying out scheduled maintenance works in: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Shipping cost of maintenance materials	6,700		Costs of shipping maintenance equipment to Nonouti, Abemama, Kuria, Maiana, Marakei
	Accommodation	6,772		Cost of accomodation during all 9 atoll visits
Other				
	Tranings	3,000		Estimated cost of training per year to send AtoN hand/superviosr to basic training e.g. welding or dive training
	Contingency (10%)	8,383		10% percent of all other costs
Total Recurring exp			64,884	
Total budgeted expenses			92,209	

2023

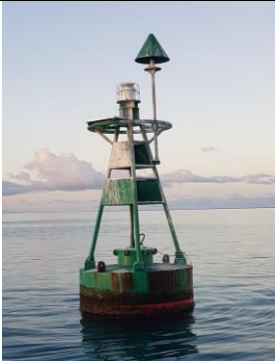
		Estimated Cost (AUD)	Estimated Cost (AUD)	Notes
Capital expenditure				
Procurement				
	Fenders for wharf	100,000		- As part of Tarawa SoN risk assessment, installation of fenders at wharf to mitigate risk of allision
	Marine Lanterns	3,500		5 lanterns to be bought to replace current installations and keep as spares
	Freight	3,825		Estimated cost of freight and customs clearance cost of new AtoN equipment - Freight from Aus only. Free on arrival in Kiribati (Approx \$765 per piece of equipment)
Total Capital exp			107,325	
Recurring expenditure				
Labour costs				
	Allowances	1396.00		Inclusive of welding, painting and diving allowances in island visits to: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Overtime	13,000		Estimated overtime costs based on yearly expected sum
	Temporary Assistance - replacement personal	2,500		Costs for temporarily fill in when staff are on leave. Based on yearly expected sum
	Labourers	1,418		Hire of labourers during maintenance visits to atolls
Maintenance materials				
	Paint etc	2128.6		Following painting needs in Tarawa, Nonouti, Abemama, Kuria and Maiana: - Paint primer 4 ltrs - Paint green 4 ltrs - Paint red 4 ltrs
	Galvanised pipe, PVC pipes and rivets	6,942		Purchase of galvanised pipes, sheets, rivets and PVC pipes during maintenance trips in Nonouti, Abemama, Kuria, Maiana and Marakei
	Cement	550		Purchase of 40kg cement packs for maintenance of AtoNs in Arorae, Tamana, Nonouti, Abemama, Aranuka, Maiana and Marakei
Service & repairs				
	Old AtoN motorbike	500		Service of current motorbike
	Proposed new AtoN motorbike	1,000		Service of proposed AtoN motorbike
	Electronic tools repairs	500		Repairs to electronic tools
Office Supplies				
	New computer set	1,900		Proposal to purchase a new computer set in the first year to help with AtoN management
Travel and Accommodation				
	Airfare	3,844		Return fare for two officers to conduct maintenance checks in Arorae, Tamana, TabSouth, Nonouti, Aranuka, Abemama, Kuria and Maiana
	Airport tax	360		Airport tax to be paid when visiting atolls
	Fuel	41		Bike fuel on visits to: Arorae, Tamana, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Boat hire	3,950		Boat hire includes the cost of boat hire when carrying out scheduled maintenance works in: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Shipping cost of maintenance materials	6,700		Costs of shipping maintenance equipment to Nonouti, Abemama, Kuria, Maiana, Marakei
	Accommodation	6,772		Cost of accommodation during all 9 atoll visits
Other				
	Tranings	3,000		Estimated cost of training per year to send AtoN hand/superviosr to basic training e.g. welding or dive training
	Contingency (10%)	16,383		10% percent of all other costs
Total Recurring exp			72,884	
Total budgeted expenses			180,209	


2024

		Estimated Cost (AUD)	Estimated Cost (AUD)	Notes
Capital expenditure				
Procurement				
	Marine Lanterns	3,500		5 lanterns to be bought to replace current installations and keep as spares
	Freight/Customs	3,825		Estimated cost of freight and customs clearance cost of new AtoN equipment - Freight from Aus only. Free on arrival in Kiribati (Approx \$765 per piece of equipment)
Total Capital exp			7,325	
Recurring expenditure				
Labour costs				
	Allowances	1396.00		Inclusive of welding, painting and diving allowances in island visits to: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Overtime	13,000		Estimated overtime costs based on yearly expected sum
	Temporary Assistance - replacement personal	2,500		Costs for temporarily fill in when staff are on leave. Based on yearly expected sum
	Labourers	1,418		Hire of labourers during maintenance visits to atolls
Maintenance materials				
	Paint etc	2128.6		Following painting needs in Tarawa, Nonouti, Abemama, Kuria and Maiana: - Paint primer 4 ltrs - Paint green 4 ltrs - Paint red 4 ltrs
	Galvanised pipe, PVC pipes and rivets	6,942		Purchase of galvanised pipes, sheets, rivets and PVC pipes during maintenance trips in Nonouti, Abemama, Kuria, Maiana and Marakei
	Cement	550		Purchase of 40kg cement packs for maintenance of AtoNs in Arorae, Tamana, Nonouti, Abemama, Aranuka, Maiana and Marakei
Service & repairs				
	Old AtoN motorbike	500		Service of current motorbike
	Proposed new AtoN motorbike	1,000		Service of proposed AtoN motorbike
	Electronic tools repairs	500		Repairs to electronic tools
Office Supplies				
	New computer set	1,900		Proposal to purchase a new computer set in the first year to help with AtoN management
Travel and Accomodation				
	Airfare	3,844		Return fare for two officers to conduct maintenance checks in Arorae, Tamana, TabSouth, Nonouti, Aranuka, Abemama, Kuria and Maiana
	Airport tax	360		Airport tax to be paid when visiting atolls
	Fuel	41		Bike fuel on visits to: Arorae, Tamana, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Boat hire	3,950		Boat hire includes the cost of boat hire when carrying out scheduled maintenance works in: Tarawa, Tabiteuea, Nonouti, Abemama, Aranuka, Kuria, Maiana and Marakei
	Shipping cost of maintenance materials	6,700		Costs of shipping maintenance equipment to Nonouti, Abemama, Kuria, Maiana, Marakei
	Accomodation	6,772		Cost of accomodation during all 9 atoll visits
Other				
	Tranings	3,000		Estimated cost of training per year to send AtoN hand/superviosr to basic training e.g. welding or dive training
	Contingency (10%)	6,383		10% percent of all other costs
Total Recurring exp			62,884	
Total budgeted expenses			70,209	

14.6 Annex F. Buoy Status summary

Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	3 Special mark Buoy yellow 3s FL(3s) 01°22.718N 172°56.804E This is supposed to act as a leading mark for the approach channel and as well as mark the shallow shoal, either way the yellow mark is inappropriate.	
Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	2 east cardinal mark Buoy unknown 01°22.593N 172°55.702E Top mark and light present but not working due to solar panel missing and battery under water buoy not properly installed	
Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	1 west cardinal mark Buoy Q(9) 15s 01°22.080N 172°56.350E No top mark needs urgent maintenance	
Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	1 Starboard hand mark Buoy, single green cone pointing upwards FL G(3s) 01°24.643N 172°55.131E needs urgent maintenance	

Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	3 Starboard hand mark Buoy, single green cone pointing upwards FL G(3s) 01°24.349N 172°55.819E needs urgent maintenance	
Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	5 Starboard hand mark Buoy, single green cone pointing upwards FL G(3s) 01°23.203N 172°56.138E needs urgent maintenance	
Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	7 Starboard hand mark Buoy, single green cone pointing upwards FL G(3s) 01°22.411N 172°56.065E needs urgent maintenance	
Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	2 Port hand mark Buoy, red can FL G(3s) 01°24.610N 172°55.698E needs urgent maintenance	
Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	4 Port hand mark Buoy, red can FL G(3s) 01°23.800N 172°56.313E needs urgent maintenance	

Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	5 Port hand mark Buoy, red can FL G(3s) 01°23.203N 172°56.138E needs urgent maintenance	
Number on Buoy Feature Name: Description: Light Characteristics: Position (WGS84): Comments:	8 Port hand mark Buoy, red can FL G(3s) 01°22.533N 172°56.261E no light, solar panel and top mark needs urgent maintenance	