Environmental Assessment Document

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Papua New Guinea: Building Resilience to Climate Change – Additional Financing

Climate Proofing and Connectivity Improvement of Alotau Provincial Wharf

Initial Environmental Examination

Prepared by the Climate Change and Development Authority for the Asian Development Bank.

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ABBREVIATIONS

ADB	Asian Development Bank
AULLG	Alotau Urban Local Level Government
BRCC	Building Resilience to Climate Change
CCDA	Climate Change and Development Authority (executing agency)
CEPA	Conservation and Environmental Protection Authority
CSS	Country Safeguards System
EARF	environmental assessment and review framework
ECO	Environment and Conservation Officer (in MBPA)
EIA	environmental impact assessment
EIS	environmental impact statement
EHSG	Environmental, Health, and Safety Guidelines (of the World Bank)
EMP	environmental management plan
EPAR	Environment (Prescribed Activities) Regulation
ESO	environment safeguards officer (to be established in the PIU)
ESS	environmental safeguard specialist (of the PISC)
FGD	focus group discussion
IEE	initial environmental examination
GFP	grievance focal point
GRM	grievance redress mechanism
KII	key informant interview
MBPA	Milne Bay Provincial Administration
MBPTA	Milne Bay Provincial Transport Authority
NMSA	National Maritime Safety Administration
PAC	Provincial Advisory Committee
PISC	project implementation and supervision consultant
PIU	project implementation unit (of the implementing agency - MBPA)
PNG	Papua New Guinea
PPE	personal protective equipment
PSC	Project Steering Committee
SEMP	site-specific environmental management plan
SPS	Safeguard Policy Statement 2009 (of ADB)

CURRENCY EQUIVALENTS

(as of 6 June 2018)

Currency unit	-	PNG Kina (PGK)
PGK 1.00	=	USD 0.3064
USD 1.00	=	PGK 3.2626

NOTES

The fiscal year (FY) of the Government of Papua New Guinea and its agencies ends on 31 December. "FY" before a calendar year denotes the year in which the fiscal year ends, e.g., FY2011 ends on xxx 2011.

In this report, "$" refers to US dollars unless otherwise stated.

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EXECUTIVE SUMMARY

1. **Background**. The Asian Development Bank (ADB) is supporting the Government of Papua New Guinea (PNG) (the government) to develop the Building Resilience to Climate Change (BRCC) program, designed to implement the country's Strategic Program for Climate Resilience (SPCR). The SPCR is funded under the Pilot Program for Climate Resilience (PPCR) of the Strategic Climate Fund (SCF); a multi-donor Trust Fund within the Climate Investment Funds (CIF). The BRCC will facilitate integration of climate resilience into development processes through: (i) enhanced access to financial resources dedicated to climate change adaptation; (ii) development and dissemination of knowledge products and adaptation tools; (iii) better understanding of climate change vulnerabilities and adaptation options; (iv) increased adaptive capacity at the sectoral, national, district, and community levels, thereby building climate resilient communities, (v) addressing climate change risks to food security; and (vi) development of climate-resilient infrastructure.

2. In July 2015, the SCF PPCR Sub-Committee endorsed :(i) USD 24.25 million in PPCR grant funding for the proposed BRCC Project, to be administered by ADB; and (ii) the concept note for the allocation of an additional USD 5.0 million in PPCR grant resources to the project: Additional Financing for Building Resilience to Climate Change in Papua New Guinea to climate-proof Alotau Provincial Wharf. The government request was for this additional support from the ADB the fund the rehabilitation and climate proofing of the Provincial Wharf at Alotau, the Provincial Capital of Milne Bay Province.

3. **The BRCC program**. The government requested assistance from ADB in developing and upgrading the wharf, including climate proofing features. The BRCC has three outputs: (i) climate change and vulnerability assessments carried out and adaptation plans developed for target communities, (ii) sustainable fishery ecosystems and food security investments piloted in nine vulnerable island and atoll communities, and (iii) the establishment of an enabling framework for climate resilient infrastructure, and extension of a related early-warning communications network. The proposed additional financing delivers a fourth output on the climate proofing of the existing Alotau Provincial Wharf. This will serve as a pilot and demonstration climate adaptation model for climate proofing similar structures in PNG, thereby contributing to and augmenting output 3 to develop a climate resilient framework for similar vulnerable structures in PNG.

4. **Institutional arrangements**. The executing agency for the project is the PNG Climate Change Development Agency (CCDA), the CCDA has established a project management unit to coordinate overall activities of the BRCC. The implementing agency is the Milne Bay Works Supervision Unit (WSU), which is the department of the Milne Bay Provincial Administration (MBPA) charged with the design, procurement and construction of civil works required by the Provincial Government. A project implementation unit (PIU) will be established within the MBPA for day-to-day management of project implementation. The PIU will be supported by a project implementation and supervision consultant (PISC). The beneficiary of the wharf investment is the Milne Bay Provincial Transport Authority (MBPTA) which is the operator of the three Alotau wharves owned and operated by the MBPG, namely the provincial jetty and the dinghy (small open boat) wharves. The Deputy Provincial Administrator has been assigned as the focal person for the project and the Manager of the MBPTA as the alternate focal person. A Provincial Advisory Committee, established under the CCDA, shall steer and advise project teams and provide final endorsement on project recommendations and outputs.

5. **Environmental assessment**. This report is the initial environmental examination (IEE) report, the environmental safeguard document prepared for the Climate Proofing and Connectivity Improvement of Alotau Provincial Wharf. The IEE was conducted as part of the project preparation, with the prime purpose of: (i) identifying and assessing potential impacts and risks arising from the implementation of the proposed project on the physical, biological, physical cultural and socio-economic environment; and (ii) recommending measures to avoid, mitigate, and compensate for adverse impacts, and enhance positive impacts of the project. The IEE was carried out following the PNG Environment Act 2000 and Safeguard Policy Statement 2009 (SPS) of the ADB. Relevant reports/documents, site reconnaissance, consultations with stakeholders and close working coordination with the CCDA and the MBPA have provided the basis for the IEE.

6. **Project location and rationale**. The Alotau provincial wharf is located in Milne Bay in a readily accessible location. The communities and economies in the outer-islands are fully dependent on the wharf for access to essential services and business activities in Alotau. The wharf serves both small and medium cargo and passenger vessels (up to 600 towns displacement) engaged in Milne Bay's outer islands trade. Reliable maritime infrastructure is an essential pre-requisite for trade, economic development, health services, and poverty reduction in these outer islands.

7. The project aims to upgrade the Alotau provincial wharf using innovative engineering design that incorporates climate proofing features. The impact will be increased resilience to the impacts of climate variability and climate change. The outcome will be improved capacities of communities (in vulnerable atolls and islands), government agencies, and civil society to plan and respond to the impacts of climate change. While the impact and outcome are unchanged, they will be enhanced through physical implementation of innovative climate change adaptation methods for climate-proofing the Alotau Provincial Wharf, which would have replication potential in other similar structures in PNG. The creation of new climate proofing design codes and standards for Alotau contribute directly to output 3 of the BRCC, which is an enabling framework for climate resilient infrastructure established and communications networks extended.

8. **Project description**. The project will upgrade and climate-proof the Alotau provincial wharf. Several options were considered comprising four major design alternatives, two of them with design variants:

- Option 1 - Full refurbishment of the existing wharf;
- Option 2 - Replacing the existing wharf with a floating pontoon wharf;
- Option 3 - Retaining existing wharf and construct new wharf with climate proofed wharf structures;
- Option 3a - Option 3 plus demolition of the existing wharf with the new structure constructed over the footprint of the existing wharf;
- Option 4 - Retaining the existing structure (Option 3) plus steps on the rear face (landward side) to facilitate serving smaller boats; and
- Option 4a – Option 4 plus demolition of the existing wharf with the new structure constructed over the footprint of the existing wharf.

9. An options evaluation workshop was held in Alotau on 6 March 2017. Based on a consensus of stakeholders, Options 3a and 4a were preferred. Consequently, the feasibility study focused on these two options.

10. Both options include the decommissioning and demolition of the existing wharf and uses the same main wharf design and location, with the development occupying approximately the same footprint as the existing wharf.

11. Subsequently, another design option was explored–Option 4b, which is similar to the footprint of Option 4a, but with dropped level secondary landings, and later agreed by the government as the final design for the project. The potential benefits and anticipated construction-related impacts will be the same for all design options. The Government of Australia, through the Department of Foreign Affairs and Trade, has committed additional financing which will allow implementation of Option 4a.

12. **The preferred option**. The preferred Option 4b, will utilize precast concrete decking with a cast in situ reinforced concrete topping slab. It will have an approach deck positioned (as near as possible) within the footprint of the existing wharf. The length of the approach is 30m, the main wharf of 40m in length would provide suitable access for two x 20m length vessels or one 30m length vessel. The fendering to be provided on the main wharf considers all tidal ranges. The width of the wharf and access way will be sufficient to provide for safe access for concurrent pedestrian and vehicle movements. Foundations will be driven steel tubular piles, reinforced concrete bored piers or precast reinforced concrete piles. Wheel stops or kerbs are to be provided to all exposed edges of the structure. Handrails are to be provided to all non-operational faces of the wharf. A minimum of three safety ladders will be provided at approximately 60m intervals. Lighting will be provided to the structure to enable night time operations. Top of deck level of the deck shall be +3.4m lowest astronomical tide. Steps will be included on the rear face (landward side) to facilitate serving of smaller boats.

13. The construction period is estimated to be nine months including mobilization of the contractor, demolition of the existing wharf, and construction of the new structure. During construction, provision for continuing vessel operation will be made by the MBPTA as operators of the wharf and jetty. Up to wharf demolition, MBPTA will carry out urgent rehabilitations to improve the safety of current operations. During construction, vessels will use the adjacent jetty where feasible, and where not, will use private wharves or the PNG Ports Corporation coastal wharf.

14. **Impacts and mitigations**. The main environmental and social impacts will occur during the construction phase. These potentially include: (i) deposits on or contamination of the seabed; (ii) reduced localized air quality; (iii) noise and vibration; (iv) impacts on marine water quality; (v) impacts on marine ecology; (vi) impacts on the socio-economic environment such as impacts on the sustainability of urban services such as drainage and solid waste services due to the large volume of generated solid waste; (vii) local traffic congestion; (viii) local flooding from indiscriminate stockpiles of natural aggregates and contractor's container storage; (ix) potential social conflicts from hiring workers from outside; (x) disruption of socio-economic activities; and (xi) worker and public health and safety risks and hazards.

15. All impacts during construction will be temporary, localized, and can be mitigated without difficulty using standard mitigation measures. Mitigation measures have been identified, at a generic level, and included in the environmental management plan (EMP). The contractor will elaborate upon these measures in their site-specific construction EMP (SEMP).

16. There do not appear to be any operational adverse effects. The new wharf will be located at the site of the existing 50-year old wharf. There will only be piles supporting the wharf's deck.

17. The PIU will liaise and coordinate with other projects. Climate change data developed under the study will be provided to any other works in Sanderson Bay, such as the World Bank-assisted PNG Tourism Sector Development Project.

18. **Environmental management plan**. The EMP will serve as the framework for the environmental management in all phases of the Project (detailed design and pre-construction through to operation). The EMP contains: (i) institutional arrangement and responsibilities for EMP implementation; (ii) mitigation and management; (iii) grievance redress mechanism; and (iv) monitoring and reporting. The EMP contained in the IEE will be updated based on detailed design and additional baseline studies to be undertaken by the design and supervision consultant[1]. The contractor will respond to the EMP with a SEMP which will detail their construction methodology, sub-plans and site-specific drawings and layout plans clearly showing how they will achieve the mitigations and targets specified in the EMP.

19. **Consultation and disclosure**. Stakeholder consultations were held over the periods 13-24 February and 07-14 March 2017. Consultations included on-site random interviews, key informant interviews, and focus group discussions (FGD). The first consultations were due diligence-oriented, soliciting general information about the environmental, social and economic concerns about the existing wharf and associated facilities, and potential impacts of the upgrade activities. The second round of consultations were oriented toward obtaining comments on the design options for the new wharf, anticipated impacts during construction and the benefits that will be derived from the new wharf.

20. Stakeholder consultations will continue throughout implementation following the process set out in the Project's communication and consultation plan (CCP): (i) during detailed design to disclose the IEE and EMP to affected communities through public meetings; (ii) prior to construction, information will be disclosed (following the methods set out in the CCP) to ensure sufficient awareness/information among the affected communities regarding the upcoming construction, its anticipated impacts, the grievance redress mechanism (GRM), contact details and location of the CCDA-PMU and PIU, among others; (iii) during construction, through regular random interviews to monitor environmental and social concerns of the affected communities; and (iv) during operation, for a period prescribed in the CCP, periodic random interviews will be held to monitor the environmental and social concerns of the communities in the main area of influence of the completed wharf.

21. To date, the following information has been disclosed: (i) the plan to build a new climate-proofed wharf, and (ii) the design options and the preferred option. During detailed engineering design, the IEE and EMP will be made available at the offices of the PIU and MBPTA for the perusal of interested parties. The environmental monitoring reports during construction will be disclosed and made available on the ADB's website.

[1] This will include water quality and marine ecology (including benthic flora and fauna) baseline information based on surveys to be carried out under the project concurrently with the detailed design. In addition, any baseline data emerging from the forthcoming WB-supported tourism improvement project in Sanderson Bay may be used to supplement this baseline.

22. **Grievance redress mechanism**. The Project will elaborate and refine as required the GRM set out in the environmental assessment and review framework (EARF) prepared for the overall BRCC. The GRM is included in the EMP to make it clear what the contractor must do to resolve complaints and concerns.

23. For this project, a grievance focal point will be established by the Alotau Urban Local Level Government, assisted and supported by the WSU staff member identified to perform the role of environmental safeguards officer (ESO) in the PIU, who will maintain a register of complaints, keep track of their status, and report to the CCDA. The contractor will also maintain a register of complaints.

24. **Monitoring and reporting**. Throughout Project implementation, CCDA and ADB will monitor the progress and impact of the Project, this includes evaluating the overall impacts and benefits of the project and monitoring the implementation and effectiveness of mitigation measures. CCDA is required to implement safeguard measures and to periodically submit monitoring reports on implementation performance. The MBPA-PIU will monitor contractor's compliance with the approved SEMP during construction, and report to CCDA to in turn report to the ADB. Environmental monitoring reports will be prepared as follows: (i) a report at the end of project design, prepared by the MBPA-PIU for submission to the CCDA; (ii) a monthly report prepared by the Contractor during construction submitted to the MBPA-PIU, who in turn will submit to CCDA; (iii) a quarterly progress report prepared by CCDA for ADB which will cover safeguards matters; (iv) semi-annual safeguards monitoring reports; and (v) an annual report prepared by the operator during operation for as long as monitoring is specified in the EMP.

22. **Conclusion**. The IEE concludes that the proposed Project is not located adjacent to or within environmentally sensitive or critical or natural habitat areas and any impacts created are expected to be localized, confined within the Project's main area of influence and can be readily mitigated. Based on the above conclusions, the Project's classification as Category B for environment is confirmed.

23. The impacts will not be sufficient to threaten or weaken the surrounding resources. The preparation and implementation of the SEMP will address, as a minimum requirement, the matters identified in this IEE and EMP.

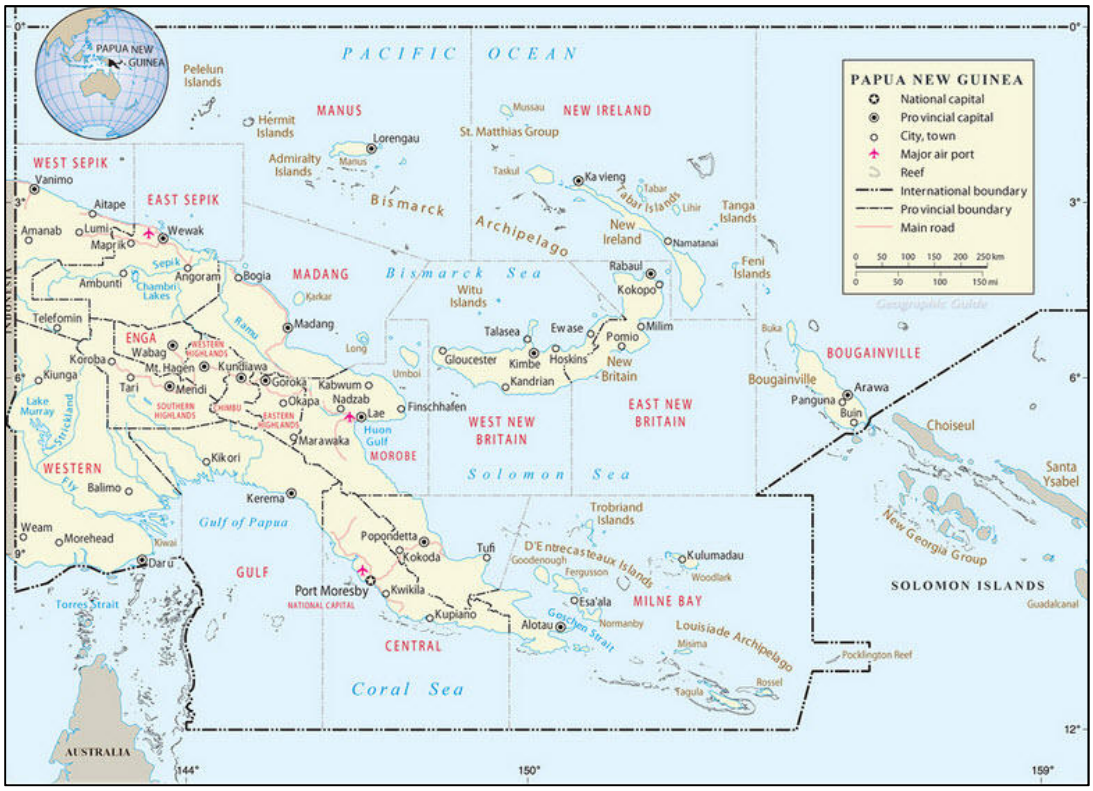
I. INTRODUCTION

A. Project Background and Rationale

1. **Background**. The Asian Development Bank (ADB) is supporting the Government of Papua New Guinea (PNG) (the government) to develop the Building Resilience to Climate Change (BRCC) program, designed to implement the country's Strategic Program for Climate Resilience (SPCR). The SPCR is funded under the Pilot Program for Climate Resilience (PPCR) of the Strategic Climate Fund (SCF); a multi-donor Trust Fund within the Climate Investment Funds (CIF). The BRCC will facilitate integration of climate resilience into development processes through: (i) enhanced access to financial resources dedicated to climate change adaptation; (ii) development and dissemination of knowledge products and adaptation tools; (iii) better understanding of climate change vulnerabilities and adaptation options; (iv) increased adaptive capacity at the sectoral, national, district, and community levels, thereby building climate resilient communities, (v) addressing climate change risks to food security; and (vi) development of climate-resilient infrastructure.

2. The government requested support from the ADB for the rehabilitation and climate proofing of the Provincial Wharf at Alotau, the Provincial Capital of Milne Bay Province (Figure 1.1). In July 2015, the SCF-PPCR Sub-Committee endorsed additional financing of US$5 million to upgrade the wharf.

Figure 1.1: Papua New Guinea, Milne Bay Province and Alotau



3. The BRCC program has three outputs: (i) climate change and vulnerability assessments carried out and adaptation plans developed for target communities, (ii) sustainable fishery ecosystems and food security investments piloted in nine vulnerable island and atoll communities, and (iii) the establishment of an enabling framework for climate resilient infrastructure, and extension of a related early-warning communications network. The proposed additional financing delivers a fourth output on the climate proofing of the existing Alotau Provincial Wharf. This will serve as a pilot and demonstration climate adaptation model for climate proofing similar structures in PNG, thereby contributing to and augmenting output 3 to develop a climate resilient framework for similar vulnerable structures in PNG.

4. **Institutional arrangements**. The executing agency for the project is the PNG Climate Change Development Agency (CCDA), a department of the PNG national government. The CCDA has established a project management unit for the BRCC program. The implementing agency is the Milne Bay Works Supervision Unit (WSU) of the Milne Bay Provincial Administration (MBPA) charged with the design, procurement and construction of civil works required by the Provincial Government. A project implementation unit (PIU) will be established within the MBPA for day-to-day management of project implementation. The PIU will be supported by a project implementation and supervision consultant (PISC). The beneficiary of the wharf investment is the Milne Bay Provincial Transport Authority (MBPTA) which is the operator of the three Alotau wharves owned and operated by the MBPA, namely the provincial jetty and the dinghy (small open boat) wharves. The Deputy Provincial Administrator has been assigned as the focal person for the project and the Manager of the MBPTA as the alternate focal person. A Provincial Advisory Committee, established under the CCDA, shall steer and advise project teams and provide final endorsement on project recommendations and outputs, including recommendations on necessary institutional and capacity strengthening measures for the implementing agency and beneficiary.

5. To prepare the project for funding, the government requested assistance from ADB in developing and upgrading the wharf, including climate proofing features:

- the preparation of rehabilitation options and a pre-feasibility design and procurement proposals for the selected option;
- an adaptation report in accordance with the CIF's PPCR guidelines;
- a full climate risk and vulnerability assessment
- completed application forms as per CIF's PPCR guidelines
- due diligence studies and reports covering the economic, financial, institutional, procurement, and safeguards aspects of the project; and
- procurement and construction recommendations to allow the early commencement of any recommended climate proofing and improvement works.

6. **Environmental safeguards due diligence**. This report is the initial environmental examination (IEE) of the Climate Proofing and Connectivity Improvement of Alotau Provincial Wharf. The IEE was conducted as part of the project preparation, with the prime objective of: (i) identifying and assessing potential impacts and risks arising from the implementation of the proposed project on the physical, biological, physical cultural and socio-economic environment; and (ii) recommending measures to avoid, mitigate, and compensate for adverse impacts, and enhance positive impacts.

7. The IEE was carried out following the PNG Environment Act 2000 and Safeguard Policy Statement 2009 (SPS) of the ADB and reference to the most-relevant best practice and guidelines.

B. Objectives, Impacts and Outcome of the Investment

8. The Alotau provincial wharf is located in Milne Bay in a readily accessible location. The communities and economies in the outer-islands are fully dependent on the wharf for access to essential services and business activities in Alotau. The wharf serves both small and medium cargo and passenger vessels engaged in Milne Bay's outer islands trade. Reliable maritime infrastructure is an essential pre-requisite for trade, economic development, health services, and poverty reduction in such outer islands.

9. The project aims to upgrade the Alotau provincial wharf using innovative engineering design that incorporates climate proofing features. The impact will be increased resilience to the impacts of climate variability and climate change. The outcome will be improved capacities of communities (in vulnerable atolls and islands), government agencies, and civil society to plan and respond to the impacts of climate change. While the impact and outcome are unchanged, they will be enhanced through physical implementation of innovative climate change adaptation methods of climate proofing of Alotau Provincial Wharf, which will have replication potential in other similar structures in PNG. The creation of new climate proofing design codes and standards for Alotau contribute directly to output 3 of the original project, which is to establish an enabling framework for climate resilient infrastructure, and extend the communications network.

C. Structure of the Report

10. The IEE report is organized following the outline prescribed in Appendix 1 of the SPS: Executive Summary; (i) introduction; (ii) legal and policy framework; (iii) description of the project; (iv) description of the environment; (v) anticipated environmental impacts and mitigation measures; (vi) analysis of alternatives; (vii) information disclosure, consultation and participation; (viii) environmental management plan; and (ix) conclusions and recommendations.

II. LEGAL, POLICY AND ADMINISTRATIVE FRAMEWORK

A. Country Safeguards Systems

11. **Legal framework**. The country safeguards system (CSS) for environment includes the Environment Act 2000, Environment (Amendment) Act 2014, and Environment (Prescribed Activities) Regulation 2002 (EPAR), which address environmental impact assessment and management. The Environment Act (the Act) provides for the sustainable management of the biological and physical components of the land, air and water resources of the country. It sets out the country's environmental safeguard system, regulating the impacts of development activities on the environment through an established environmental approval and permitting process.

12. The Act classifies development activities into Levels 1, 2 or 3, depending on the extent of their impacts on the environment and human health:

- A level 3 activity is one which may: (i) result in serious environmental harm; or (ii) have a significant negative impact on a matter of national importance.
- A level 2 activity is one which is not a level 3 activity but which may: (i) result in material environmental harm; or (ii) may have a negative impact on a matter of national importance.
- A level 1 activity is any other activity that is neither a level 2 or 3 activity. A level 1 activity applies environmental guidelines or codes of practice developed for specific activities on a voluntary basis. Provincial and local level governments may regulate these activities.
- Level 2 and 3 activities require the submission of a notification of intention to carry out preparatory work. The notification will allow the Conservation and Environmental Protection Authority (CEPA) to determine if an activity is Level 2 or 3.
- If an activity is determined to be a Level 2 activity from its notification, project proponent can proceed to the application of an environment permit. If determined to be a Level 3 activity, project proponent is required to have an environmental inception report approved, undertake EIA and have an environmental impact statement (EIS) approved prior to applying for an environment permit.
- When a Level 2 activity poses a threat of serious environmental harm, it could be required to undergo an EIA.

13. The EPAR sets out the Level 2 and 3 activities as "Prescribed Activities". Schedule 1 provides the list of Level 2 activities that are subdivided into Category A and B. Category B has 10 sub-categories with sub-category 12 addressing Infrastructure Development under which items 12.1 and 12.2 cover maritime infrastructure. Schedule 2 consists of Level 3 activities classified into 8 sub-categories with sub-category 19 addressing Infrastructure Construction that has item 19 covering maritime infrastructure. Activities associated with the construction of wharf, such as gravel extraction and quarrying, are included in Schedule 1 as Level 2 – Category A activities (items 2.3 and 2.4 of sub-category 2), requiring environment permit from CEPA. Refer to Table 2.1.

Table 2.1: Screening of Proposed Project Per EPAR 2002 [a]

Relevant Provisions in EPAR 2002		Required documents/ submission [b]				Remarks
		1	2	3	4	
Schedule 1, Level 2, Sub-Category 12 – Infrastructure						
12.1	Operation of maritime construction, deballast and repair facilities designed to handle vessels of a mass of greater than 50 tonnes.	X	-	-	X	Likely applicable to the proposed wharf construction.
12.2	Construction of marinas and boating facilities designed or used to provide moorings for more than 50 powered vessels at any one time.	X	-	-	X	The proposed wharf is designed to handle at the maximum, only 12 vessels at any one time. (Less than 25% of the prescribed threshold)
Schedule 2, Level 3, Sub-Category 19 – Infrastructure Construction						
14.1	Activities involving investment of a capital cost of more than K50 million, except where such investment is made in pursuing an activity otherwise dealt with in this Regulation in which case that category of activity will apply to the investment.	X	X	X	X	K50 milion is equivalent to USD 15.75 million. The project will involve only USD 5 million (only about 1/3 of prescribed amount).
19.2	Construction of sea ports and ship repair facilities serving ships of an individual tonnage of more than 500 tonnes.	X	X	X	X	The proposed wharf is designed to handle ships with individual DWT of only 40 tonnes or 60 tonnes laden displacement (only 12% of 500 tonnes and prescribed threshold is more than 500 tonnes).

[a] Mainly referring the design scale and scope of the project to Schedules 1 and 2 of EPAR 2000.
[b] 1 = Notice of intention to carry out preparatory work; 2 = Environmental Inception Report; 3 = EIS; 4 = Environment Permit
Note: The proposed project is outside the conditions specified in Section 50 of the Environment Act 2000 whereby Level 2 activities would require an EIA undertaking. In case, the project would be required to undertake an EIA, the EIS preparation, assessment, public review and approval process is described in detail in Environmental Act 2000.

14. The country's safeguard system also includes a number of procedures set out in several guidelines including: (i) Guideline for submission of an application for an environment permit to discharge waste (GL-Env/03/2004) which covers: noise discharges (IB-ENV/03/2004); air discharges (IB-ENV/02/2004); and water and land discharges (IB-ENV/04/2004); and (ii) Guideline for Preparation of an Environmental Management Plan (EMP) (No. 02/2013), which is intended to assist and guide prospective developers (and/or their consultants) to prepare an EMP, as required for Level 2 and 3 activities.

15. The following legislation and regulation will also apply to the project:

- **Sea water quality.** The Environment (Water Quality Criteria) Regulation 2002 provides the water quality criteria for the protection of marine aquatic life.
- **Public health**. The Public Health Act 1978 protects the public by regulating and controlling the unplanned disposal of any environmental contaminants such as domestic or industrial waste and/or refuse that will have impact on the lives of people. The act regulates the proper and planned establishment of waste disposal points such as rubbish dumps and landfills so that such establishments are seen to be causing minimal inconvenience to people's lives. The act also covers all the activities that pose risks and potential risks and inconveniences to the usage of the environment surrounding the area of activity. As the project will affect the lives of people, especially the communities in the area of influence of the wharf, this act is applicable and has been taken into consideration.

- **Labor health and safety**. The Employment Act 1978 is an act relating to the employment of nationals and non-citizens. The act covers recruitment, conditions of employment as well as health and safety aspects and is administered by the Department of Labor and Employment. Conditions of this act are relevant to the health and safety of workers employed during construction and during operation and are reflected in the IEE.

- **Quarrying, gravel extraction.** The Mining Act 1992 and Regulation, which also covers quarrying, provides that the assessment of proposals for a mining lease shall consider whether the applicant has evidence regarding having complied with the requirements of CEPA in terms of the protection of the environment.

- **Dumping of wastes at sea.** The Dumping of Wastes at Sea Act 1979, provides for the prevention of pollution of the sea by the dumping of wastes and other matter, which may create hazards to human health, harm living resources, damage amenities or interfere with other legitimate uses of the sea. This Act is pending repeal. A bill for an act entitled Marine Pollution (Sea Dumping) Act is currently in under deliberation.

16. In the absence of established national technical standards for ambient air quality and noise[2], the Environmental, Health and Safety Guidelines (EHSG) will apply. Compliance with the EHSG is also a general requirement of the SPS.

17. PNG is party to the following international conventions, deemed most relevant to the Project:

- London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972.

- London Convention for the Prevention of Pollution of the Sea by Oil.

- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region and related Protocols (SPREP, 1986) and the associated protocol, entitled Protocol for the Prevention of Pollution of the South Pacific Region by Dumping.

18. **Policy and Institutional Framework**. The Conservation and Environment Protection Authority (CEPA), formerly known as the Department of Environment and Conservation, is government's environmental management agency. It operates with the mission statement: "To ensure PNG's natural resources are managed to sustain environmental quality, human well-being and support improved standards of living" (CEPA Corporate Plan (2009-2012). It administers the Act and its associated regulations, most relevant of which are the: (i) EPAR; and (ii) Environmental (Permits and Transitional) Regulations 2002. The CEPA consists of six divisions, of which the Environment Protection Division is responsible for the effective and efficient administration of the Environment Regulatory System in regulating development activities with potential for causing environmental harm including providing cost recovery guidelines. (CEPA website, http://pngcepa.com/about-us/divisons).

[2] There are currently no PNG standards for ambient air quality and noise, and hence compliance will be with EHSG. In addition, following the baseline studies, a better understanding of baseline conditions, impacts and required mitigations will be available, and therefore the standards to be complied with.

19. CEPA operates at the national level from its office based in Port Moresby. It does not have offices and staff in the provinces. All environment approvals are made in the central office in Port Moresby. As part of the PNG decentralization policy, CEPA works in close consultation with the provincial governments through the respective provincial administrations to ensure implementation of environmental legislation at the provincial level. Certain environmental management and monitoring functions are delegated to provincial administrations on an "if and when" they have the resources and capacity to conduct these activities

B. Asian Development Bank Safeguard Requirements

20. **Safeguard policies.** In addition to complying with country safeguards, the Project will also need to comply with the SPS, which sets out the policies and principles for protecting the environment and people by wherever possible avoiding impacts and mitigating and/or compensating for impacts that cannot be avoided. The SPS is a policy document in respect of safeguards and avoiding, minimizing or mitigating adverse impacts on people and the environment.

24. The SPS has the following objectives: (i) avoid adverse impacts of projects on the environment and affected people; (ii) where possible; minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and (iii) help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks. The environment safeguard requires due diligence, which entails addressing environmental concerns, if any, of a proposed activity in the initial stages of project preparation.

25. The SPS categorizes potential projects or activities into categories of impact (A, B or C) to determine the level of due diligence required to address the potential impacts. Category A defines projects with the potential to cause significant adverse impacts; while category C projects are those posing no or minimal impacts. The Project is categorized as environment Category B because potential adverse environmental impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be readily designed.

26. This IEE has been prepared as the appropriate level of assessment for projects screened as category B for environment.

27. **Environmental assessment and review framework.** The EARF for Building Resilience to Climate Change in Papua New Guinea sets out, for the overall program, the processes adopted to comply with both the country's safeguard system and SPS in the environmental assessment of this Project. The EARF: (i) reflects the policy objectives and relevant policy principles and safeguard requirements governing preparation and implementation of projects and/or components; (ii) explains the general anticipated impacts of the project and/or components; (iii) specifies the requirements that will be followed for subproject screening and categorization, assessment, and planning, information disclosure, meaningful consultation, and grievance redress mechanism; and (iv) describes implementation procedures, including budgets, institutional arrangements, and capacity development.

28. The EARF also sets out the capacity building measures that will be implemented during implementation of the program.

29. **Initial environmental examination**. Under the SPS, the Project is classified Category B because the potential adverse environmental impacts are site-specific, few if any of them are irreversible, and mitigation measures can be designed readily. The appropriate level of environmental assessment for environment Category B is an IEE. The objectives of this IEE are to: (i) identify and describe the existing environmental conditions in the project area including the identification of environmentally sensitive areas; (ii) assess the proposed works and activities to identify their potential impacts, evaluate the impacts, and determine their significance; and (iii) propose appropriate mitigation measures that can be incorporated into the proposed activities to minimize any adverse impacts, ensure that residual impacts are acceptable and establish the requirements for monitoring of the Project.

30. The IEE is based on compilation of primary and secondary sources of information and data (including from published reports). The team conducted interviews with local people and leaders in the Project area to gather the relevant social and environment-related information and data needed for this report. Site reconnaissance was conducted. Public consultations with government stakeholders and communities were undertaken as part of the IEE process to determine community perceptions relating to the development, and to obtain relevant information. The report structure follows the format outlined in Appendix 1 of the SPS.

III. DESCRIPTION OF THE PROJECT

A. Rationale

31. The Alotau provincial wharf, built in 1968, is located in a readily accessible location in Sanderson Bay at the northern head of Milne Bay. This facility, is an essential element in the socio-economic life of Milne Bay Province and directly benefits all income groups including the poor as it seeks to improve and ensure connectivity for the population residing in Milne Bay Province and especially between the remoter outer islands and the provincial town of Alotau. The communities and economies in the outer-islands are fully dependent on the wharf and the associated jetty for access to essential services and business activities in Alotau. The wharf serves small and medium cargo and passenger vessels (up to 600 tonnes displacement) engaged in Milne Bay's outer islands trade. The jetty exclusively serves small craft (up to 30 tonnes displacement).

32. However, the 50 year old facility is in a poor state of repair and is vulnerable to the adverse effects of climate change, especially sea level rise and increasingly intensive storm surges. The Provincial Government confirms that the wharf is in urgent need of rehabilitation and climate proofing.

33. Alotau is the capital and main town of Milne Bay province. It is the commercial, medical and institutional centre for the offshore islands where over 50% of the provincial population resides. There is therefore a continuous flow of goods and people between Alotau and the islands by small vessels (8 m-25 m) with Alotau itself largely connected with other provinces and overseas markets by larger commercial ships. Shipping is handled at several locations within Alotau town.

34. In Sanderson Bay, the provincial government is responsible for 2 small adjacent facilities designated as: (i) the Provincial Jetty of about 40 metres length; and (ii) this project's subject Provincial Wharf with a length of 36 metres. Moored end on, the jetty handles about 15 vessels and moored side on, the wharf handles up to three larger (20m)[3] vessels and occasionally very small vessels such as police boats on the landward side behind the wharf.

35. Between them, these two berths serve almost all of the provincial interisland traffic. Traffic from the islands to Alotau comprises: (i) passengers coming for various purposes including shopping, medical appointments, social and work commitments etc. and (ii) cargoes which are mainly agricultural and other local produce. From Alotau to the islands, traffic comprises returning passengers and food, rice, consumer goods, fuel, building materials and sundry items. Apart from regular freight and passenger vessels, there are irregular emergency and naval/military vessels which are not counted. Hospital ships including the PNG Ywam Hospital Vessel generally dock at the PNG Ports Coastal facility. Occasionally, fishing vessels of up to 30m in length change crew at Alotau wharf although this will likely cease once the JICA funded fish market and fish jetty is constructed.

36. In general, the mix of fuel, passengers, people and cargo operations at both the jetty and the wharf currently pose a threat to life and safety.

[3] Up to 25 metre length vessels occasionally.

37. The assessment of the existing wharf condition, undertaken in January 2017 by the engineering team of the Project Preparatory Technical Assistance (PPTA) Team through visual inspection made from the deck level and by inspection boat, revealed that the existing wharf is at the end of its service life and is in disrepair, with serious structural defects. Deck-supporting steel beams are severely corroded, some piles show section loss due to corrosion on flanges, concrete decks have severe cracks and other damage, and the design of the interfaces does not meet current standards, posing significant risks to current operations and indicating that a refurbishment in unlikely to be a viable option. A replacement structure should no longer be deferred (Refer Figure 6.1). The existing deck is occasionally inundated during storms, requiring a raised wharf to accommodate future sea level rises and storm surges.

38. The environmental and social safeguards due diligence in February 2017, through site reconnaissance and consultations with boat and dinghy operators, passengers and other stakeholders, concluded that the critical conditions of the wharf structure, which local users expect to collapse any time, warranted an urgent replacement. This project responds to the request of the Provincial Government for support in the rehabilitation and climate proofing of the wharf. The project will contribute to the achievement of one of the objectives of the BRCC program, i.e., the integration of climate resilience into the development process through the development of climate-resilient infrastructure.

D. Options for Improvement of Wharf

39. Four redevelopment and improvement options were developed by ICF/GHD in February 2017 to form part of the Options Workshop held in Alotau on 08 March 2017. These options are summarized as follows:

- Option 1 - Full refurbishment of the existing wharf;
- Option 2 - Replacing the existing wharf with a floating pontoon wharf;
- Option 3 - Retaining the existing wharf and constructing a new wharf with climate proofed wharf structures; and
- Option 4 - Retaining the existing wharf and constructing a new wharf with climate proofed structures with steps on the rear face (landward side) to provide improved access for small craft and/or low tide operations.

40. As a result, a visual inspection, and discussions with representatives from the MBPA and MBPTA, variants to options 3 and 4 were subsequently developed - options 3a and 4a – and these were prepared and also presented during the Options Workshop.

- Option 3a - same as Option 3, but including the demolition of the existing wharf with the new structure constructed over the footprint of the existing wharf (see Figures 3.1 and 3.2); and
- Option 4a – same as Option 4 but including the demolition of the existing wharf with the new structure constructed over the footprint of the existing wharf (see Figures 3.1-3.5).

41. Based on the review of cost estimates, design options and funding limitation understood to be a constraint to the financial resources available for this project, a further option, defined as option 3b, was developed, which includes the main features of option 3a, but with the geometry (positional) arrangement of option 4a.

42. The main difference between options 3b and 3a is the provision of two extra piles, a headstock and extra approach slab. This option provides the flexibility for the addition of a rear berth (or berths) to the wharf and steps on the rear face (landward side), as proposed under Option 4a, later when/if funding permits.

43. Option 3b was initially recommended as the preferred option. The geometry and structural provision under this option makes provision for the future phased development of additional stepped wharves to provide a more flexible facility. Subsequently, the Government of Australia, through Department of Foreign Affairs and Trade, committed additional financing which will allow implementation of Option 4a.

E. Description of Proposed Works

44. Option 4a features the construction of a main wharf, with provision for the construction of additional lower platforms and steps (refer to Figures 3.2 – 3.6). The following are the main components of the preferred option (4a).

45. **Main Wharf.** The construction of the main wharf will include the following activities and elements/components:

- The decommissioning and demolition of the existing wharf;
- A new wharf utilizing precast concrete decking with a cast in situ reinforced concrete topping slab. Upon completion of the works, the topping slab, precast decking units and headstocks shall form a monolithic structure of shear ligatures cast into the precast elements;
- The wharf will have an approach deck and shall be positioned (as near as possible) within the footprint of the existing wharf. The length of the approach for Option 4a will be approximately 30m;
- The main wharf will be 40m in length and provide suitable access for two x 20m length vessels or one 30m length vessel. Fendering of the main wharf shall consider all tide ranges;
- The width of the wharf and access way is to be sufficient to provide for safe access for concurrent pedestrian and vehicle movements;
- Foundations are to be either driven steel tubular piles, reinforced concrete bored piers or precast reinforced concrete piles. A decision on the preferred option is to be deferred until a geotechnical assessment has been undertaken allowing section of the most appropriate option to be made considering both capital and maintenance costs;
- Wheel stops or kerbs are to be provided to all exposed edges of the structure;
- Handrails are to be provided to all non-operational faces of the wharf. A minimum of three safety ladders shall be provided at a maximum of 60m intervals;
- Lighting shall be provided to the structure to enable ‘after dark’ operations (minimum P8 category in accordance with AS 1158). The design of the lighting shall minimize glare to the navigation channel;

- Top of deck level of the deck shall be +3.4m LAT. Landside works (completed by others) shall match the top of deck level. It is assumed that a run slab will be provided to connect to a new access road;
- Security gates shall be provided at the entrance to the wharf;
- Cast-in-place mounting sleeves for removable davits may be required to assist with the loading / unloading of vessels. Confirmation of their requirement and location of the sleeves shall be provided after consultation is completed with wharf users; and
- Other structures which are to be located on land (access road and sanitation building) are not included within the scope of this document.

46. **Provision for lower platforms.** The design and structural elements included under option 3b and 4a provide for a secondary wharf and steps, located along the shore side of the main wharf. This secondary wharf would consist of two platforms at different heights to facilitate easier access to small vessels at lower tides, and the high platform at higher tides. These two landings would be accessible by stairs and access ramps, with sufficient space for berthing for two 12 m craft. The floor of the lower platform (including ramps and steps) would consist of open mesh grating (nominal fiber reinforced plastic grates) to reduce uplift forces from waves whilst the platforms are submerged.

47. The grating material would also be removable and could be considered for re-use later should tidal level changes result in the lower level becoming redundant. Access ramps would be provided from the main wharf to the landings with a maximum gradient of 1:14 and at least 1.8m (minimum 1.2m) between handrails. Access would be compliant with AS4997 for assisted wheelchair access.

48. **Wharf drainage and clean-up sumps.** The wharf shall drain directly into the waterbody. Kerbs shall be provided with drain holes to allow free flow of any surface water. It is understood that bunkering operations will cease at the berth. Therefore, petrochemicals or materials hazardous to the marine environment are not anticipated to be handled across the deck. This operation will occur at the International wharf on the other side of the Bay. If the handling of such material is required, the operator shall be responsible for ensuring that no petrochemicals or materials hazardous to the marine environment are handled across the deck without suitable precautions in place to prevent such material entering the waterbody, subject to acceptance of the wharf owner.

49. **Berth pocket.** The oil tanker--MV Lukianos, 3,640 tonnes and 90m overall length--berths at the wharf approximately every two weeks, the existing depth at the wharf is sufficient for the design vessels (20-30 m length overall and up to 600 tonnes displacement). Depth is estimated to be 8–12 m. The wharf is to be positioned such that dredging is not required during construction, with a low risk of dredging through operational use.

50. **Equipment and maintenance requirements.** Equipment and maintenance requirements are to be kept at a minimum. Owing to this, the main structural elements for the wharf (piles and concrete deck) shall be designed for a design life of 50 years with minimum intervention. Design measures to minimize loss of structural capacity of the steel elements from corrosion include: (i) piles to be coated and cased; (ii) application of a protective coating to the fender steelwork; and (iii) use of a thicker section of steel (or adding a “sacrificial thickness” of 3mm) to provide for the assumed 3mm loss of steel to corrosion in 50 years’ time. To minimize cracking of the reinforced concrete decks, causing entry of chlorides to cause corrosion of the steel reinforcements, the appropriate concrete grade and reinforcement cover will be adopted.

51. **Construction workers and accommodation**. The number of construction workers, and the arrangements for their accommodation will depend on the contractor's approach to the construction. However, it is anticipated that a workforce of about 40 would be involved in the demolition and reconstruction of the wharf, of which the majority would be locally hired. Those not locally hired would be accommodated within Alotau town in guest houses, hotels and other existing accommodation. There would not be need for a temporary construction camp.

52. **Implementation**. Project implementation mode will be for separate detailed design followed by competitive tender of an ad measurement construction contract. The implementation period for the fabrication, installation and construction phase is estimated to be 12 months in total, to include: (i) about three months for contractor mobilization and barge mobilization; and (ii) about nine months for demolition of existing wharf, installation of piles, placement of precast deck, casting on site of the topping slab, installation of other furniture/fixtures and defect amendments.

F. Audit of Existing Facilities and Operations

53. An audit of the existing wharf and associated facilities was conducted in February 2017. The findings are summarized in Table 3.1.

Table 3.1: Findings of Audit and Corrective Actions

Current Salient Issues/Concerns	Corrective Actions
Physical Environment	
◦ Suspended particulates in air from: (i) movement of vehicles over unpaved surfaces; and (ii) wind action on unpaved surfaces.	Seal/pave all internal roads.
◦ Gas emissions from vessels, vehicles and generator set operations.	Have emission test as pre-requisite for renewal of vessel registration.
◦ Deteriorating bay water quality from: (i) solids---solid waste, raw sewage, sediments; and (ii) liquids--discharges from drainage outfalls, human discharges, oil and grease from spills/leaks/runoff.	Holding tanks for vessel toilets and system of their disposal. Strict enforcement of the "no dumping at sea" law. While docking observe solid/liquid waste and sewage management regulations. Provide adequate toilets nearby. When these are available, prohibit use of boat toilets while on dock.
◦ Bay bottom situation: (i) getting shallower due to deposits of sediments and solid waste; and (ii) contaminants from oil and grease.	Dredging being suggested by boat operators to remove the deposits/obstructions and improve navigation/enable safer navigation. The removal of the two beacons in Sanderson Bay (after dredging) was also suggested for more navigational space. An assessment of the marine ecology, including coral reef system, flora and fauna including benthic needs to be made prior to any dredging activity. Seal/pave all internal roads.
◦ Corroded steel structural elements of the existing wharf	Plans to replace the old wharf should not be deferred.
Biological Environment	
◦ Marine habitat in Sanderson Bay and Milne Bay (within the project's main area of influence) already modified by human activities.	The reef at the middle of the two beacons is growing. An assessment of the marine ecology, including coral reef system, is recommended prior to the formulation of actions.
Socio-economic Environment	
◦ Public safety concerns at wharf: - Wharf is in a state wherein the structural elements are showing defects/damages/corrosion.	Existing wharf needs replacement.
- The deck has a hole but no warning or physical barrier is in place.	Meanwhile project is in the preparation stage, the hole must be securely enclosed.
- Children are using the deck of the wharf as diving board, lounging area. Children were also found sitting on the gas pipes at the bunkering station of Islands Petroleum.	Planning of the new wharf must incorporate measures to keep non-boat users out from the wharf. The bunkering pipes should also be demolished.
- No lighting.	New wharf should have sufficient lighting.
- No waiting shed/covered terminal for passengers.	New wharf should have a covered waiting shed for passengers.

Current Salient Issues/Concerns	Corrective Actions
◦ Public safety concerns at provincial jetty - fuel-filled drums & passengers in same holding area, sometimes with passengers sitting on top, sometimes some people smoking nearby. - Passengers going in and out of the boat during loading of fuel-filled drums onto the boat. - no segregation of passengers and patrons of supermarket, poor lighting, etc.	Separate holding area for oil drums. Separate waiting area for boat passengers, not for use by non-passengers, with sufficient lighting. Passengers to be prohibited from getting near the boat while fuel-filled drums are being loaded onto the boat.
◦ Passengers/boat operators without access to potable water and adequate sanitation facilities. Toilets of vessels do not have holding tanks. During the docking days of boats, it is expected that Sanderson Bay is directly receiving raw sewage from the boats.	Provide water taps from sources of treated water. Adequate toilets and showers should be available closer to the wharf/jetty area. The existing public toilet near the Informal Market is about 200 m from the provincial jetty or wharf.
◦ Inadequate awareness on the part of wharf/jetty users on the significance of keeping the Sanderson Bay clean.	Participatory maintenance of cleanliness of, and protection of the environmental quality of, Sanderson Bay, to be encouraged from boat owners/operators and passengers. Set up an adequate system of solid and liquid waste storage and disposal. Install adequate signage.
◦ Access road with many potholes, muddy during heavy rains; puddles during normal rains.	Seal/pave the road. Provide adequate drainage for surface runoff.
◦ Discharge point of the access road drainage is not high enough to prevent bay water from entering/flowing landward into the drainage system during high tide.	This is recently built drainage along the access road. To be resolved during the improvement of the access road by Provincial Government after the completion of the new wharf.
◦ Sediment-laden runoff when it rains, dry loose sediments deposited in the drainage channels, and wind action on dry unpaved surfaces – lead sediments into the Sanderson Bay.	Seal/pave unpaved surfaces. During the improvement of the access road, improve the existing drainage on both sides to make them less vulnerable to being easily deposited with dry loose sediments and solid waste.
◦ A broken boat has been staying in the bay near the dinghy mooring area for long time now, contributing to obstacles in navigation.	The broken boat must be removed.

E. Consideration of Environmental Concerns in Project Design

54. Environmental issues and concerns need to be considered early in project design. Table 3.2 presents the considerations made at this stage.

Table 3.2: Environmental Issues and Corrective Actions for Incorporation in Design

Salient Issues/Concerns	Corrective Actions	Remarks
○ The existing wharf has serious defects; corroded steel, cracks and holes in concrete decks.	○ Replace wharf with a new one.	○ A new wharf will be built under the Project.
○ Drainage channels on each side of the access road have their discharge points close to each side of the wharf's entrance. Currently, backflow was observed during high tide level.	○ Design and supervision consultant to: - ensure new wharf will in not in any way obstruct effective discharge from these channels; and - discuss with the Provincial Government on how to best prevent/mitigate worsening of backflow during construction. ○ Proposed improvement of access road by Provincial Government should correct the current back flow and incorporate SLR in the design of the drainage discharge.	○ There are two drainage discharge points: - One discharge point at existing barge ramp will be maintained under all options. - Second point is currently between the NMSA fence and the wharf. With a wider new wharf, it is possible that this discharge point will be within the 8m width of the new wharf. The centerlines of piles P1 and P2 will be 1.6 m away from the existing seawall (or a clear distance of about 1.3 m, considering P1 and P2 will be about 63cm in diameter). Hence, no structural element will obstruct this discharge point.
○ An existing barge ramp adjacent on the north face of the wharf.	○ New wharf must allow continued use of the ramp.	○ The new wharf will be so positioned to maintain use of barge ramp.

Salient Issues/Concerns	Corrective Actions	Remarks
○ Pump-house of Islands Petroleum at the existing wharf, with exposed pipes attached to the outside of the wharf superstructure beams.	○ Remove the pump house and all pipes and electric cables as soon as bunkering operations have been moved to the Alotau International Port.	○ If not removed prior to start of construction, pump-house and associated pipes and cables will be removed during the demolition of the existing wharf.
○ Width quite narrow, and narrower during peak loading/unloading operations. No side railing, posing safety risks.	○ Include railings in the new wharf, as appropriate.	○ Option 4a proposes width that will provide safe access for concurrent passenger and vehicle movement and handrails at non-operational faces of the wharf.
○ Wharf does not accommodate small vessels/dinghies. Dinghy operators and passengers are exposed to health risk when having to wade through contaminated bay water when getting off and on the dinghy.	○ New wharf to also accommodate small crafts/dinghies.	○ Option 4a will allow construction of lower decks and steps now (rather than later as per Option 3b)
○ No lighting	○ Provide lighting.	○ Option 4a designed with sufficient lighting.
○ Lack of security as wharf can be accessed anytime by the unauthorized people	○ New wharf should be secured from entry of non-relevant public.	Option provides for security gates at the entrance to the main wharf.
○ Clear distance between the wharf's and jetty's edges should be such that permits safe maneuvering towards and from the jetty and wharf, especially during peak operations.	○ Design must ensure that there is adequately safe space for maneuvering in the area between wharf and jetty. ○ The AULLG suggested an offshore anchorage area to relieve congestion.	○ Drawings indicate width of 8m entry deck will be measured from north edge of the existing wharf southwards to NMSA side. If this is correct, then all options maintain the existing distance between jetty & wharf.

Figure 3.1: Drainage Discharge Points at Seawall and Current Backflow During High Tide Level

Figure 3.2: General Arrangement of New Wharf - Option 3b

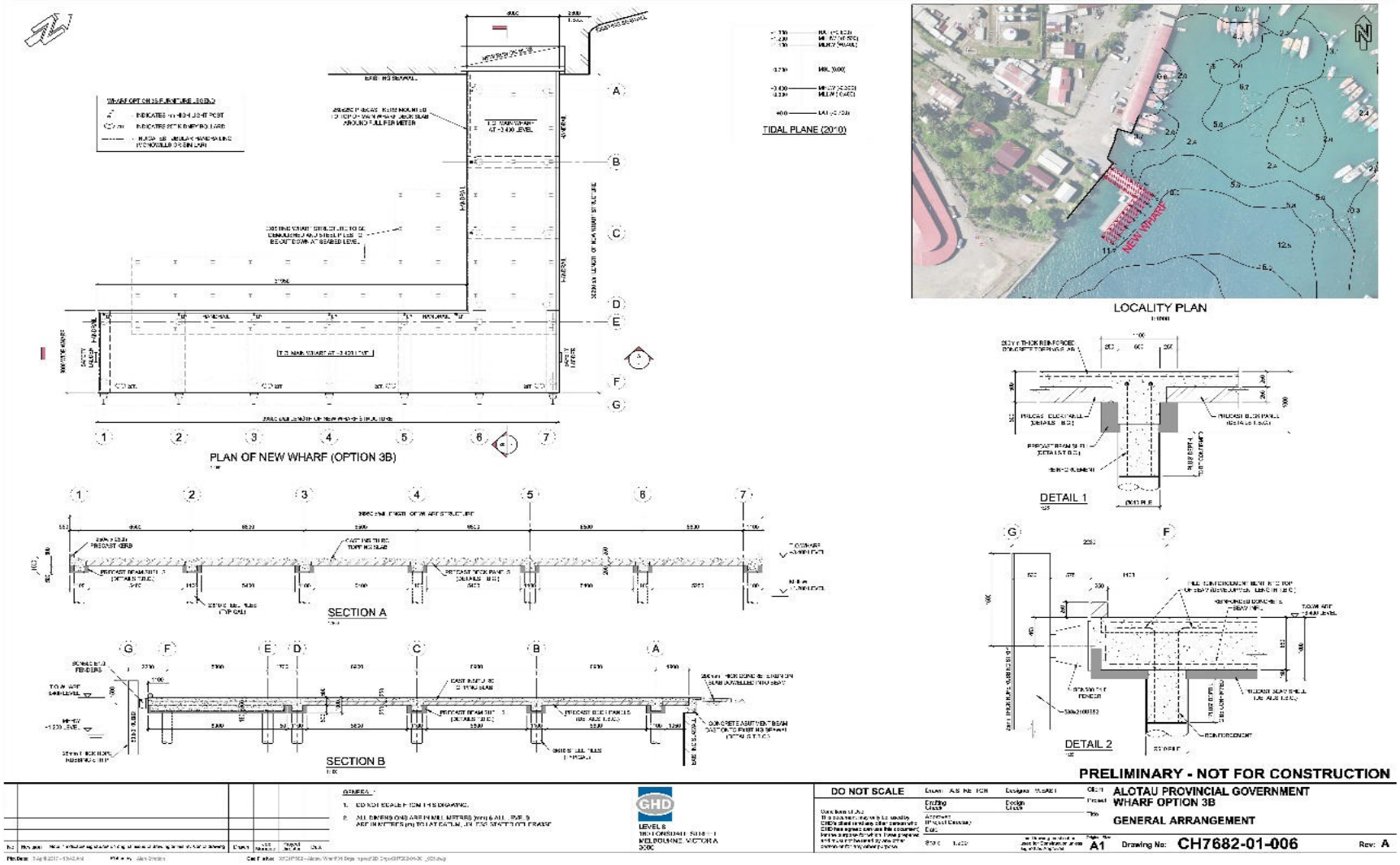


Figure 3.3: Piling Layout – Options 3b/4a

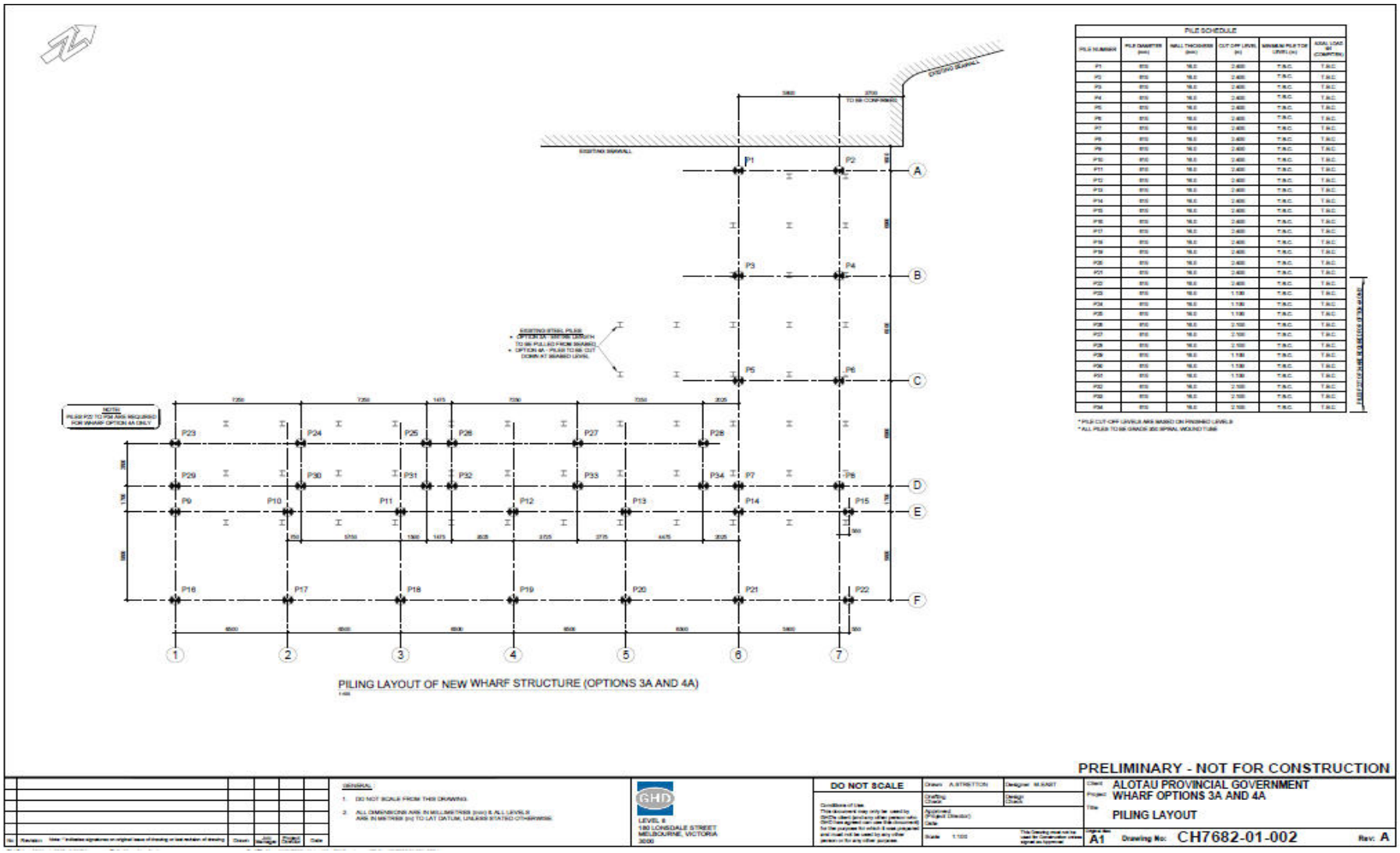


Figure 3.4: Split Level Wharf Option 4a – Main Wharf Deck - Plan and Sections

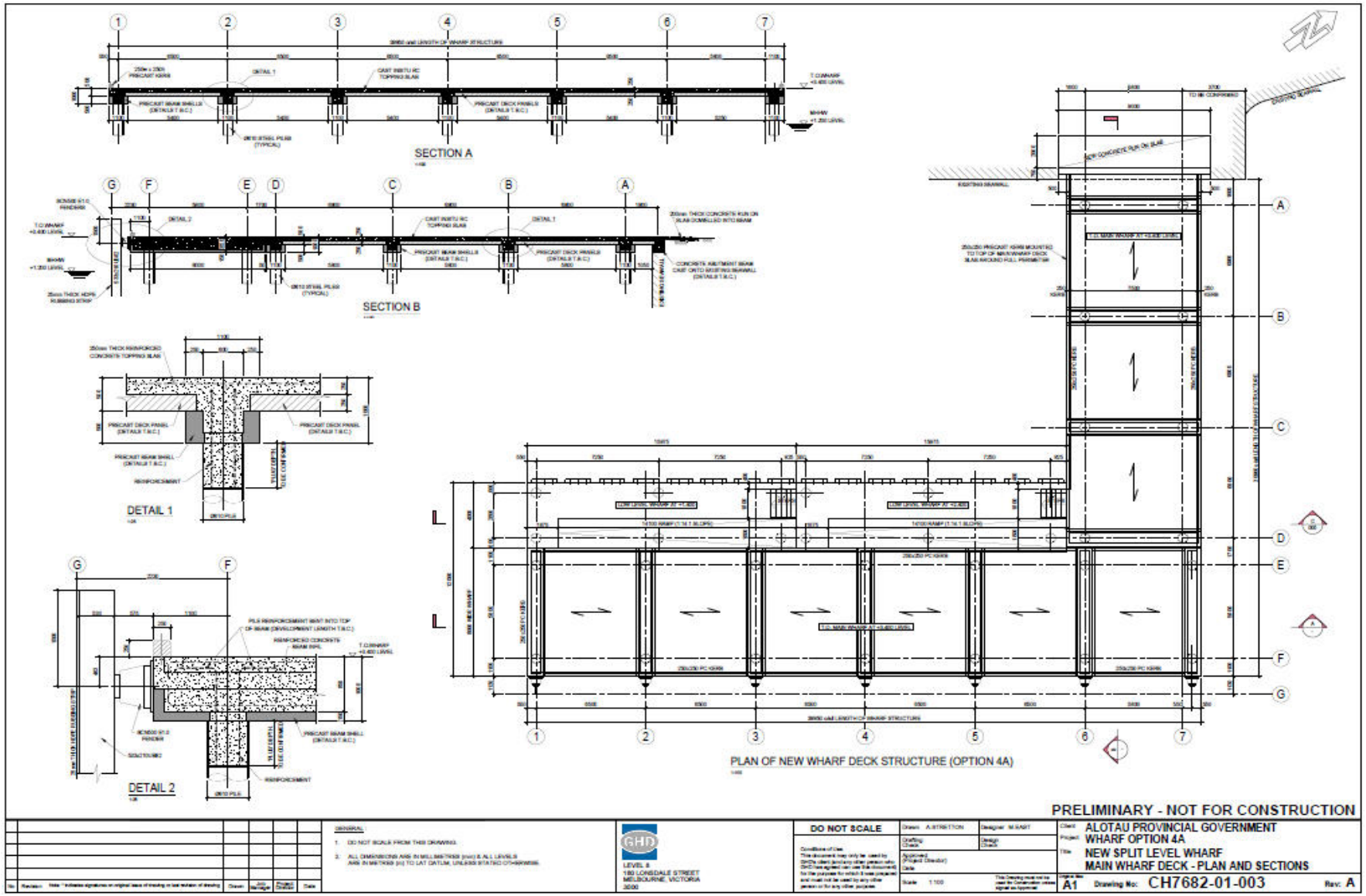


Figure 3.5: New Split Level Wharf Option 4 a – Elevation of Wharf

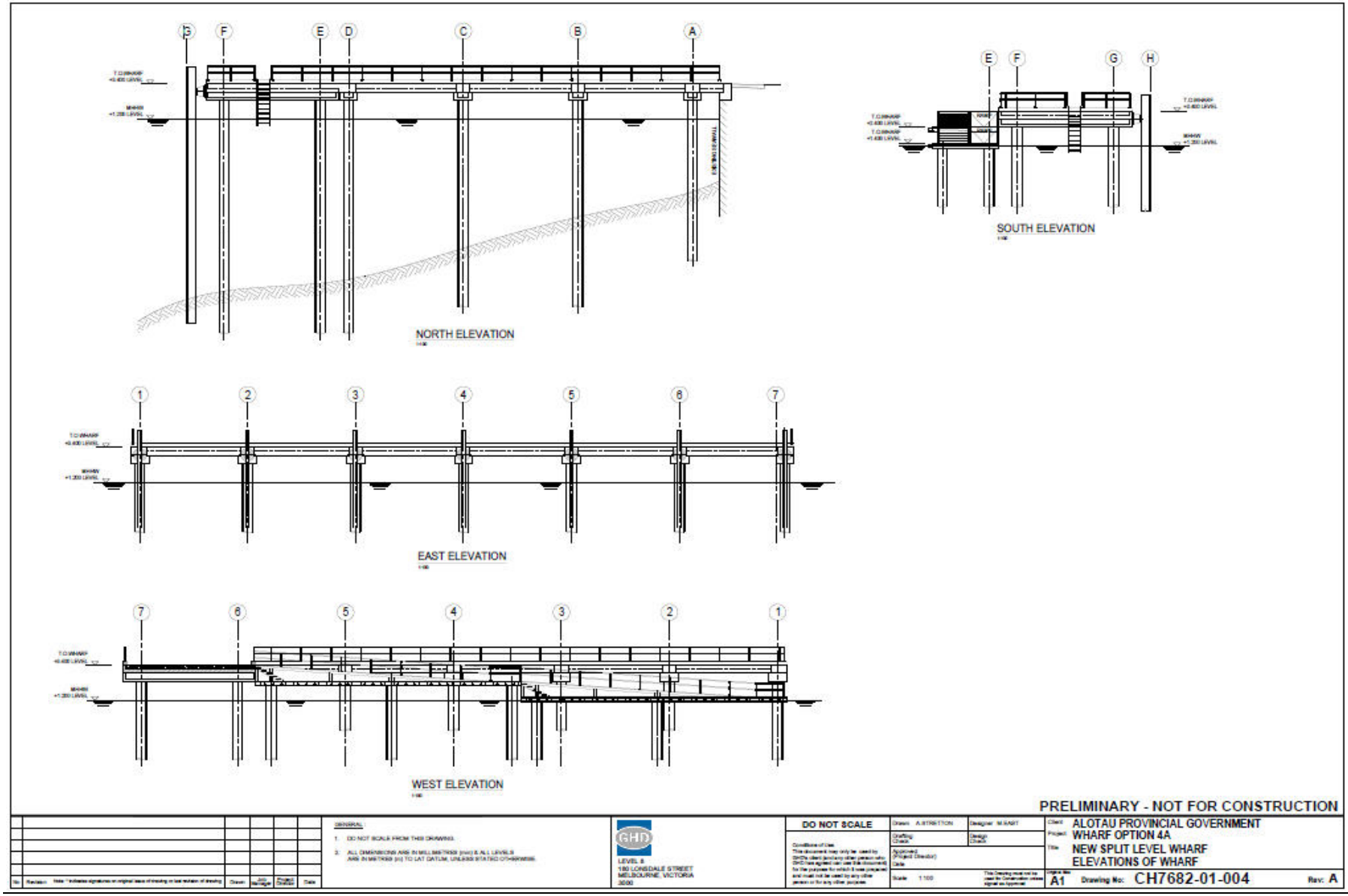
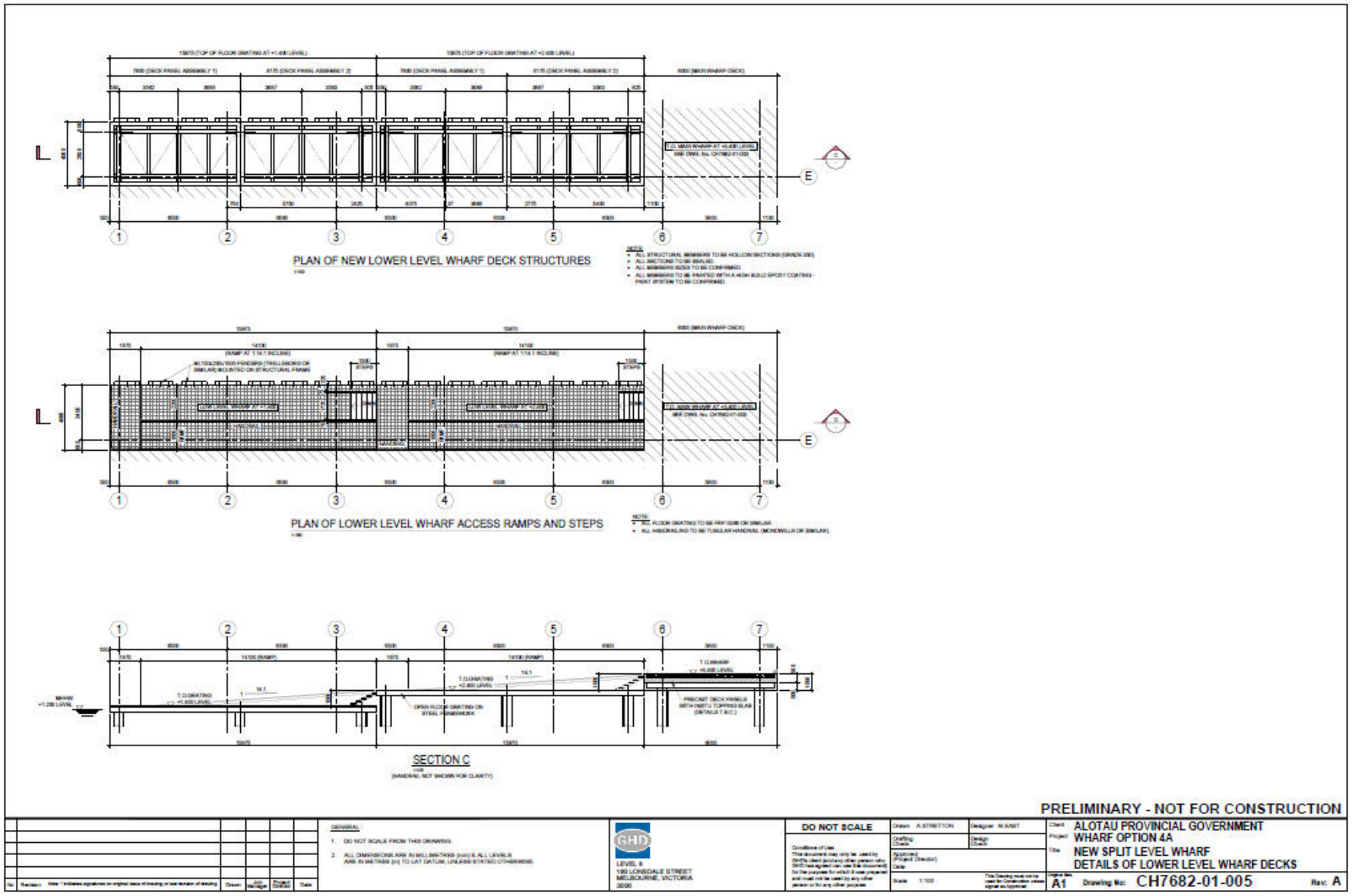


Figure 3.6: New Split Level Wharf - Details of Lower Level Wharf Decks Option 4a



IV. DESCRIPTION OF THE ENVIRONMENT

A. Location

55. **Milne Bay Province**. Milne Bay Province (Figure 4.1), located in the southeast of PNG, comprises the eastern peninsulas of the mainland of PNG together with some 600 islands, about 160 of which are inhabited, lying to the east and northeast of Milne Bay itself. The province covers 16,202 km² of land and 252,990 km² of sea. Alotau is the provincial capital, and lies on the northern shore, close to the head, of Milne Bay.

Figure 4.1. Milne Bay Province and Alotau Wharf

Source: Google Maps

56. **Alotau wharf**. Sanderson Bay is located in Milne Bay. The Alotau Wharf, is situated in Sanderson Bay, some 1 km southeast of the Alotau town center. The wharf is an L-shaped pier on the north-western shore of Sanderson Bay and south of the provincial jetty. Sanderson Bay includes mooring facilities, including a dinghy mooring area with a small jetty (north and northeast), private wharves (east), and the provincial jetty and the Alotau Wharf (northwest). The Alotau International Port lies to the southeast. In the center of Sanderson Bay are two navigational beacons denoting the reef (refer to Figure 4.2).

G. Project Area of Influence

57. The project influence area or impact area includes : (i) the directly impacted areas, covering the project construction footprint and immediately surrounding areas (as shown in Figure 4.3), considering the potential reach of impacts during construction; and (ii) indirect or extended areas of influence which include quarry sites, waste disposal site, sources of water for construction use, workers' campsites and sources of labor, and include the following areas: (a) sections of Abel Highway outside the main area of influence; and (b) access routes to and from the areas of influence. Potentially affected resources within the main area of influence are presented Table 4.1 below.

Figure 4.2: Sanderson Bay 2016

Source: Milne Bay Provincial Administration

Key: 1-Provincial Wharf; 2-Provincial Jetty; 3-Dinghy mooring area; 4-private wharves; 5-Alotau International Port

Figure 4.3: Project's Main Area of Influence

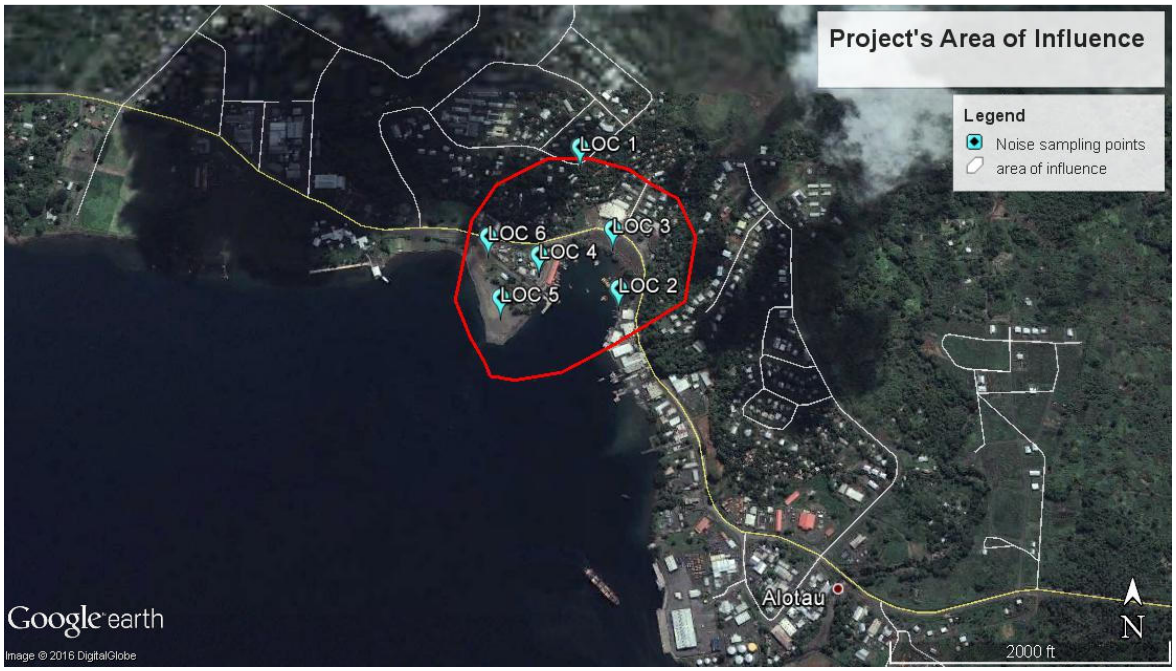


Table 4.1: Potentially Affected Resources

Natural Resource	Socio-economic Resource
• Sanderson Bay and its marine ecology • Milne Bay and its marine ecology	• Community (various sensitive receptors) - Boat and dinghy owners/operators & passengers - Transit Hotel caretakers & lodgers - Informal market administration, vendors & patrons - Business establishments' management/employees & patrons - Employees of MBPTA and NMSA - Pedestrians along Abel Highway - Management & employees of the two nearest private establishments to the east of the Bay - Users of Abel Highway - Residential communities and the management/employees & patrons of commercial establishments across Abel Highway • Existing maritime & maritime-associated facilities - Provincial jetty - Dinghy mooring area - Private wharves - Office building of NMSA • Existing utility lines in the area

H. Physical Environment

58. **Geology.** Three main components define the geological framework of Papua New Guinea, namely the: (i) Australian Craton; (ii) New Guinea Orogen; and (iii) Melanesian Arc.[4] Of the three components, the New Guinea Orogen is most relevant, as this component includes the Aure Fold Belt (see Davies 2009), which incorporates the Aure Deformation Zone and Eastern Fold Belt of Williamson and Hancock (2005), and the Port Morseby, Kutu and Menyamya terranes of Pigram and Davies (1987). From Figure 4.4, Alotau is situated in the Eastern Fold Belt.

59. The New Guinea Orogen comprises sedimentary and volcanic rocks that have undergone fold-and-thrust belt deformation and metamorphism, granitic and gabbroic rocks, and obducted oceanic crust. The Aura Fold Belt is composed of a thick sequence of mainly classic sedimentary rocks that were deposited from the late Oligocene to the Pliocene. East of about Port Moresby (where Alotau is found), these folded sedimentary rocks give way to thrust-bounded, strike ridges of Paleocene to Eocene fine-grained siliciclastic sedimentary rocks with minor coarser-grained Oligocene sedimentary rocks, all intruded by Oligocene gabbro of the Sadowa Gabbro during the early Eocene to middle Oligocene.

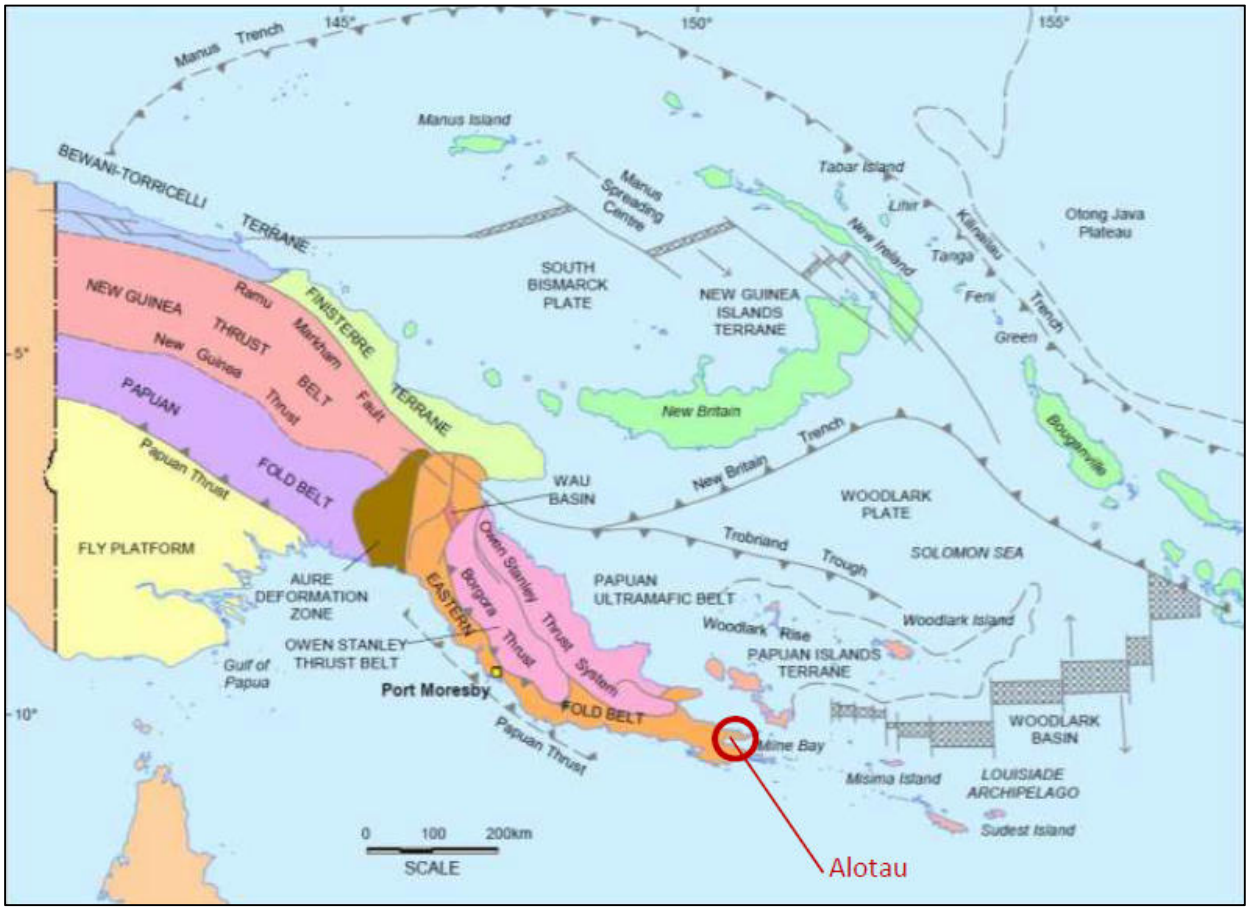
[4] Sheppard, S and Cranfield, LC, 2012, Geological framework and mineralization of Papua New Guinea — an update: Mineral Resources Authority, Papua New Guinea, 65p.)

60. **Landform**. Based on the regional geomorphological perceptions, the north coast of the region's mainland is made up of raised coral limestone and has no deep-water anchorage. [5] The eastern section of the Cape Vogel basin comprises low hills, flood plains and raised coral platforms.

61. The bay area, of which Alotau is part, is 28 kilometers long. At its western end, there is a Naura/Hagita plain with the Sagarai plain to the south and the Gadaisu/Mullins Harbor areas to the southwest. The bay areas are the province's only large area of flat land.

62. Alotau District stretches from the mountains at the end of the Owen Stanley Ranges to the coastal areas of the southeastern end of the mainland. The coastal areas are dominated by narrow plains and inland hills, while the interior of the district is mountainous. The major landform types of Alotau comprise the mountain and hill areas extending outwards into Sanderson Bay flanked by the narrow coastal plains on its eastern and western flanks (Table 4.2 and Figure 4.5).

Figure 4.4: Main Geological Elements of PNG



Source: Sheppard & Cranfield. Geological framework and mineralization of PNG — an Update. Mineral Resources Authority, Papua New Guinea (2012)

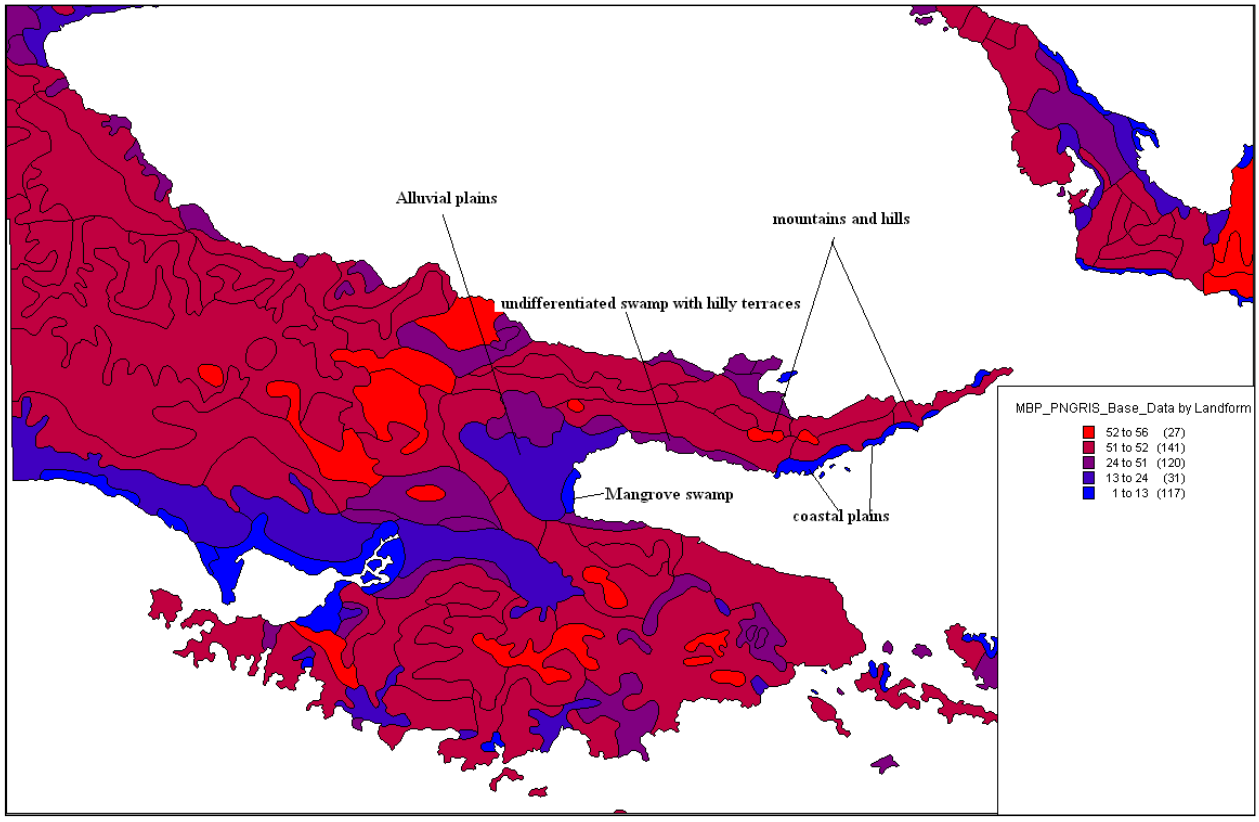
[5] Environment Unit-MBPA. 2017. Information on Alotau – Sanderson Bay.

Table 4.2: Alotau Landforms

Landform Type	Zone	Location
Littoral landform	The littoral landform consisted of Mangroves, estuarine plain and deltas and beach ridge plains, tidal flats, beach ridges and alluvial plain.	Parts of Alotau area
Alluvial Plains	The landform type includes small areas of alluvial fans and small narrow alluvial plains. It also includes ridges and v-shaped valleys associating with the relict surface and structural plateau.	Coastal areas of Alotau
Mountains	The steep land of the province having dominant slope over 30 degrees and high to very high relief (100 meters).	Upland Alotau area
Hills	Hilly landform environment is a complex and highly variable landform due largely to differences in relative resistance of the underlying bedrock in response to weathering and erosion. They are mostly form on sedimentary rock and have low relief (less than 100 meters) and slopes dominantly in the 20-30 degrees range.	Alotau area

Source: Information on Alotau – Sanderson Bay collected by the Environment Unit-MBPA (21 March 2017)

Figure 4.5: Major Landforms in PNG

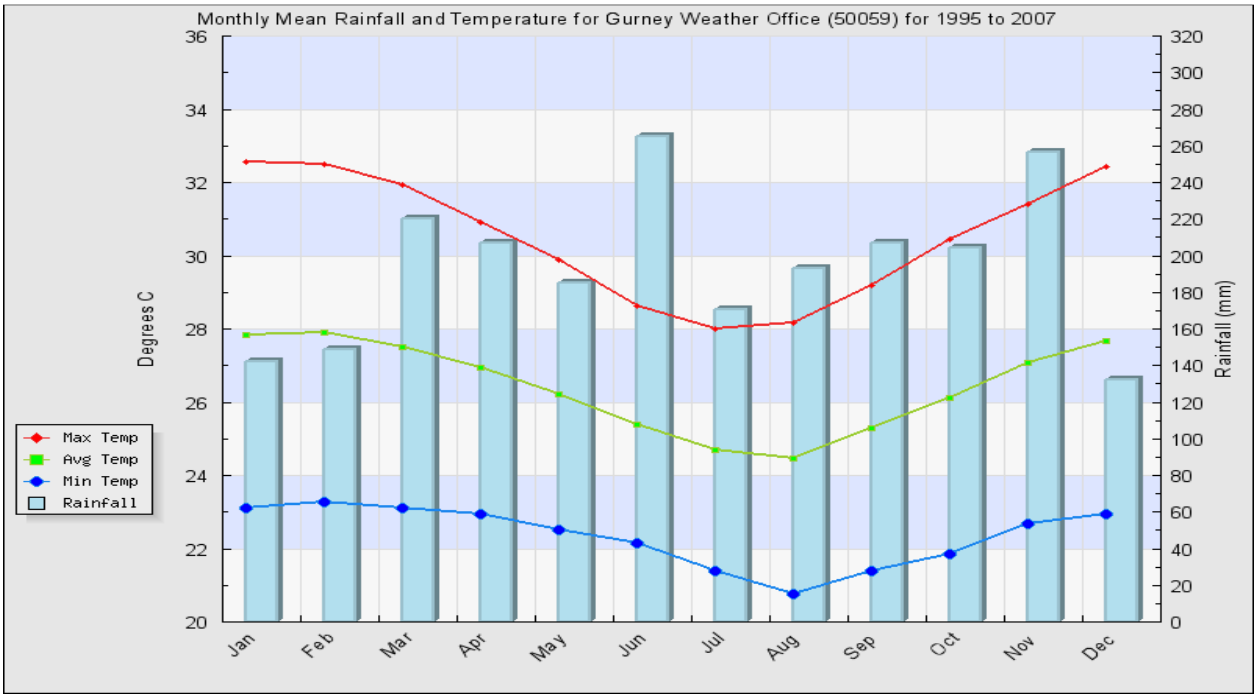


Source: Information on Alotau – Sanderson Bay collected by the Environment Unit- MBPA (21 March 2017)

63. **Climate.** Alotau climate is dominated by lowland humid climate (Type 3), with annual maximum temperatures slightly cooler than the drier lowland climates and average annual rainfall between 2,000 mm and 3,500 mm.[6]

64. In Gurney, Alotau, temperatures peak in the summer months during the Northwest wind monsoon season (December-January), during which maximum temperature reaches 33°C, minimum temperature reaches 23°C, and average temperature is 28°C. Temperature is lowest in August, at which point maximum temperature reaches 28°C, minimum temperature is between 20 and 21°C, and average temperature is between 24 and 25°C. Average annual rainfall in Gurney, Alotau is 2,368 mm, with an average monthly rainfall of 197.3 mm (Kulawin et al). During the Northwest monsoon wind season (December-March), monthly average rainfall is 156.7 mm, while the Southeast trade wind season (May-October) experiences a monthly average rainfall of 210 mm (Kaluwin et al), refer Figure 4.6.

Figure 4.6: Monthly Temperatures and Rainfall 1995 - 2007 - Gurney, Alotau



Source: PNG Alotau Wharf Climate Risk and Vulnerability Assessment, March 2017 after Kaluwin et al. 2011

Note: Gurney is about 13-14 km from Alotau town center.

65. **Climate Change.** For the period 1950-2009, the observed trends in air temperature at Port Moresby are as follows: (i) warming trends of a similar magnitude are evident in both annual and seasonal mean air temperatures; and (ii) air temperature trends are generally greater in the wet season that they are in the dry season and minimum air temperature trends are considerably stronger than maximum air temperature trends.[7]

[6] Environment Unit-MBPA. 2017. Information on Alotau – Sanderson Bay.
[7] Australian Bureau of Meteorology and CSIRO. 2011. Climate Change in the Pacific: Scientific Assessment and New Research. Volume 1: Regional Overview. Volume 2: Country Reports.

66. Annual and seasonal rainfall trends for Port Moresby for the period 1950-2009 and Kavieng for the period 1957-2009 are not statistically significant as shown in Table 4.3.

Table 4.3: Annual and Seasonal Temperature and Rainfall Trends - Port Moresby & Kavieng 1957-2009

	Port Moresby Tmax (°C per 10 yrs)	Port Moresby Tmin (°C per 10 yrs)	Port Moresby Tmean (°C per 10 yrs)	Port Moresby Rain (mm per 10 yrs)	Kavieng Rain (mm per 10 yrs)
Annual	+0.11	+0.31	+0.21	+7	-27
Wet season	+0.14	+0.32	+0.23	-4	-42
Dry season	+0.08	+0.31	+0.20	+4	+13

Source: Australian Bureau of Meteorology and CSIRO (2011).

67. Projections in surface air temperature and rainfall are presented in Table 4.4. Annual average air temperature will continue to increase, resulting in a rise in the number of hot days and warm nights and a decline in cooler weather. By 2090, annual mean surface air temperature is projected to increase by up to 3.4°C, 1-in-20-year maximum temperature is projected to increase by up to 4.2°C, and 1-in-20-year minimum temperature is projected to increase by up to 4.7°C, based on the upper bound of the 95% confidence interval for high emissions scenario (A2) projections. Average annual and seasonal rainfall is projected to increase over the course of the 21st century, consistent with the expected intensification of the West Pacific Monsoon and the Intertropical Convergence Zone. By the end of the century, total rainfall is projected to increase by a maximum of 36%, wet season (November-April) rainfall is projected to increase by a maximum of 35%, and dry season (May-October) rainfall is projected to increase by a maximum of 41%.

Table 4.4: Projected Change in Annual and Seasonal Mean Climate for PNG

Variable	Season	2030	2055	2090	Confidence
Surface air temperature (°C)	Annual	+0.7 ± 0.4 +0.8 ± 0.4 +0.7 ± 0.3	+1.1 ± 0.5 +1.5 ± 0.5 +1.5 ± 0.4	+1.6 ± 0.6 +2.4 ± 0.8 +2.8 ± 0.6	High
Maximum temperature (°C)	1-in-20-year event	N/A	+1.0 ± 0.9 +1.4 ± 0.9 +1.5 ± 0.7	+1.3 ± 1.0 +2.2 ± 1.3 +2.7 ± 1.5	Low
Minimum temperature (°C)	1-in-20-year event	N/A	+1.4 ± 1.8 +1.7 ± 2.0 +1.6 ± 1.8	+1.8 ± 1.8 +2.4 ± 1.9 +2.6 ± 2.1	Low
Total rainfall (%)*	Annual	+3 ± 13 +3 ± 13 +5 ± 9	+8 ± 13 +7 ± 17 +7 ± 13	+11 ± 13 +15 ± 20 +15 ± 21	Moderate
Wet season rainfall (%)*	November-April	+4 ± 12 +5 ± 11 +6 ± 10	+10 ± 13 +9 ± 17 +8 ± 12	+12 ± 12 +16 ± 18 +15 ± 20	Moderate
Dry season rainfall (%)*	May-October	+1 ± 15 +1 ± 16 +4 ± 12	+7 ± 16 +5 ± 20 +6 ± 17	+10 ± 16 +15 ± 24 +15 ± 26	Moderate

Notes: Projections are given for three 20-year periods centered on 2030 (2020-2039), 2055 (2046-2065) and 2090 (2080-2099), relative to 1990 (1980-1999). The margin of error represents 95% of the model projections.

Emission scenarios: B1 – low (blue); A1B – medium (green) and A2 – high (purple).

Source: Australian Bureau of Meteorology and CSIRO (2011).

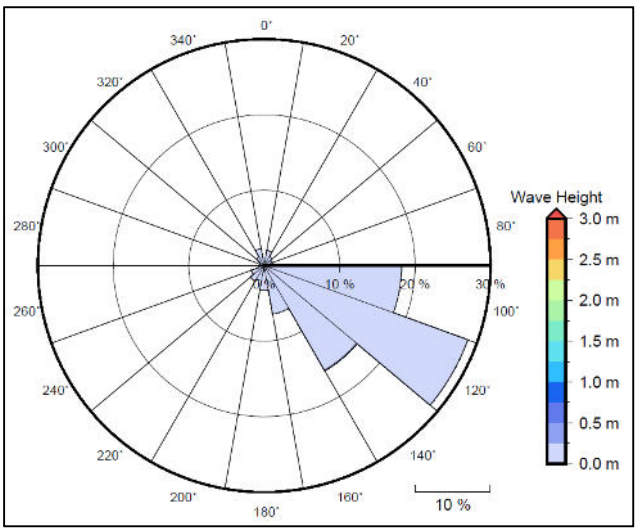
68. **Wave Climate.** In Alotau, the average sea state is calm, particularly during the period dominated by winds from the Southeast.[8] Rapid changes in periods of wave direction or amplitude are seldom experienced. Wave conditions tend to be consistent, meaning that they vary little within a few hours. The waves reaching Alotau are generally produced by the trade winds blowing the wave across hundreds of kilometers, although conditions are invariably calm and almost never rough. The principal direction, where waves occasionally come from is the Southeast (120°), refer to Table 4.5, Figure 4.7 and Annex A.

Table 4.5: Alotau - Mean Wave Conditions 1979 - 2010

Mean wave height	0.09m
Mean wave period	2.23s
Mean wave direction [° True North]	121 °
Mean number of wave components	0.46
Mean annual variability [m] (%)	0.02 m (21.5 %)
Mean seasonal variability [m] (%)	0.10 m (110.1 %)

Source: Wave Climate Report – Alotau. Waves and Coasts in the Pacific. Obtained from http://gsd.spc.int/wacop/

Figure 4.7: Alotau - Annual Wave Rose and Mean Wave Conditions 1979 - 2010



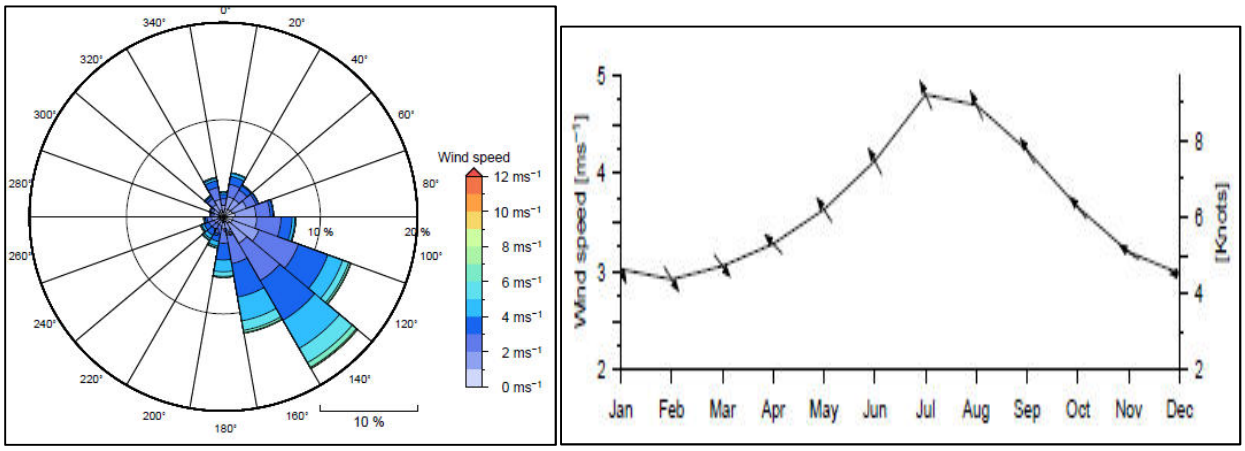
Source: Wave Climate Report – Alotau. Waves and Coasts in the Pacific. Obtained from http://gsd.spc.int/wacop/

69. **Wind.** The southeasterly wind season spans the period from April/May to October, while the shorter northwesterly wind season spans November/December through March.[9] Surface winds are the strongest during the Southeasterly Wind season, during which average wind speed is 15 knots; during the Northwesterly Wind season, average wind speed is approximately 10 knots

[8] Wave Climate Report – Alotau. Waves and Coasts in the Pacific. Obtained from http://gsd.spc.int/wacop/.
[9] ADB. 2017. Alotau Wharf Climate Risk and Vulnerability Assessment.

(Kaluwin et al. 2011). In Alotau, the prevailing wind is dominated by southeasterly trade winds, with a mean wind speed of 3.64ms^{-1} (7.08knts) from the 134° (refer to Figure 4.8).[10]

Figure 4.8: Alotau - Annual Wind Rose and Monthly Wind Speed and Wind Direction



70. Milne Bay is currently exposed to cyclones, although most cyclones directly affecting Milne Bay have strengths corresponding to Tropical Storms and Severe Tropical Storms, below Cyclone Category 1 strength. From 1967-2016, six cyclones crossed within 100 km, seven crossed 100-200 km away, 12 crossed 200-300 km away, and 22 crossed 300-400 km away from Gurney, Alotau (Kaluwin and Kilepak 2017). The tropical cyclone season occurs between November and April, overlapping with the entire Northwesterly Wind season and the beginning of the Southeasterly Wind season, and an average of six cyclones per decade occur within 400 km of Port Moresby (PCCSP 2013). Tropical cyclones occur most frequently during El Niño Southern Oscillation-neutral years (at a rate of eight cyclones per decade) and least frequently is during El Niño and La Niña years (a rate of four cyclones per decade) (PCCSP 2013).

71. **Water quality**. There is lack of baseline data on water quality of Sanderson Bay. Pollutants enter Sanderson Bay from point and non-point sources. Point sources include the discharges from maritime vessels, people (litter), sewer discharge pipes of septic tanks of establishments around the bay, and the bunkering operations (drips/leaks). Non-point sources are runoff form the streets and land around the bay, potential atmospheric deposition, discharges from a creek and discharges from drainage channels. A water quality baseline survey, and surveys of benthic flora and fauna, will be undertaken during, or concurrently with, the detailed engineering design stage and the IEE and environmental management plan (EMP), as required, will be updated accordingly.

72. **Air Quality**. There is no available baseline data on air quality in Alotau. There is no entity providing professional services in air quality monitoring is based in Alotau. The main, sources of air pollutants in Alotau Town, as well as in the Project's main area of influence, include light industrial activities; operation of vehicles, generator sets, and ships; and burning of solid waste and yard wastes. However, none of these sources result in observed or reported air pollution. The air quality in Alotau, including the Project's main area of influence, is considered good.

73. **Natural Hazards.** Current hazards experienced in the Milne Bay Province include southeasterly surge and tropical cyclone-generated storms. Tropical cyclones are particularly common within the Far Eastern Region of the Province, including the Misima, Sudest, and Rossel

[10] Op cit footnote 8.

Islands. Additionally, residents of coastal areas and low-lying islands report that they are already experiencing the impacts of climate change-induced sea-level rise, including coastal erosion and salt water inundation (Samof 2007). Based on the AWARE environmental risk screening tool, PNG has a high-risk rating in sea level rise and a low risk rating from a Category 1 storm.

74. Figure 4.9 taken from the record of PNG's Historical Tropical Cyclone Activity from 1945 to 2008, shows no storm tracks passed through Alotau over this period. Key informant interviews held in February 2017 confirmed that Alotau only experiences the effects of tropical cyclones centered elsewhere nearby. Due to its location, PNG is generally at risk of being subjected to earthquakes. However, the historical records of earthquake activities from 1900-2008 show that Alotau is not earthquake prone. Informal discussions with locals confirmed that Alotau only experiences the effects earthquakes centered elsewhere nearby (refer Figure 4.10).

Figure 4.9: Historical Tropical Cyclone Activity 1945 - 2008

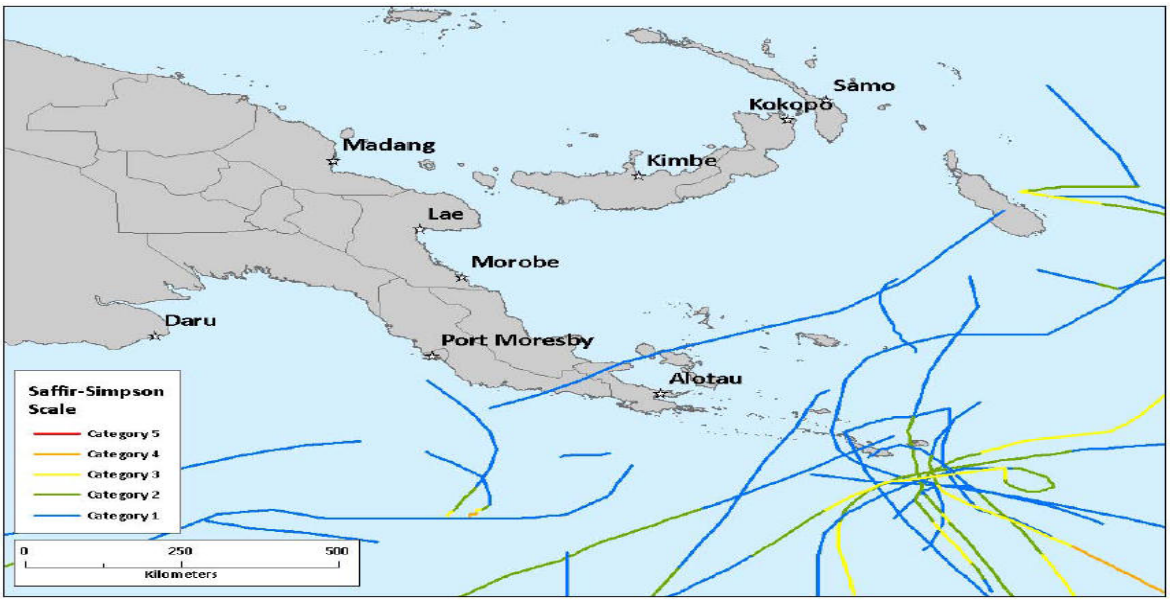
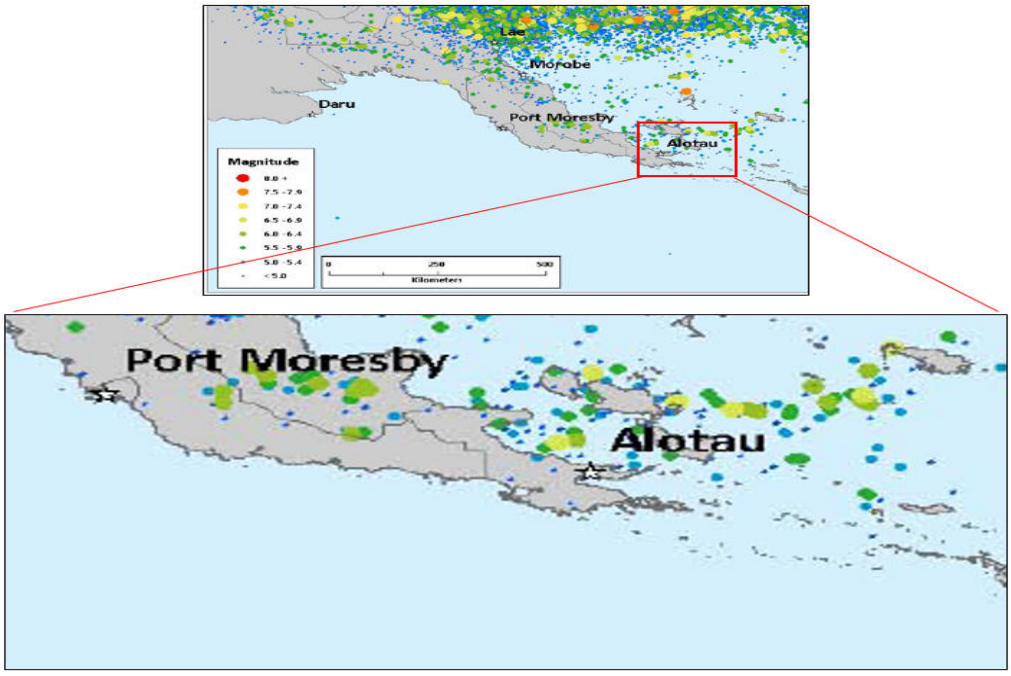


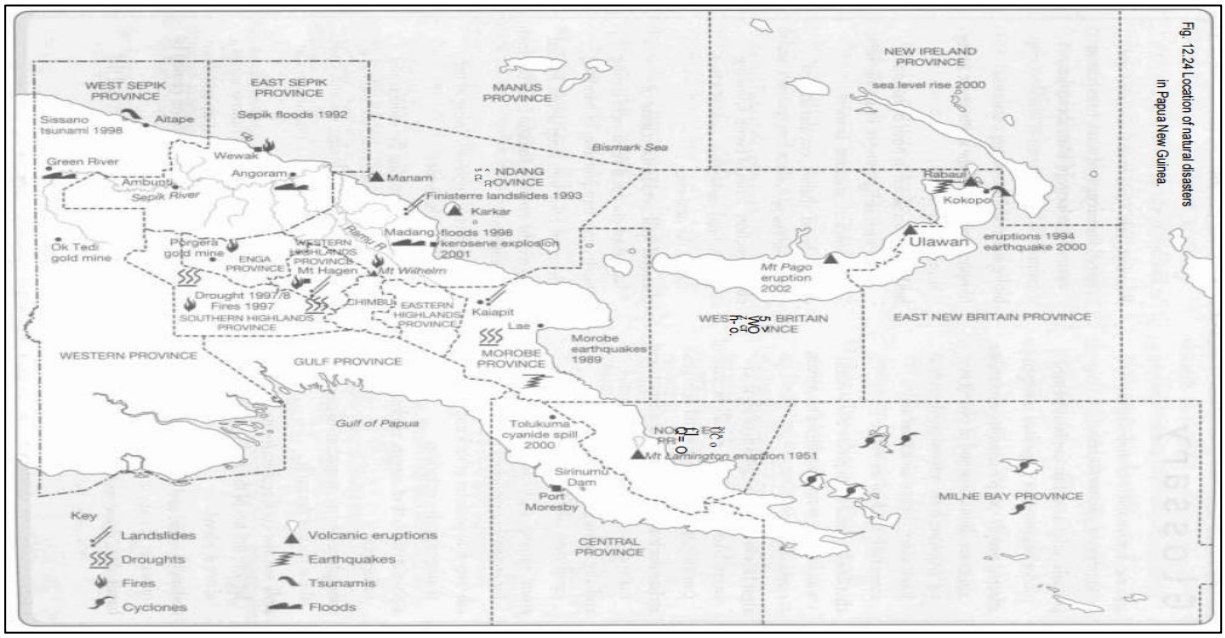
Figure 4.10: PNG's Historical Earthquake Activity 1900 – 2008



Source: Air Worldwide Corporation (2008)

75. The AWARE risk assessment tool indicates that PNG has a high risk rating from landslide. Figure 4.11 shows that Alotau is not prone to landslides. Furthermore, informal discussions with locals has confirmed that Alotau is not landslide prone.

Figure 4.11: Location of Natural Disasters in Papua New Guinea



Source: Lauer. S - Natural Hazards and Disasters in Papua New Guinea (2004)

I. Biological Environment

76. **Sanderson Bay.** The marine environment of Sanderson Bay comprises beaches, foreshore reefs, intertidal zones, reef flats as well as shallow terraces. Each of these environments comprises different types of marine fauna known to various marine habitats identified in the area, which also are found in many of the shorelines in nearby areas making the chances of re-colonization in any affected area greater. Sanderson Bay marine environments are heavily degraded and the trend of recovery might not be great due to the current scope of work set to inhibit the growth of marine re-colonization in many of the reclaimed zones.[11]

77. The vicinity along the existing Provincial Wharf at Sanderson Bay was among the 53 sites visited during the conduct of rapid biodiversity assessment of the coral reefs of Milne Bay Province by Conservation International in September/October 1997 in collaboration with the Milne Bay Provincial Administration. It was the first-ever systematic effort to document marine biodiversity in the province. The survey broadly classified the 53 sites into five. The site along the Provincial Wharf (or Alotau Harbor (10°18.63'S, 150°27.07'E) under the survey) was classified under "silty bays and harbours". According to the survey report, these sites: (i) were invariably low in biodiversity; (ii) were habitats often overlooked due to low visibility; (iii) were highly sheltered in areas susceptible to siltation due to proximity to terrestrial runoff; and (iv) often harbored luxuriant growths of hard and soft corals in shallow water.[12]

[11] Planning & Coordination Division – MBPA. 2010. Sanderson Bay Foreshore Development Environment Impact Brief.

[12] Conservation International. 1998. A Rapid Biodiversity Assessment of the Coral Reefs of Milne Bay Province (PNG)

78. The survey report has described the Alotau Harbour site as follows: *"Heavily silted coastal reef environment; bottom of harbor (28 m depth) relatively flat with thick layer of fine silt, but surprisingly large sections of live coral (mainly tabular Montipora and Mycediurn); on west side of harbor a solid reef rises up steeply from harbor bottom to depth of about 3-4 m, then gradually decreases in depth towards shore; reef edge and shallows with an excellent variety of corals, particularly Porites, Acropora, Pectinia and Pocillopora; bottom of harbor with incredibly large population of the tiny hovering goby Bryaninops natans) and an abundance of Colin's Damselfish (Pomacentrus coloni), endemic to southeastern Papua New Guinea."*

79. The survey also identified 111 species of fish: mostly from the damselfish, gobies, wrasses, butterfly fishes, cardinal fishes, blennies etc. The Coral Fish Diversity Index value for Alotau Harbor was 68, interpreted as "poor" relative biodiversity. According to MBPA, the coral shallow reefs discussed in the survey report is the area occupied by the reclaimed land where the Transit Hotel is. No other biodiversity assessment of coral reef has been undertaken anywhere near the Alotau Wharf since then. No benthic baseline data is available. The lack of benthic flora and fauna data is a gap that will be filled during the detailed engineering design stage.

80. **Terrestrial Vegetation.** The vegetation type found around Alotau comprises lowland hill forest followed by mangrove forest (alluvium forest) along the major delta of the rivers mostly around Maiwara to Wagawaga. Lowland forest extends from sea level to 1000 meters above sea level. Most of the lowland forest is degraded to secondary forest as a result of logging along the upland areas of Padipadi and further clear-cut felling for oil palm development.[13] In the Project's main area of influence, a few trees can be found: (i) at the beach in front of the dinghy mooring area; (ii) inside MBPTA office compound; (iii) inside NMSA compound; (iv) at the end of the access road close to Abel Highway; (v) inside the compound of NAKO Fisheries, Ltd.; and (vi) inside the compound of Islands Petroleum. The upward sloping low-density residential area of Middle Town (across Abel Highway, at least 150 m from the wharf) is largely vegetated. No trees will be felled under the Project.

81. **Marine Ecology.** Secondary information was collected from various sources. The latest study on marine ecology, dated 2015, was funded through AusAid in collaboration with PNG Government Agencies through the CEPA.[14] The study subdivided the marine ecology of PNG into marine ecoregions and marine bioregions (Figure 4.12). The project site, Alotau Wharf, is within the Solomon Sea Marine Ecoregion and Samarai Marine Bioregion.

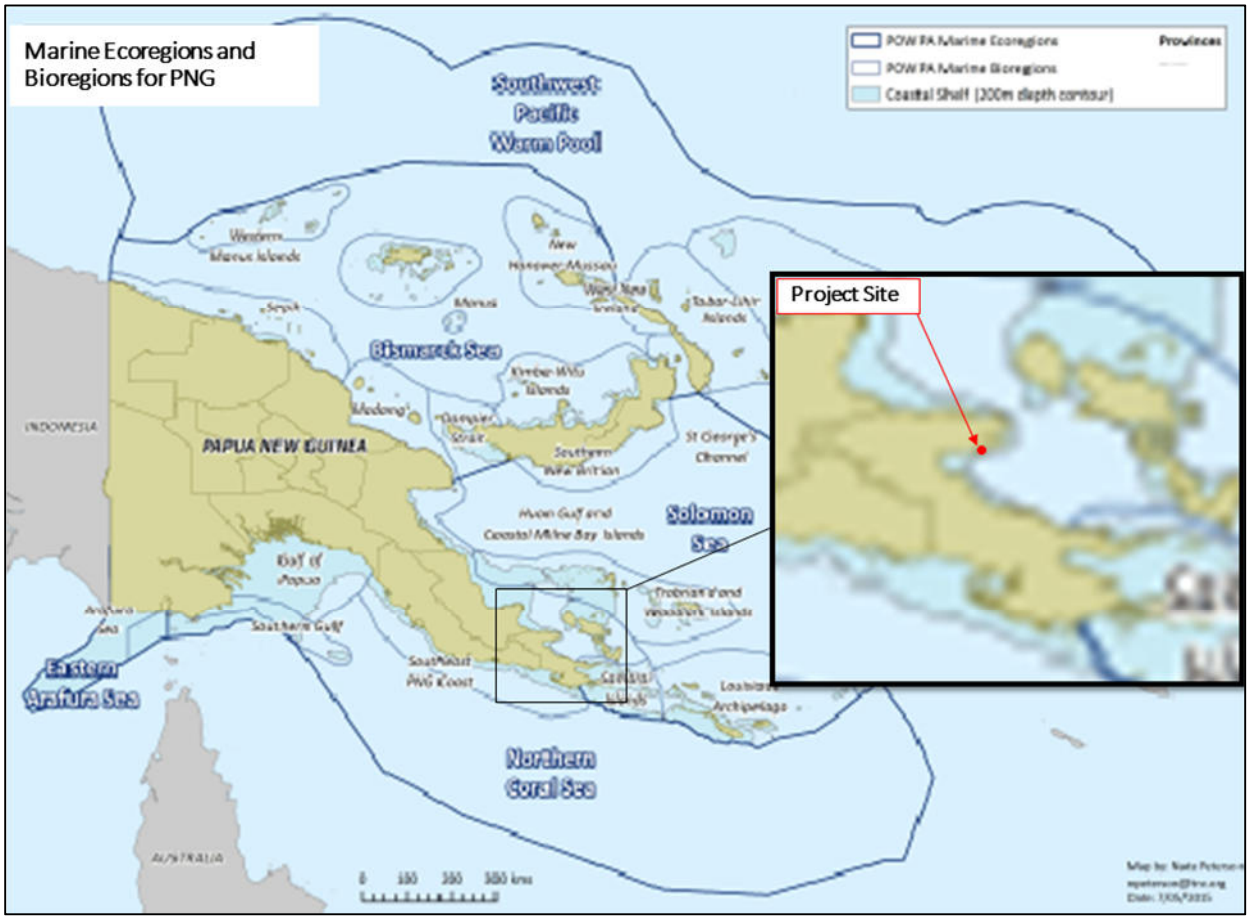
82. The report showed no representations of the following habitat types in Solomon Sea region, where the project is located: (i) important bird areas; (ii) spawning aggregation;[15] (iii) important turtle sites; and (iv) important whale sites. There was also very low representation of: (i) mangroves, (ii) deep habitats, and (iii) coral reef. The site visit in February 2017 confirmed that the above habitat types were not observed at the project site.

83. PNG is committed to the establishment of a network of marine protected areas to fulfil national and international commitments. To assist this, the conservation priority areas analysis identified a range of areas of high conservation interest in the PNG marine environment, based on the principles of comprehensiveness, adequacy, representation and resilience (CARR). The report presented key areas that addressed the CARR principle.

[13] Environment Unit-MBPA. 2017. Information on Alotau – Sanderson Bay.
[14] CEPA. 2015. National Marine Conservation Assessment for Papua New Guinea (Port Moresby, 51pp).
[15] A 'spawning aggregation' is a predictable gathering of adult fish for spawning (www.marinecsi.org)

84. The resulting maps identify areas of high conservation interest that should be prioritized by the PNG Government for further assessment. Areas for conservation priorities, considering existing protected areas, included Milne Bay in the Samarai Marin Bioregion as low priority.

Figure 4.12: Marine Ecoregions and Bioregions of PNG



Source: CEPA. National Marine Conservation Assessment for PNG (2015)

85. The overlap of high priority conservation areas and high shipping traffic maps, particularly in the Western Manus Islands and Milne Bay, was identified. Most of the marine area in Milne Bay was noted as areas for conservation priority. The project area, however, was noted as low priority conservation area. Annex C features the relevant maps from the study.

86. During the detailed design stage, baseline surveys including water and marine ecology (including benthic flora and fauna) will be undertaken. The EMP will be updated, as required, at that time.

J. Socio-economic Environment

87. **Noise.** Ambient noise baseline data was not readily available. Initial measurements were undertaken in March 2017 in six locations in the Project's main area of influence. The findings, shown in Table 4.6 below, were validated in April when readings were taken using a calibrated hand held sound meter manufactured to the IEC651 Type 2 standard (see Annex B).

88. Of the six locations, the daytime averages of three locations (Look-Out Point, NAKO and dinghy mooring area) has met the EHSG's daytime guideline for residential areas. Those for the remaining three locations (Pik n Pay Supermarket, Transit Hotel and Informal Market) has met the EHSG daytime guideline for commercial/industrial areas (for further detail refer to Annex B.)

Table 4.6: Ambient Noise Baseline Data - March 2017*

Measurement Location			AM		PM	
Area/Place	Distance from Wharf **	Description of Community	Ave (dB)	Max (dB)	Ave (dB)	Max (dB)
1 Look-Out Point, Middle Town^	320 m	Within a low density residential community, across Abel Highway	40-42	66-77	38-47	72-83
2 NAKO Fisheries, Ltd.	150 m	Light commercial/light industrial, east coast of Sanderson Bay	40-52	70-80	39-50	71-78
3 Dinghy mooring area	175 m	Beach along the Abel Highway	51-54	69-81	49-53	71-82
4 Pik n Pay Supermarket	50 m	Commercial, about 25 m across the Provincial Jetty	57-58	73-79	58-60	77-81
5 Transit Hotel	100 m	Residential with informal vendors	51-60	64-78	52-60	75-81
6 Informal Market	175 m	Commercial, along the access road to the wharf	57-62	78-81	56-62	78-81
EHSG Daytime Guideline (dBA)		Residential	55			
		Commercial/Industrial	70			

* Note: The measurements were taken using Android apps sound meter to establish initial data.

^ Look-Out Point - approx. 50 m elevation. Distance (320m) estimated horizontal distance from wharf.

** Approximate distances measured from google maps.

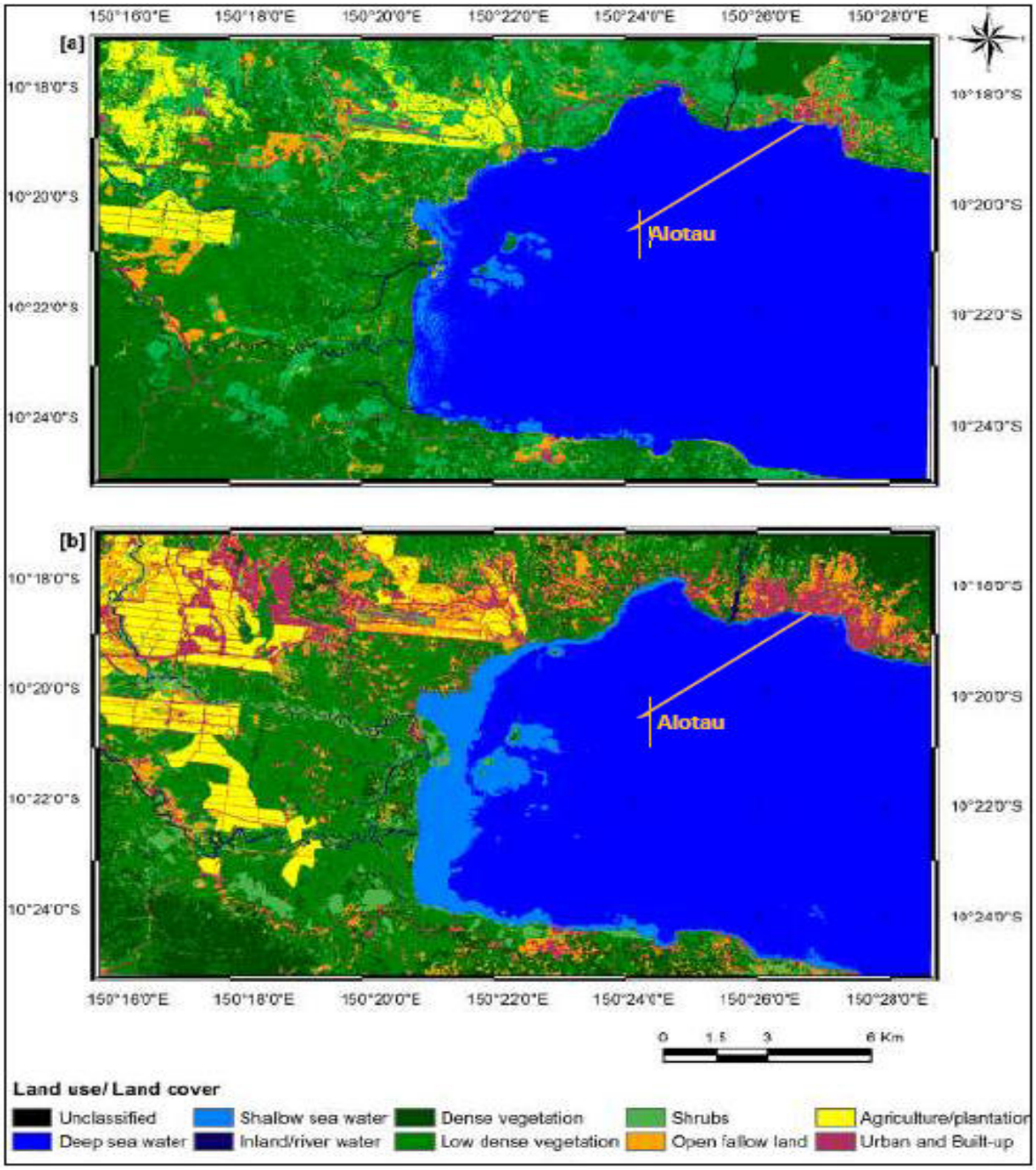
89. **Land Use Development.** Information on land use/land cover in Alotau is very limited. Land use plan (with zoned areas) was not available during data gathering and site visit in February 2017. A published paper by Samanta, S. and Pal, D.K. (2016)[16] noted changes in land cover through geographic information system (GIS) remote sensing data spanning over the last 20 years (1992-2014).

90. The coastal areas in Sanderson Bay used to be low dense vegetation, open fallow land and urban built-up area in 1992. It was noted to have become a fully urbanized area by 2014 based on GIS image (Figure 4.13). This is confirmed in an image of the vicinity of the project area captured in Google Earth Pro (Figure 4.14). The immediate areas surrounding Sanderson Bay are currently devoted to commercial, institutional and light industrial uses. Sanderson Bay is bordered to the west by the following: (i) reclaimed land for the Transit Hotel; (ii) an informal market immediately north of the Transit Hotel; (iii) a green area adjacent to the Transit Hotel that is being redeveloped for the local office of the NMSA; (iv) unpaved access road alongside the NMSA compound and the informal market leading to the Alotau Wharf; (v) an area north of the access road occupied by Islands Petroleum storage tank farm, the office compound of the MBPTA and by two business establishments (Pick n Pay Supermarket Ltd. and Milne Chan Enterprises Ltd).

[16] Samanta, S. and Pal, D.K. 2016. *Change Detection of Land Use and Land Cover over a Period of 20 Years in Papua New Guinea*. Natural Science # 8, pp.138-151. http://dx.doi.org/10.4236/ns.2016.83017

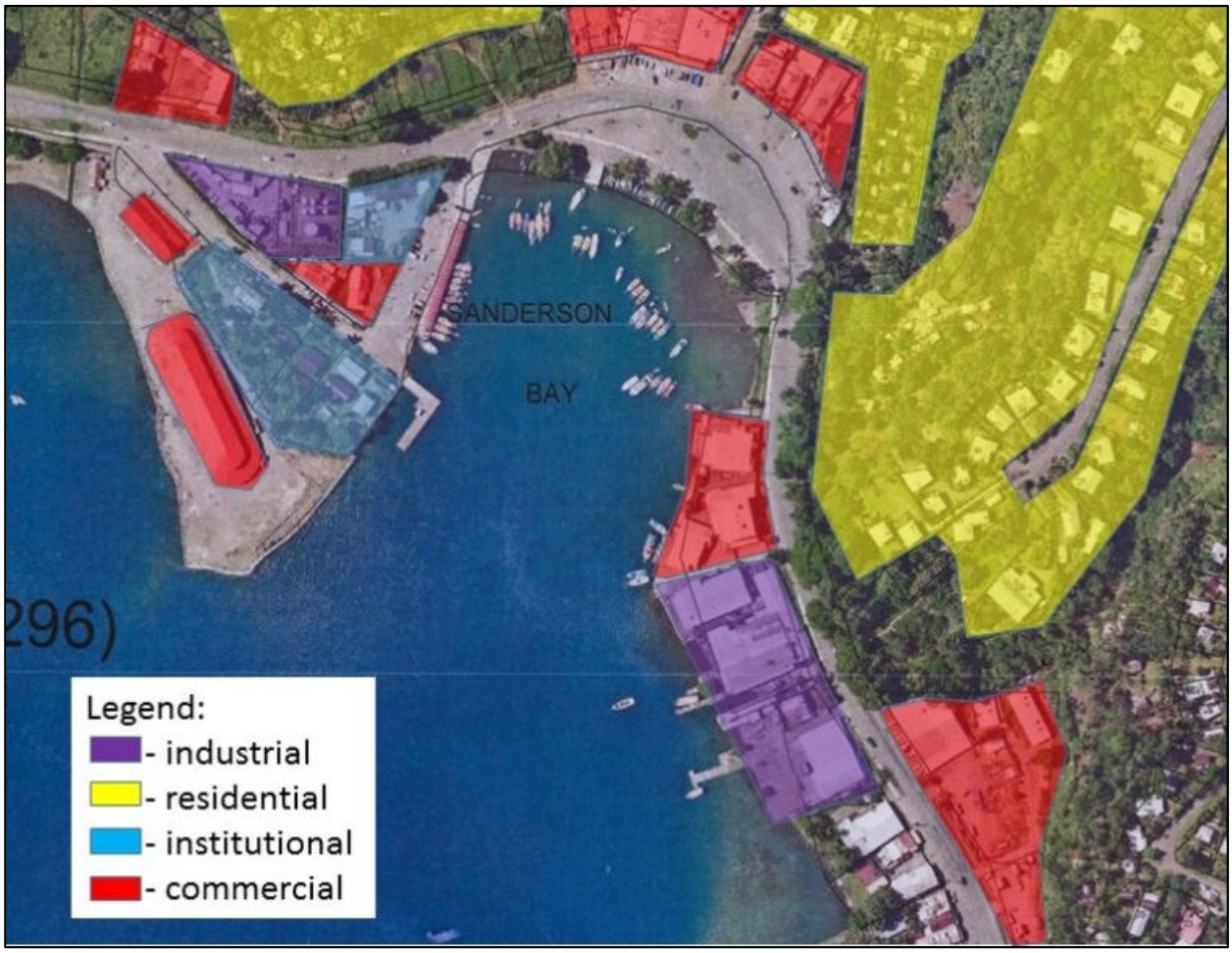
91. Imports of petroleum products are currently delivered to the Provincial Wharf in a 3640 DWT tanker and are pumped ashore using a pump mounted on the wharf. It is proposed to move the tank farm and deliveries to the International Port and the wholesale activities to the eastern shore of Sanderson Bay. The vacated site will then be redeveloped as a supermarket.

Figure 4.13: Land Use/ Land Cover Map of Alotau in 1992 [a] and 2014 [b]



Source: Samanta, S & Pal, D.K. *Change Detection of Land Use and Land Cover over a Period of 20 Years in Papua New Guinea*. Natural Science # 8 (2016. pp. 138-151. http://dx.doi.org/10.4236/ns.2016.83017)

Figure 4.14: Land Use/Land Cover Map of Sanderson Bay Area



Source: Google Maps

92. To the north and northeast of the Bay, the remaining beach of Sanderson Bay is used as a dinghy mooring area. A small jetty exists here, but is seldom used since the site is becoming shallower. A few large trees line the coast and provide shade to lounging dinghy passengers and boat owners and operators. Discharging into Sanderson Bay are a creek and a pair of drainage channels.

93. Bordering the landside edge of the beach is Charles Abel Highway. Across Abel Highway, terrain to the northwest and northeast rises with some houses on the slopes.; while the terrain in between remains flat with a strip of low-intensity commercial establishments, after which, the terrain begins to rise. To the east, urban development is characterized by low-intensity commercial and low-to-moderate intensity industrial activities, including the Alotau International Port.

94. **Population.** Based on the population census in 2011, Milne Bay then had a total population of 276,512 or 3.8 percent of PNG population.[17] The province had 55,262 households or 4 percent of total PNG households. The District of Alotau had: (i) 99,539 people or almost 36 percent of Milne Bay Province's population; and (ii) 19,226 households or almost 35 percent of Milne Bay Province's total households. Alotau Town (Alotau Urban) had 11,857 population or 4.3 percent of Milne Bay Province population and 1979 households or 3.6 percent of the Province's households. Averaged household size in Alotau Town is 6.0, higher than the Province's 5.0.

95. Milne Bay Province is projected to grow at an average annual growth rate of 2.5% in the next ten years. By 2021, Alotau Town is estimated to reach nearly 15,200, an increase of about 3,300 persons (or 28% of the 2011 population). In the project's area of influence, the nearest residential communities are those in the southern fringe of Middle Town and western fringe of Top Goilanai. These low density communities are at higher altitudes (estimated at least 20-25 m above the Abel Highway) and from the northern edge of Sanderson Bay overlooking the Sanderson Bay. At the wharf area, outside the caretakers in the Transit Hotel and owner and some management staff of the Pick and Pay Supermarket, there are no permanent residents. Table 4.7 presents the identified sensitive receptors in the project's area of influence.

Table 4.7: Sensitive Receptors in the Project's Main Area of Influence

Sensitive Receptors	Approximate distance to wharf
At the wharf's immediate vicinity	
Caretakers and transit lodgers of Transit Hotel	At least 85 m
Users of the provincial jetty (boat operators & passengers)	20-25 m
Management, employees and patrons/clients of Pick-n-Pay Supermarket and Milne Chan (business establishments)	50 m
Dinghy operators and passengers	Within 170 m
Employees of the MBPTA	Within 100 m
Employees of the NMSA	Within 20 m
Pedestrians along Abel Highway	At least 120 m
Users of Abel Highway	At least 125 m
Management & employees of NAKO Fisheries Ltd. and users of NAKO wharf	At least 140 m
Management, vendors & patrons/clients of the Informal Market	At least 175 m
To the north of Sanderson Bay, across Abel Highway	
Management, employees & patrons/clients of business establishments at the foot of Middle Town & Top Goilanai	At least 230 m
Low-density communities in the southern fringe of Middle Town and western fringe of Top Goilanai (particularly the few residents on the slopes)	At least 170 m

[17] National Statistical Office. 2011. National Population and Housing Census of Papua New Guinea - Final Figures. https://www.nso.gov.pg/

96. **Roads.** Most roads in Alotau Town are single carriageways, largely without sidewalks on either side. There is no concrete road in Alotau. Approximately 130 km of the existing roads are asphalt-paved. About 90 kms are unpaved provincial roads. In the project's area of influence, the Abel Highway is paved with a paved footpath on one side; but all internal roads have unpaved and exposed surfaces.[18]

97. **Water Supply**. Water supplied to Alotau Town is sourced from both surface water and groundwater. Surface water is drawn from Goilawaligina Creek, which has a constant flow; while groundwater is extracted through boreholes at Koiabule (KB) and Raven. Water from Goilawaligina Creek and the KB boreholes is conveyed to the Garuboi Water Treatment Plant. The system has 5 reservoirs, i.e., one main reservoir at the back of the water treatment plant and one each at Top Town, Middle Town, Cameron High School and Goilanai. According to the Water PNG Business Centre in Alotau, by December of 2016, 1,640 HHs of Alotau urban area were connected to the system.[19] (The number of connected households represented about 74% of the estimated 2016 total urban households).[20] The Project's main area of influence is served by the piped water supply system of Alotau-Water PNG. The Provincial Jetty has water taps, although water from these taps is reported as not potable. The raw water comes from the borehole in Raven, Gaoilainai, water from which is not conveyed to the water treatment plant.

98. **Sanitation and Wastewater Management**. Most sanitation facilities in Alotau town are connected to septic tanks for primary wastewater treatment. There still exist a few households using pit latrines. Effluents from septic tanks discharge to water bodies, seepage pit, or (in the case of the provincial general hospital and one secondary school) to drainage channels. There is no sewerage system in Alotau. The Alotau Urban Local Level Government (AULLG) has no desludging equipment. For desludging, the AULLG engages the services of the lone private desludging services provider in town. [21]

99. In the Project's main area of influence, private establishments and government offices have sanitation facilities. A public toilet (with 3 toilets and 2 showers each for female and male) can be found near the informal market. This facility is meant to serve the informal market and Transit Hotel - a user pays PGK 1 for each use of toilet and/or shower. Constructed in 2012 by the MBPA, the facility was handed over to the AULLG for management. In the last quarter of 2016, the facility was ordered closed by health inspectors of MBPA as the facility has become unhygienic from backflow. The facility's septic tank is full and has not been de-sludged.

100. **Drainage.** An underground storm water drainage system has been provided in the town center (or town's central business district). Outside the town center, drainage facilities are either road side earth ditches or absent. In the project's area of influence, drainage facilities are a combination of: (i) underground drainage and open concrete lined drainage along the access road from the wharf to Abel Highway; (ii) open concrete lined drainage at one side of the informal market; and (iii) earth ditches on one side of the Transit Hotel site and of Abel Highway.

[18] Information obtained from key informant interviews with Mr. Wesley Katobwau, Project Officer, Works Supervision Unit-MBPA (22 February and 14 March 2017).

[19] Information obtained during key informant interview with Mr. Tau Siamweni Lauwasi, Team Leader Customer Service, Alotau Water PNG (22 February 2017).

[20] Total population of Alotau Urban in 2016 was estimated to be 13,415. Assuming the household (HH) size of 6 by 2011 census remained applicable in 2016, total HHs by 2016 would be 2,235. The 1,640 households connected to the system, therefore, represented some 74% of the total 2016 HHs.

[21] Information obtained during key Informant Interviews with Mr. Mickey Gahinem, AULLG (20 February 2017).

101. **Solid Waste Management**. All legally subdivided lands are provided with solid waste collection services. But efficiency is not 100%. Scheduled collections are sometimes missed. Solid wastes from public places are collected once weekly. In the wharf area, AULLG tries to collect solid waste from bins twice weekly. Collection vehicles include one unit each of $8m^3$ and 6 m^3 compactor trucks and 2 open dump trucks (of 3 and 2 tonnes). Solid wastes in all illegal settlements that cannot be reached are not collected. Solid waste is disposed of openly in a site at Gehua, some 2.5 km from the town center.

102. **Power Supply.** Power is generated by two pairs of generator sets which have become ineffective to meet the demands of Alotau Town. Power supply is rationed, with those without generators sets being prioritized. The project area of influence is connected to the power grid although power outages can last for 7-8 hours. PNG power is trying to rectify the grid. It is proposed to develop hydropower supplies in Alotau.

103. **Health Care and Education.** The provision of health care and educational facilities are constrained by land availability issues. Current health care facilities in Alotau include one health center and one general hospital with a 150-bed capacity. A second health center is programmed to be built in 2017. Presently, not all wards have an elementary school. (Goilanai, Koebule (KB) and Bottom Town). There are two secondary schools (Cameron Secondary school and Hagita secondary school), 1 vocational school, 1 branch of a university of Port Moresby, and one nursing school. There are three private schools, namely Goilanai Baptist School, Melton School and Alotau International School. None of the existing health centers, hospitals or schools are within the Project's main area of influence.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

104. This section of the report identifies and assesses the potential environmental impacts associated with the design and pre-construction, construction and operation phases of the proposed Project. Specific mitigation and monitoring measures for any potential impact are also presented below.

A. Design and Pre-Construction Phase

105. The issues or activities that would need to be acted on or conducted during the design and pre-construction phase would mainly relate to environmentally and socially preparing the Project, key players and affected communities for construction.

106. **The limited open land in the project's vicinity** has raised the concerns of: (i) where to locate the temporary construction facilities and work areas, such as site office, stockpiles, sanitation facilities, vehicle and equipment parking, among others; and (i) how to facilitate the entry and exit of construction vehicles and equipment, while ensuring public safety and minimal disruption of socio-economic activities in the Project's immediate area of influence. These issues and concerns can be mitigated as follows: The conduct of adequate consultations, coordination and joint planning with the stakeholders on the: (i) location of temporary facilities and work areas, e.g., stockpiles and storage areas, sanitation facilities; and (ii) measures to mitigate anticipated traffic along the access road to the wharf and congestion at the intersections of the access road with Abel Highway and the internal road beside the informal market leading to the Transit Hotel. This will mitigate public health and safety risks and disruption of socio-economic activities in the vicinity.

107. **Baseline data on environmental quality in Alotau.** The lack of baseline data will make monitoring and assessment of the changes that the Project will cause on the environment during construction and operation difficult. However, during detailed engineering design, surveys to establish baseline data for ambient air quality, marine water quality, marine flora and fauna (including benthos) and noise and vibration at the Transit Hotel site will be conducted.

108. **Institutional readiness of executing and implementing agencies**. To mitigate this issue/concern: Ensure that the CCDA-PMU and the MBPA and its PIU have made the necessary arrangements for, and mobilized, the agreed environmental and social and gender specialists to be engaged as part of the PISC team. The PISC, with MBPA-PIU, will facilitate orientation workshop(s) for safeguards implementation for the project including the EMP requirements and monitoring and reporting. Monitoring and reporting forms will be prepared by the PISC prior to the commencement of construction mobilization, and the PIU must have familiarized itself with the forms. As suggested by the MBPTA through the capacity needs assessment, technical assistance in the form of project management and capacity-building support will be provided during project implementation for institutional strengthening and "hands-on" training in the environmental management of the Project.

109. **Project's compliance with country system requirements.** The CDA-PMU and the PIU will engage with CEPA and prepare the 'notice of preparatory works' and submit to CEPA. Subject to the project screening and scoping undertaken by CEPA (as per Environment Act 2000), if required, prepare an environmental assessment report (based on the IEE). The updated EMP cleared by ADB will also be submitted to CEPA for information and/or approval along with application for an environmental permit.

110. **Ensuring environmentally responsible procurement.** The measures include the following: Update of the EMP as required based on detailed design and baseline surveys to be undertaken during or prior to the detailed design stage and include the ADB-cleared EMP in the bidding and contract documents. Include in the contract the requirement for the contractor to prepare the site-specific EMP (SEMP) that will respond to the EMP included in the bid and contact documents. Ensure the contract requires the submission by the contractor of a monthly environmental monitoring report, outline to be appended to the contract. Ensure the contract stipulates some tie-up of progress payment and collection of performance bond with the performance in SEMP implementation.

111. **Review and clearance of the SEMP.** Management measures will include: (i) ensure the contractor has engaged environmental and social safeguards specialists, as required, prior to preparation of the SEMP; (ii) ensure that the contractor prepares a SEMP that addresses the updated EMP and any environmental permit conditions. The SEMP will include: aggregates management plan, sediment and erosion control, solid and hazardous wastes management, hazardous substances management, spills response, traffic management; health and safety (workers and community); (iii) the PIU with assistance from the PISC will review the SEMP; (iv) ensure the SEMP has been cleared and instruction to commence works has been issued to the contractor by the Engineer; (v) the contractor's team are prepared and inducted to the site and receive awareness about the approved SEMP and other matters through the conduct of orientation on the SEMP; and (v) ensure the contractor has set up and adequately equipped the emergency response team and linked the team with MBPA's Disaster Risk Response Team.

112. **Community preparation for construction.** Measures to mitigate issues and concerns include conducting awareness and disclosing information in a timely manner following the communications and consultation plan (CCP) at the latest one month prior to construction mobilization to inform the affected communities of the: (i) implementation period, contact and other details, such as probably restricted area to use along access road or potential blocking of access road from pedestrians, (ii) potential risk of communicable and transmittable diseases brought with the entry of outside workers, (iii) overall health and safety hazards during construction, and (iv) GRM. Post details on project implementation at strategic locations in the main area of influence at the latest one month prior to construction mobilization. Details to include, among others – implementation period, name and contact details of the contractor and focal persons of the PIU and if required relevant staff in the CCDA-PMU.

B. Construction Impacts on Physical Environment

113. **Deposits on or contamination of the seabed** resulting from the demolition of the existing wharf and building of the new wharf. These activities would involve: (i) disturbance of the seabed where piles are extracted and new piles installed leading to re-suspension, diffusion and settlement of the existing sediments that may include contaminants; and (ii) some unavoidable deposition of new sediments, rubble and/or contaminants. The works would not involve any dredging, excavation and filling under water or over land. It is expected that the disturbance of the seabed would be minor, localized and of a temporary nature. The seabed would not be significantly impacted.

114. The measures to mitigate impacts on the seabed would be: (i) the installation of containment booms fitted with turbidity curtains around an effective area for the construction works and movements over water, prior to construction (the curtain may require being rolled, removed and cleaned at regular intervals). At completion of the construction works, the curtain is to be rolled and removed so that sediments caught on the curtain are not deposited on the seabed; and (ii) a

moveable silt curtain around the piles to be extracted each day in the event excessive turbidity (when water has completely lost its transparency or clearness) is observed in the first few extractions. The conduct of seabed sediment monitoring at least once, within 15 days from construction demobilization, is recommended. The results will be assessed against the baseline data established during the detailed engineering design stage.

115. **Impacts on coastal zone.** Construction activities will take place in the area where the 50-year old wharf is located. Only piles will be constructed to support the deck of the wharf. Potential impacts to or modification of coastal processes, water course and hydrology with impacts to sedimentation rates and patterns and coastal erosion are foreseen to be none, or extremely low.

116. **Reduced local air quality.** Suspended particulates in air and gas emissions are potential sources of air pollution. Construction activities that would contribute to the generation and suspension of particulates include: (i) demolition of the concrete decks and structural supports of the existing wharf; (ii) transport, loading/unloading and storage of cement, natural aggregates, rubble and dry solid wastes and other materials; (iii) movements of construction–associated vehicles over unpaved roads/surfaces; and (iv) on-site concrete mixing for the reinforced concrete topping slab. Wind action on stockpiles of cement, fine natural aggregates, rubble and solid wastes is another source of suspended particulates in air. Except during windy days, fugitive dust and fine aggregates would not be transported beyond the Project's main influence area.

117. Potential sources of gas emissions include the: (i) operation of construction equipment/vehicles, including generator sets; (ii) burning of solid and hazardous construction wastes; and (iii) storage and use of high volatile organic compounds (VOC)-emitting products such as fuel and specialty applications, e.g., paint coating for corrosion protection. It is expected that the impacts on air quality would be moderate during peak construction period, but can be easily mitigated. For the rest of the construction period, impacts on air quality are expected to be minor and to remain localized. Measures to mitigate the impacts on air quality are presented in Table 5.1 below. The conduct of air quality monitoring on a quarterly basis is recommended.

Table 5.1: Measures to Mitigate Impacts on Air Quality

Impact	Mitigation Measures
Suspended particulates/dust in air	▪ Spray water on concrete decks and structural elements to be demolished. ▪ Securely cover trucks that are hauling aggregates, cement and other similar materials and maintain a minimum 2 feet freeboard. ▪ Spray water on access road at least twice daily. ▪ Limit speed of construction vehicles to 30 kph when in Project's main area of influence. ▪ Manage the delivery of natural aggregates, cement and other similar materials to the site to minimize having more stockpiles than necessary. ▪ Set up temporary fences/walls (as applicable) between work/stockpile areas and sensitive receptors at the provincial jetty, Transit Hotel and along access road. ▪ Ensure that stockpiles are securely covered. ▪ Ensure concrete batch plant has dust suppression equipment.
Gas emissions	▪ Reduce vehicular movements through coordinated/managed transport of materials, spoils and waste and use of bigger capacity trucks for hauling of wastes/spoils, where access roads allow. ▪ Ensure construction vehicles/equipment are regularly serviced and maintained to industry standards. ▪ Turn off equipment/vehicle when not in use. Limit engine idling to a maximum of 5 minutes. ▪ Use clean fuel (green) power generator sets. ▪ No burning of wastes.

118. **Impacts on marine water quality.** The extraction of piles of the existing wharf, the driving and installation of the new piles and sand compaction will cause the re-suspension of sediments. The new piles will need to be driven to refusal or to rock at 13.5 m depth (depending on geotechnical survey results) to achieve the required bearing and lateral capacity. Since a construction barge will be employed, the maneuvering and anchoring of the barge would also cause disturbance of the seabed. Re-suspension of sediments will cause turbidity that would be temporary and expected to be confined within the area of influence of the under water works.

119. Uncontrolled sediments from the demolition of concrete decks and structural elements of existing wharf; from on-site concrete works; from silt-laden runoff from stockpiles; and from accidental spills of fine aggregates will contribute to an increase in suspended solids and turbidity. Inadequately managed rubble from demolition works, solid and hazardous wastes, wastewater and hazardous construction materials (including accidental spills) would contribute to reduced marine water quality. However, it is expected that the impact would be temporary, confined within the area of influence of construction works, and can be easily mitigated. Some mitigation measures are presented in Table 5.2. The conduct of water quality monitoring on monthly basis and after extreme rainfall is recommended.

Table 5.2: Measures to Mitigate Impacts on Marine Water Quality

Issue contributing to reduced water quality	Some Mitigation Measure
Re-suspension of bottom sediments and uncontrolled sediments from activities	▪ Apply appropriate equipment and alternative techniques/ technologies in pile extraction and driving, sand compaction, demolition of decks and other structural elements, on-site concrete works--- that would generate least re-suspension of bottom sediments and/or facilitate control of new sediments entering water. ▪ Use floating booms with silt curtains. ▪ Provide proper formwork around on-site concrete works. ▪ Stockpile natural aggregates away from main surface drainage routes. ▪ Use silt fences, sandbags, barrier nets at the effective side/s of stockpiles.
Inadequate management of debris/rubble, other solid wastes and hazardous wastes	▪ Enforcing waste minimization, reuse and segregation. ▪ Have adequate covered storage containers, color-coded, clearly marked. ▪ Separate enclosed storage areas for solid and hazardous wastes. ▪ Dispose of residual wastes (post recovery and recycling) at designated disposal site. ▪ Coordinate with AULLG for the disposal of hazardous wastes.
Inadequate wastewater management	▪ Provide adequate sanitation facilities, adequate water supply. ▪ Strictly enforce observance of good sanitation practices.
Inadequate management of hazardous materials	▪ Use less hazardous materials, ensuring all are legibly marked and labelled. ▪ Hazardous materials securely stored with clear caution signage. ▪ Restrict vehicle/equipment maintenance and repair on-site. ▪ Vehicles transporting hazardous materials equipped with spill kits.
Accidental spill on site.	▪ Implement the accidental spill response plan in the SEMP. ▪ Set up a fully equipped emergency response team to be present on site.

C. Construction Impacts on Biological Environment

120. **Impacts on marine ecology.** The proposed wharf project will involve an estimated 12 months of construction works, including mobilization, demolition and construction, which could be considered of a short-term duration. The existing deck will be demolished. The existing piles will be extracted. New steel pipe piles will be driven into the seabed. Some on-site concrete works will follow. A construction barge will almost certainly have to be used, when necessary. The maneuvering, anchoring, tugging and potential spills during the barge's operations are sources of direct impacts on the seabed and its habitats.

121. All these activities and operations will: (i) create elevated levels of sound and vibration under water that would be disturbing to marine life; (ii) involve the re-suspension of sediments causing increased turbidity and thereby reducing water quality; (iii) deposition of rubble and chips contributing to turbidity and introducing new sediments into the benthic zone, potentially reducing productivity; (iv) risk potential leakage of petro-chemicals and/or hydrocarbons from vessels or land-based vehicles into the marine environment; and (v) directly disturb the habitats in the benthic zone and other mobile marine resources in the influence area of the works. However, the impacts would be temporary, confined within the area of influence of construction works, and can be easily mitigated. There would be insignificant or no potential impact on:

- Alteration of areas of high biodiversity value: There is no indication of seagrass and mangrove area within or adjacent to the project site. The potentially impacted area is not considered of high terrestrial and aquatic biodiversity value or an area required for the survival of critically endangered or endangered flora and fauna.
- Alteration of aquatic habitat, including the physical removal/suspension of seabed sediments or covering of the seabed through dredging and disposal activities: The project site is the site of the old wharf. The new wharf is to be positioned such that dredging is not required during construction. Hence, there is only temporary and short-term alteration of habitats during the construction.
- Loss of habitat and sites of importance for the conservation - there are no identified IBAs or biodiversity areas[22] in the Project's area of influence. The closest wildlife management area is Sawataitai Island (>50 km north-east of Alotau).[23]

122. To mitigate impacts on marine ecology: (i) implement the sediment control plan, solid and hazardous waste management plan and hazardous materials management plan in the SEMP; (ii) adequate preparation in spills response as prescribed in the Spills Response Plan in the SEMP; and implement the recommended measures to mitigate impacts on marine water quality (Table 5.2). Periodic and random detection survey of leaks from construction equipment and associated vehicles must be a routine task of the environmental safeguard staff of the Contractor's Team. Repairs must be acted on immediately at the earliest detection of a leak. Leaking equipment or vehicles must be removed from the project's main area of influence immediately. Repairs should be done off-site.

[22] An IBA is an area identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations. The program was developed and sites are identified by BirdLife International. Currently there are over 12,000 IBAs worldwide. These sites are small enough to be entirely conserved and differ in their character, habitat or ornithological importance from the surrounding habitat.

[23] World Database of Protected Areas 2016. www.protectedplanet.net

123. The conduct of monitoring of marine flora and fauna, including benthic, at least once, within 15 days after construction demobilization is recommended. Monitoring results are to be assessed against the baseline data established during the detailed engineering design stage.

D. Construction Impacts on Socio-economic Environment

124. The anticipated impacts on the socio-economic environment include: (i) noise and vibration; (ii) impacts on the sustainability of urban services (explained in succeeding paragraph); (iii) traffic congestion, both vehicular and pedestrian, at the intersection of the access road with Abel Highway and the internal road leading to the Transit Hotel; (iv) local flooding from indiscriminate stockpiles of natural aggregates, and possibly Contractor's container storage; (v) potential social conflicts from hiring workers from outside; (vi) disruption of socio-economic activities; (vii) public health and safety hazards; and (viii) workers' health and safety hazards. These impacts will be minor, intermittent/temporary and localized and can be readily mitigated.

125. **Noise.** Construction processes and activities, e.g.: (i) demolition of existing wharf deck and associated structural elements and pile extraction and driving; (ii) operation and movement of construction vehicles and equipment that are diesel-powered and without efficient mufflers; and (iii) the unloading of coarse natural aggregates, will generate noise and vibration. Noise is expected to reach the communities along the slopes rising to Middle Town. The change in noise level is expected to be moderate to high during the peak construction period (particularly pile driving), but can be easily mitigated. For the rest of the construction period, noise impacts are expected to reduce as construction works near completion.

126. Some measures to mitigate noise include: (i) applying alternative concrete demolition techniques that emit lower noise, e.g., improved expansive grout, micro-blasting, hydro-demolition (whichever would be most applicable to the project situation); (ii) avoiding conventional pile extraction and driving (press-in piling is an alternative technology that is reportedly emitting lower noise); (iii) setting up noise barriers such as temporary fence, without gaps, around active work areas, and barriers to be as close to the source or to the receptor location as possible; (iv) installing sound-absorbing enclosures around generators; and (v) restricting the use of noisy equipment to the period from 8am and 5pm.

127. **Vibration.** Based on consultations with lodgers of the Transit Hotel, vibration is felt inside the hotel when a car or a small bus travels over the reclaimed land. The foundation of the hotel building is a set of footings that are not rested on piles. For this reason, following the structure condition survey to be undertaken prior to the commencement of construction, it is recommended to monitor vibration at this area weekly during the peak construction period. To mitigate vibration, restrict heavy equipment and vehicles to move over the reclaimed area where the Transit Hotel is located. Ensure highly vibrating mechanical equipment have vibration isolation. The conduct of vibration monitoring (only near Transit Hotel) on a weekly basis is recommended.

128. **Impacts on the sustainability of urban services.** The following will potentially impact on the sustainability of urban services: (i) inadequate management of waste, silt & aggregate stockpiling during construction, resulting to these finding their way to drainage channels along the access road and potentially along Abel Highway, compromising the effectiveness of the channels; and (ii) the large volume of solid wastes generated, particularly from the demolition and pile extraction works–for collection and disposal--straining further the limited capacities of AULLG in waste collection services and the town's disposal site.

Table 5.3: Measures to Mitigate Impacts on the Socio-economic Environment

Impact	Mitigation Measure
Impacts on the sustainability of the following urban services: ▪ drainage channels along the access road and potentially along Abel Highway from wastes, silt and aggregate stockpiling ▪ solid waste collection services and disposal services at Gehu from the large volume of solid waste generated, from demolition and pile extraction works	▪ Manage stockpiles: - Stockpile natural aggregates away from main surface drainage routes. - Use silt fences, sandbags, barrier nets at the effective side/s of stockpiles. - Divert offsite runoff around the project site. - Dispose of excess soil as soon as possible. ▪ Manage the large volume of solid waste: - Enforce waste minimization, reuse and segregation. - Arrange with private recycler/s for the recovery of recyclables and for the management of the recyclables as soon as these are generated to mitigate concerns on storage and disruptions in the Project's main are of influence. - Arrange with a private contractor for the prompt collection of residuals and hazardous wastes. - Ensure coordination with AULLG on the solid and hazardous waste management and agreement with AULLG on the disposal site/s for these wastes.
Traffic congestion (vehicular & pedestrian) at the intersection of the access road to the wharf with Abel Highway and the road leading to the Transit Hotel	▪ Coordinate traffic management scheme implementation with the local traffic authorities & affected communities. ▪ Post traffic (flag) persons during entire working hours. ▪ Spread out schedule for materials delivery in non-peak hours. ▪ Manage arrivals/departures of trucks. ▪ Ensure stockpiles do not impede/obstruct traffic flow.
Local flooding from indiscriminate stockpiles and other blockage	▪ Stockpile natural aggregates on flat grounds and away from, not obstructing, main surface drainage routes. ▪ Implement a prompt disposal of demolition and other construction debris and solid wastes to avoid stockpiling them on site for more than 2 days.
Potential social conflicts and entry of transmittable and communicable diseases from hiring workers from outside	▪ Minimize the few workers hired from outside ▪ Coordinate with AULLG & District LLG for the hiring of locals skilled in construction works. ▪ Ensure awareness of construction workers regarding potential social conflict. ▪ Recruit an NGO or CSO (an approved service provider) to implement a STIs and communicable diseases awareness and prevention program.
Disruption of socio-economic activities	▪ Provide safe alternative access for pedestrians, for patrons and vendors of the informal market, for patrons of business establishments in the main area of influence. ▪ In case of accidental damage to existing water and power lines, advise concerned utility company at once for action.
Public health and safety hazards	▪ Contractor to comply with relevant EHSG requirements ▪ Ensure stockpiles do not pose public safety hazard. ▪ Provide safe access for communities. ▪ Install adequate temporary lighting to augment the existing lighting in the main area of influence. ▪ Install adequate, legible, reflectorized signage relevant to public safety. ▪ Do not allow children to swim near the effective construction area at Sanderson Bay ▪ Recruit an NGO or CSO (an approved service provider) to implement a STIs and communicable diseases awareness and prevention program ▪ Implement good sanitation practices. ▪ Implement the GRM.
Workers' health and safety hazards	▪ Contractor to comply with relevant EHSG requirements ▪ Contractor to prepare health and safety plan as part of SEMP; ▪ Strictly enforce use of PPE, e.g., eye & nose masks, ear mufflers, helmets gloves, appropriate footwear. ▪ Install adequate lighting, safe access to/from work areas. ▪ Provide safe accommodations with reliable supply of potable water, adequate sanitation facilities. ▪ Set up emergency response team equipped with adequate staff, equipment, tools & supplies, including for fire-fighting.

E. Operational Phase Impacts

129. There do not appear to be any operational adverse effects. The new wharf will be located at the site of the existing 50-year old wharf. There will only be piles supporting the wharf's deck. The Project will liaise with groups looking at other projects in the area. Climate change data developed under the Study will be provided to any other works in Sanderson Bay, such as the WB-assisted PNG Tourism Sector Development Project.

130. For effective environmental management during operation, the wharf's operations manual must have a section on environmental management, which shall include: (i) public and workers' health and safety requirements; (ii) emergency response procedures and requirements; (iii) grievance redress mechanism; (iv) spills response plan; (v) waste management plan; and (vi) a plan for prompt investigations, implementation of required action and reporting after every extreme weather event, earthquake and any adverse incident caused by another party.

131. Extreme events, such as cyclones or significant storms, are anticipated throughout the life of the structure. After such an event, the structure should be investigated immediately and appropriate actions taken promptly. Elements likely to be damaged during such events include handrails, ladders, light poles and gates. Other structures could become damaged from improper use. For example, if a vessel remains moored at the wharf during the event, damage is likely to be inflicted on the bollards and fenders. Prompt investigation and actions to any damage must be observed and duly reported.

F. Indirect, Induced and Cumulative Impacts during Construction

133. Indirect and induced impacts during construction would be: (i) increased traffic through the town; and (ii) some congestion at the jetties to the east and to the west of Sanderson Bay.

134. **Indirect impacts.** Vehicle traffic on Abel Highway is presently light, without intense build up during peak hours. Pedestrian traffic during the peak hours is moderate. During construction, slower vehicle and pedestrian mobility beyond the Project's main area of influence could be caused as a spill-over effect of traffic congestion within the Project's main area of influence. Parking of construction trucks and equipment on the shoulders of Abel Highway would also affect traffic flow. Estimated magnitude of indirect/induced impact on mobility outside the Project's area of influence is minor.

135. In addition to the measures recommended in Table 5.3 to mitigate traffic, the following will help reduce the spill-over effect of traffic: (i) coordination with the business establishments along Abel Highway; (ii) ensuring the footpath along Abel Highway is kept open, without any obstruction, and safe for pedestrian use; (iii) regular posting of traffic flagmen up to the reach of the spill-over effect during peak hours and as necessary; and (iv) blocking off public utility vehicles from entering the wharf area during construction hours and organizing passenger loading and unloading points along Abel Highway if necessary.

136. During consultations, some boat and dinghy operators have signified the need to look for temporary jetty or wharf to dock at. This will cause some limited congestion at the jetties/wharf outside the Project's main influence area. There should be prior information dissemination to and coordination with jetty or wharf owners or operators.

137. **Induced impacts**. The Project is not expected to have significant influence on a change in land use or on population growth.

138. **Cumulative impacts.** Presently known planned projects in Alotau include: (i) the JICA-funded improvement of the main market, about 900 m to the west, to be built in 2018; and (ii) the proposed World Bank-funded Tourism Sector Development Project, which is still at concept stage. Of the two, the former would be implemented within the same time-frame as the Project. The latter will implement small-scale improvement or rehabilitation that will not affect areas outside the immediate sites, which are: (i) improving the Sanderson Bay waterfront through soft projects, such as beautification, semi-permanent benches, walkways, toilets and landscaping; (ii) upgrading of the water line to the Alotau International Port; (iii) upgrading of central foreshore park in Alotau; (iv) Alotau streetscape improvement; and (iv) War Memorial facelift.

139. During the construction of the wharf and main market, the anticipated cumulative impacts and concerns would include: (i) slowing down of mobility along Abel Highway and at road intersections between the wharf and the main market; (ii) road safety risks; (iii) demand for natural aggregates; and (iv) volumes of construction wastes and debris to be managed and accommodated at the disposal site. Without mitigation, of the four impacts and concerns, the expected large volume of construction wastes and debris is estimated to be the most significant impact considering the potential filling up of the disposal site. All other impacts are estimated to be minor to moderate in magnitude. Aside from the mitigation measures presented or discussed below, to ensure cumulative impacts are brought to acceptable levels, project proponents and implementers must agree on a collaborative effort to mitigate impacts through responsible implementation of their respective EMPs. The mitigation measures presented under direct impacts will apply. There must be adequate consultations with stakeholders and coordination among project proponents and implementers for a unified traffic management scheme, and harmonization of certain activities and schedules of materials delivery, where possible.

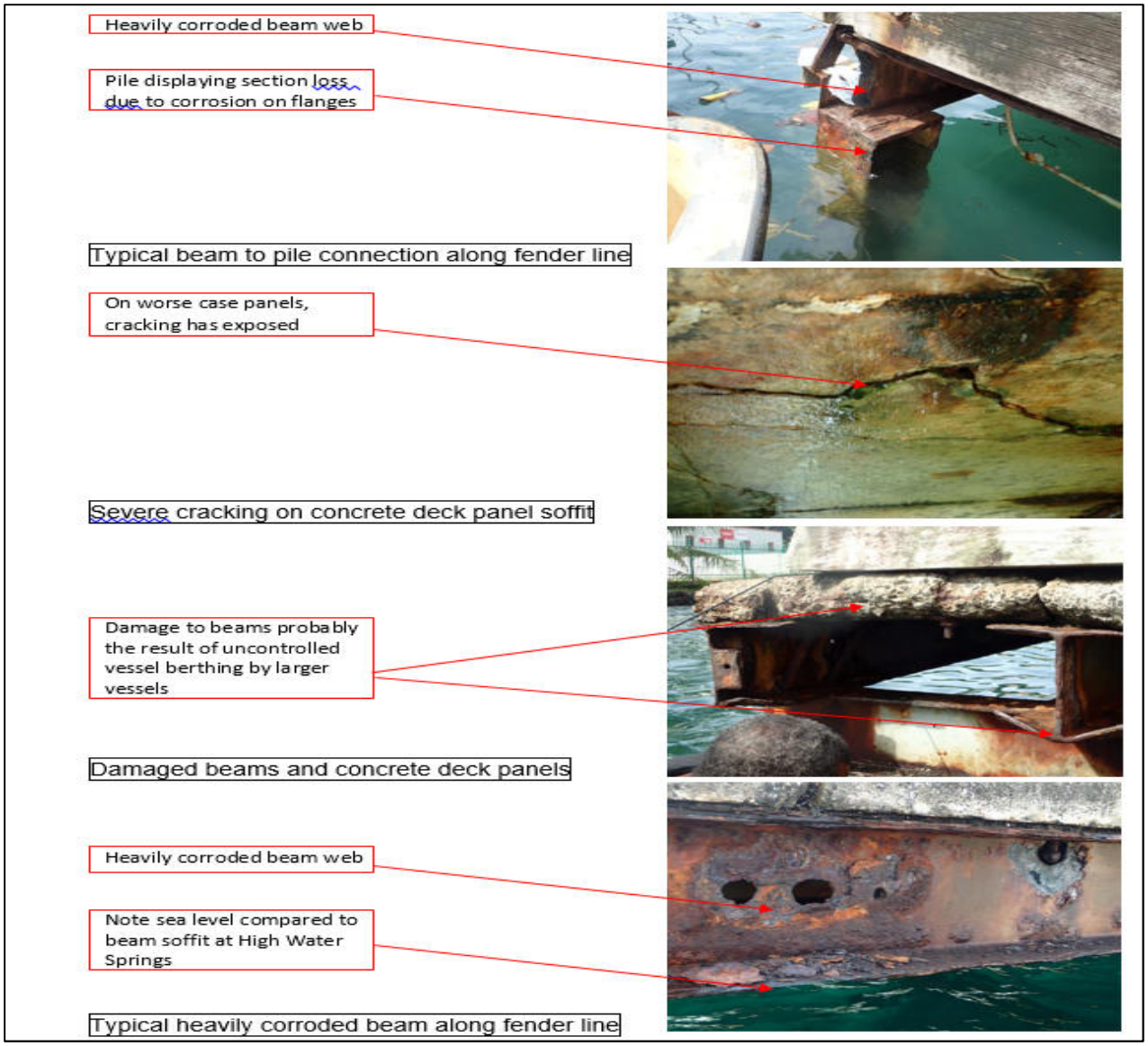
140. **During operation**. There will be no significant adverse indirect, induced or cumulative impacts during operation. Growth in Alotau will continue even without the Project, but under serious threat that at any time the wharf would collapse and could claim lives. With a new and climate-proofed wharf, there will instead be indirect benefits and positive impacts and outcome for the population in the outer islands who are fully dependent on the wharf to access social services and business opportunities. Those who come to Alotau to sell their products at the main market are expected to reap combined benefits from a new climate proofed wharf and an improved main market.

VI. ANALYSIS OF ALTERNATIVES

A. Without-Project Alternative

140. An assessment of the existing wharf condition was undertaken in January 2017 by engineers of the PPTA Team through visual inspection made from the deck level and by inspection boat. Photos taken during the inspection were assessed by the materials engineer and structural engineer (Figure 6.1). The assessment revealed that: (i) the existing wharf is at the end of its service life and is in an extreme state of disrepair, with serious structural defects; and (ii) the existing deck is occasionally inundated during storms and requires to be raised to accommodate future sea level rises and storm surges.

Figure 6.1: Photos from Visual Inspection of the Existing Wharf



B. With Project Alternative

141. Four options for the climate proofing of the wharf over a 50 years design life were prepared, with a further three variants subsequently developed.

142. Option 1 is the full refurbishment of the existing structure, involving the following works: (i) All concrete deck panels to be removed and replaced; (ii) The existing wharf to be utilized depending on the extent of section loss due to corrosion on steel beams --- removal and replacement of steelwork, welding of steel plates to webs and flanges, and cleaning of steelwork and coating with marine grade coating system; (iii) All H piles to be encased in reinforced concrete jacket to sea bed; (iv) Top piles to be raised; (v) New driven steel tubular piles with reinforced concrete infill to be provided as required; (vi) All pile bracing members to be either reinstated or new raking piles to be driven to accommodate lateral forces due to berthing and mooring; (vii) For all beam-to-beam and beam-to-pile connections, removal of corrosion products and re-welding where sufficient parent material is still available; where insufficient, to weld replace plate or section; and (viii) New lighting, fendering system and mooring bollards to be provided.

143. Option 2 is replacing the existing wharf with a floating pontoon wharf with the following features: (i) an off-the-shelf pontoon; (ii) steel articulated link span supported by floating support tank piers; (iii) guide piles; and (iv) combination of passive and active corrosion protection methods.

144. Option 3 involves removing and replacing the existing wharf and constructing a new wharf with climate proofed wharf structures. Main design features include: (i) precast concrete beams with precast concrete panels forming the deck; (ii) topping slab to be cast in-situ over the precast concrete panels; (iii) superstructure supported by reinforced concrete-filled steel tubular piles; and (iv) safety rails for pedestrians on the inner face.

145. Option 4 is similar to Option 3, removing and replacing the existing structure but with stepped berths on the rear face (landward side). Main design features include: (i) two dropped levels for small vessel access at the rear of the wharf; (ii) dropped level deck to consist of open grating made of durable fiber reinforced plastic; (iii) each level of 20-m length and 4-m width; (iv) mid-level to be 1 m lower than the main wharf for low freeboard vessels at high tide; (v) lower level is 2 m lower than the main wharf to provide access at low tide; (vi) ramp and stair access for safe passenger access; and (vii) railings on stairs, ramps and at the rear of the dropped levels.

146. Options 2, 3 and 4 include the demolition of the present wharf, which would stay in temporary service until demolition to allow completion of the new structure. Under the original options 3 and 4, the intention was to construct these adjacent to the existing wharf. However, under modified variant options (see below) the new wharf is sited on the same footprint as the existing wharf, with vessels temporarily using the provincial jetty and coastal wharf during project construction.

147. The four options have been subject to environmental, climate change and social (aside from technical, economic and financial) multi-criteria assessments. Table 6.1 presents the results of the environmental, climate change and social assessments: (i) Option 2 ranks first in the environmental assessment. However, it does not fully satisfy climate change requirements in terms of robustness under increased wind and wave loads. It ranks third only in the social assessment; (ii) Option 4 ranks first in the social assessment; last in the environmental assessment (having the biggest floor area among the four); and both met key climate change requirements.

148. At the Options Workshop with stakeholders on 8 March 2017, held in Alotau, the technical assessment that considered cost, complexity, maintenance, robustness and flexibility of use had: (i) Option 4 ranking first, followed closely by Option 3; (ii) Option 1, which would not provide a climate proofed wharf, ranking a far third; and (iii) Option 2, ranking last due to higher capital and maintenance costs. A floating pontoon has also been deemed unsuitable for the wind and wave environment in Sanderson Bay. The workshop led to the decision of having two more options developed: Options 3a and 4a. These follow the designs of Options 3 and 4, respectively, but were modified in terms of location, i.e., for the new wharf to be constructed over the footprint of the existing wharf; thus, requiring the prior demolition of the existing wharf.

149. Options 3a and 4a were the subject of the feasibility analysis which identified a further option 3b which provided the structure to enable the eventual construction of option 4a, but at a cost only marginally above that required for Option 3a; this option was agreed based on a combination of stakeholder preference and budget constraints. Subsequently DFAT has committed additional financing to allow construction of Option 4a.

C. Without versus With Project Alternatives

150. The without project alternative poses serious threat to the safety of the wharf users. With the wharf's state of disrepair, actions toward a replacement of the existing wharf should no longer be deferred. The without project alternative would be allowing the outer island to grow further as "under-serviced", but under non-optimal or unsustainable conditions. This would impede: (i) the hastening of the social and economic development of the outer islands that are fully dependent on the wharf for access to essential services and trade opportunities in Alotau; and (ii) PNG's delivery of its commitment to MDG1, eradicating poverty.

151. The with project alternative will provide residents in the outer islands a convenient, safe and reliable maritime infrastructure that will facilitate access to economic opportunities and services and basic social services, e.g., health care and education, and which is climate proofed. During construction, there will be opportunities for local employment and increased earnings of local enterprises. The opportunity for short-term employment will be both local and province-wide in scope, and not necessarily limited to the labor force available in Alotau town

152. Overall, Milne Bay Province will benefit from the 'with project' alternative. It will contribute to the realization of the Province's development goals, hasten further social and economic development and poverty reduction in the outer islands, and contribute to the overall development of MBP and the country. It will contribute to the delivery of PNG's commitment to MDG1.

Table 6.1: Results of Multi-Criteria Assessment

a. Environment Factors

Criteria	Option 1	Option 2	Option 3	Option 4
1 Demolition of the existing wharf and extraction of piles (impact on bay water and seabed)	Lesser demolition.	Exisiting wharf to be demolish after completion of new structure.	Exisiting wharf to be demolish after completion of new structure.	Exisiting wharf to be demolish after completion of new structure.
2 Deposition of rubble	Removal of old damaged slab & corroded steel beams. Cast-in-situ of new slab	Deck slab can be installed elsewhere prior to floating in the pontoon.	Precast deck panels. Cast-in-situ RC topping slab.	Precast slabs. Cast-in-situ RC topping slab. (Bigger deck area.)
3 Changes to substrate, disturbance of bottom sediments, induced resuspension/dispersal/settlement of sediments due to pile diving and sand compaction	Lesser piles to drive.	Least piles to drive. (Guide piles only.)	Less piles to drive.	Most piles to drive.
4 Extent of construction over water	Removal of the existing deck structure and construction of replacement deck.	The floating pontoon, floating support piers and link span will all be built off-site. The pontoon and piers can then be floated into position & fixed in position by the guide piles. The link span will then be lifted into place.	Precast deck panels. Cast-in-situ RC topping slab.	Precast deck panels. Cast-in-situ RC topping slab. (Biggest floor area.)
5 Size of overwater structure (bigger shade cast over water)	Smallest floor area.	Bigger floor area.	Bigger floor area.	Biggest floor area.
6 Corrosive elements, risk of corrosion contaminating the water	All existing piles need to cased as a result of existing corrosion.	Least piles. But subject to adequate maintenance.	Minor effect from corrosion of sacrificial steel piles.	Minor effect from corrosion of sacrificial steel piles.

Most favorable

Least favorable

b. Climate Change Factors

Criteria	Option 1	Option 2	Option 3	Option 4
1 Sea level rise				
2 Wind and wave		Satisfies SLR requirements but not requirements for robustness under increased wind & wave loads.		

Most favorable

Least favorable

c. Social Factors

Criteria	Option 1	Option 2	Option 3	Option 4
1 Allow use of existing wharf during construction.				
2 The position of the approach wharf from landside may be too close to the jetty, limiting the maneuvering/ positioning of vessels (for both wharf and jetty).				
3 The dropped split level rear wharf provides access to small vessels/dinghies.				
4 Ramps and stairs offers for passengers with limited mobility especially those being transported by dinghies/ small vessels (i.e., patients in wheelchair, critical/ emergency case patients).				
5 Availability for emergency use.				
6 Provision of small waiting shed, supervisor & revenue collection office.				

Most favorable

Least favorable

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

153. This section: (i) presents the form of stakeholder consultations carried out and the information disclosed during project preparation; (ii) summarizes the comments and concerns received from those consulted and suggested improvements; and (iii) describes the planned information disclosure measures (including the type of information to be disseminated and the method of dissemination) and the process for carrying out consultation with affected people and facilitating their participation during project implementation.

A. Stakeholder Consultations

154. Stakeholder consultations were held during the second (February 2017) and third (March 2017) missions. The process in engaging stakeholders involved on-site random interviews, key informant interviews (KIIs), joint social and environmental focus group discussion (FGD), and a workshop. Consultations were due diligence-oriented, soliciting feedback on the environmental, social and economic concerns of the existing wharf and associated facilities. The forms of consultation were on-site random interviews with wharf, jetty and dinghy landing users, KIIs with key persons from at least 20 organizations and FGD attended by at least 10 organizations. Consulted stakeholders were informed of the plan to build a new climate-proofed wharf. Table 7.1 below summarizes their raised concerns and suggested improvements to be considered under the project.

Table 7.1: Stakeholder Concerns on Existing Wharf and Entire Wharf/Jetty Area

Stakeholder Concerns	Suggested Improvements
Wharf dangerous, any time could collapse. Some referring to the wharf as a “time bomb”.	A new bigger wharf to replace existing wharf. A new wharf that can be used by all types of boats.
Sanderson Bay getting shallower. 2 beacons alerting boats on an existing growing reef.	Some suggested that the growing reef be dredged out then take beacons out to facilitate navigation. A key informant suggested that prior to any dredging activity, under-water investigation must be done.
Sediments from landside contributes to the bay’s getting shallower.	Dredge bay, but must conduct under-water investigation first.
Bay is deposited with debris coming from boats and litters from boat operators and passengers.	Signage on “no litters” and cleaning up of the area.
Public safety risk with people going in and out of boat while fuel-filled drums are being loaded onto the boats.	Terminal/waiting area only for passengers, so they board boat only when loading of drums are done.
Lack of security and theft/robbery quite a concern.	Secure the site probably with a fence and gate.
Drainage outfall discharging sediment-laden storm water.	Pave the road surfaces.
No access to potable water and sanitation facility. Water from existing tap is not treated water.	Provide: (i) taps from the nearest source of water having been treated; (ii) adequate toilets/shower facilities nearby.
Boats no holding tanks for toilets; sewage directly deposited into the bay while on dock for days.	Provide adequate toilets/shower facilities nearby. When these are available, install signage to prohibit and enforce a regulation prohibiting the: (i) use of boat toilets while on dock; and (ii) practice of publicly discharging into the bay.
Wharf no lighting and no side rails to protect people from falling during peak loading of cargoes and passengers.	Wharf must be provided with lighting. Guard rail on the sides, if possible.
Risk of oil spill and fire with bunkering operations at the wharf. And no capacity to respond to major fire. High risk.	Bunkering operations must be stopped.
The general hospital in Middle Town is connected to the drainage channels that discharge into Sanderson Bay.	Must investigate if liquid medical wastes are also drained into the channels, prior to formulating action.
Oil and grease from boat maintenance works while on dock, contaminating bay water and potentially, seabed	Conduct water and sediment quality investigation prior to formulating actions.
Current operations at Sanderson Bay is disorganized, making the bay not good for tourism.	Introduce an anchorage spot at an accessible point in Milne Bay to ease traffic in the use of jetty for loading and unloading cargoes and passengers.

155. Consultations during third mission were oriented toward obtaining comments on the design options for the new wharf, anticipated impacts during construction and the benefits that will be derived from the new wharf. Consultations were a combination of a workshop, FGD and on-site random interviews. Annex D presents a list of stakeholders consulted in the second and third missions. Consulted stakeholders were shown and explained the preferred design options for the new wharf. Table 7.2 below summarizes their anticipation of impacts during construction, their perceived benefits from the new wharf and their preferred option.

Table 7.2: Anticipated Construction Impacts and Perceived Benefits from New Wharf

Anticipated Impacts during Construction	Perceived Benefits from a New Wharf
- Dust/air pollution. - Noise. - Construction rubbish to get into the bay polluting the bay water. - Construction stockpiles and equipment/vehicles would be risks to public safety. - More potholes on the access roads. - Use of public toilet by construction workers will just make the toilet congested – competing with the market vendors and the public. - Limited land space for construction equipment and construction materials. - Lighting along the access road must be improved for public safety. - Drop off/loading of vehicles and parking must be looked at. - Congested area between jetty and wharf. - Vibration may be felt at Transit Hotel, which is felt presently each time a vehicle passes by the Hotel. - Traffic and congestion of activities (construction plus normal activities). - With restricted bay space during construction, boat ins and outs have to be managed. - Oil/grease form construction equipment, rusty metals from demolition and corroded piles to contaminate the bay water	<u>Perceived benefits:</u> - Informal market is expected to have increased earnings when tourists arrive. - If new wharf will also allow use by dinghies, then dinghy passengers will no longer have to wade in dirty water when getting off from and on to the dinghy. - If improvement of access road will follow, benefits will include: walking will be more convenient, no more flooding/puddles when it rains, no more dust, goods sold in the informal market and stores will be less/not dusty. - Local employment during construction, not only for Alotau folks but could also be for those from the outer islands. - Loading/unloading of goods will be better and easier. - Benefit of peace, having wharf that can be used anytime. - Vehicles could come in and bring cargoes closer to the boat (expected). - Bigger wharf. Improvement a big change to development. - Benefits the economy. Facilitates the access of outer islanders to services in Alotau. - Safer facility and faster movement. - Safer docking for dinghies, if dinghies allowed to use the new wharf. - Expect operations to be orderly. <u>Preferred design option</u> - Design option not too important as long as there would be a new wharf. - Option 4a better, because most boats are smaller. - Option 4a because its design is friendly to physically disabled people and in bringing in patients form the outer islands. - Option 4a, if accessible also to lower boats like dinghies.

156. Following the project's CCP, stakeholder consultations will continue through implementation and operation. All stakeholders must be invited and encouraged to participate in community consultations. To facilitate the engagement of stakeholders, the PIU will maintain good communication and collaboration with stakeholder groups. The executing agency and the PIU, contractor and MBPA (operation) will be open to contact by the public on matters concerning the progress of the Project, adverse impacts, mitigation measures, environmental monitoring and grievances. Future stakeholder consultations will include the following:

- During detailed design to disclose the updated IEE and EMP through a public meeting to the affected communities and solicit feedback.
- Prior to construction, the PIU will ensure that information is provided and disclosed in a timely and appropriate manner to ensure sufficient level of awareness and information among the affected communities regarding the upcoming construction, its anticipated impacts, the grievance redress mechanism, contact details and location of the PIU, and status of compliance with government's environmental safeguard requirements, among others, are attained and/or provided. Billboards about the subproject, implementation schedule, environment permit number and date of issue, construction permit number and date of issue, and contact details of the executing agency, PIU and contractor will have been set up at strategic locations in the Project's main area of influence.
- The GRM information will be posted at the offices of the PIU, MBPA, AULLG, MBPTA, Provincial Jetty, dinghy mooring area, informal market and Transit Hotel.
- During construction, regular random interviews will be jointly conducted by the CCDA-PMU and PIU to monitor environmental and social concerns of the communities in the Project's main area of influence.
- During operation, for a period prescribed in the CCP, periodic random interviews will be jointly conducted by the PIU and MBPA to monitor the environmental and social concerns of the communities in the main area of influence on the completed wharf.

B. Information Disclosure

157. To date, general information has been disclosed about the objectives and plans to build a new climate-proofed wharf and the various options for achieving the objectives. In the third mission, discussions were held about the preferred option.

158. The draft IEE and its update (including the EMP and GRM), and, if applicable, CEPA-approved EIS, will be made available at the offices of the CCDA, PIU and MBPTA for the perusal of interested parties and disclosed on ADB's website. Copies may be made available upon formal request. The semi-annual environmental monitoring reports will also be disclosed locally and on the ADB's website.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

159. The EMP will serve as the framework for the environmental management of the Project, commencing from the detailed design phase through to operation. It contains the following: (i) institutional arrangement and responsibilities for the various aspects of EMP implementation; (ii) mitigation and management; (iii) grievance redress mechanism; (iv) monitoring and reporting; and (v) EMP and monitoring matrices (Tables 8.2 and 8.3). Based on detailed design the EMP will be updated by the environmental safeguards specialist (ESS) of the PISC, at the same time the IEE will be formatted as and EIS for application for environment permit under the country system.

A. Institutional Arrangements and Responsibilities

160. The overall implementation of environmental safeguards including environmental management requirements is a joint responsibility of the: (i) CCDA and PMU; (ii) MBPA and the PIU; (iii) the Project Advisory Committee; (iv) PISC; (v) contractor; and (vi) ADB. Considering the need for institutional strengthening of the PIU and MBPA in environmental management, the ESS will provide: (i) technical assistance and support to the CDDA-PMU, MBPA and PIU in carrying out their environmental safeguard responsibilities; and (ii) to conduct and/or facilitate capacity building in the environmental management of a Project. Table 8.1 outlines the responsibilities.

161. **Climate Change and Development Authority.** As executing agency for the program, the CCDA is responsible for overall management and coordination of the program (and its individual projects and interventions) through its PMU. The CCDA is responsible for ensuring compliance with the environmental safeguards identified in the EMP, loan documents and any document associated with the environment permit. Its ESO (with support from the PISC environmental advisor) shall oversee and monitor the progress of the environmental work stream to ensure: (i) that environmental safeguards, as set out in the EMP, are implemented; (ii) compliance with country safeguards requirements and the SPS of the ADB. The CCDA is responsible for ensuring that: (i) the PMU is adequately and sufficiently staffed and allocated with resources; and (ii) the PIU is established within the MBPA and the PISC is recruited in a timely manner and with sufficient resources to assist the PIU deliver the project.

162. **Milne Bay Province Administration.** The MBPA is the implementing agency for this project. It will establish the PIU comprising relevant units and agencies at the provincial level, and will be responsible for: (i) day-to-day management of the project; and (ii) coordination with CCDA and its PMU. The Deputy Provincial Administrator has been assigned as the focal person for the Project and the Manager of the Milne Bay Province Transport Authority, as the alternate focal person. The Acting Provincial Environment Officer (ESO) of MBPA shall be the focal person on environmental safeguard matters concerning the Project, supported as necessary by the CCDA ESO and PISC environmental specialist. The ESO shall be responsible for monitoring the SEMP implementation, and with assistance from the PISC environmental specialist, responsible for preparing the reporting requirements for submission to the CCDA.

163. **Project Steering Committee.** The CDDA has established a Project Steering Committee (PSC) for the BRCC. The PSC will steer and advise project teams and provide final endorsement on project recommendations and outputs, including recommendations on necessary institutional and capacity strengthening measures for the implementing agency for this project (the MBPA). The Provincial Advisory Committee (PAC) established under BRCC will guide and coordinate project activities at the provincial level, including those related to environmental safeguards and compliance.

164. **Project implementation and supervision consultant.** The PISC will support and assist the MBPA and PIU to deliver the project. The PISC will include the ESS to: (i) ensure environmental safeguard concerns are incorporated in the detailed design; (ii) prepare TOR for, and facilitate, the surveys required to complete the baseline (water quality, marine ecology, benthic flora and fauna); (iii) based on surveys and detailed design, update the IEE and EMP; (iv) ensure environmentally responsible procurement is carried out, as prescribed in the approved IEE and updated EMP such as integrating the updated EMP into the bidding and contract documents; (v) provide inputs to bid evaluation in relation to bidders responses to the EMP provisions; (vi) provide support as required to the contractor in preparation of the SEMP; (vii) assist the PIU to review and clear the SEMP; and (viii) check and inspect that works and activities of the contractor are in compliance with the approved SEMP.

165. **Contractor.** The contractor will be responsible for: (i) engaging an environmental specialist (or designated suitable staff as) environment and safety officer (ESO) to assist in contractor compliance with the environmental safeguard requirements for the project. For the contractor, the ESO will; (ii) prepare the contractor's SEMP that addresses as minimum the requirements of the EMP; and (ii) implement the approved SEMP.

166. **Asian Development Bank**. The ADB will be responsible for reviewing and clearing all safeguards documentation, including providing comments on the SEMP and will carry out periodic reviews (through missions) of project implementation including compliance with all environmental safeguard requirements (project agreement (covenants), assurances, approved safeguard documents and monitoring reports etc)..

167. **Milne Bay Province Transport Authority.** As the operator, the MBPTA will: (i) prepare (with assistance from the PISC) and implement an operations manual that will be prepared prior to the completion of construction works; (ii) engage the MBPA's Acting Environmental Conservation Officer (ECO) as the focal person on environmental safeguard matters of the Project during operation. The ECO shall be responsible for: (i) ensuring effective implementation of the environmental management section of the Operations Manual; (ii) preparing the necessary reports for submission to the PIU, which shall in turn review and submit report to the CDDA; and (iii) continue to implement the projects CCP and GRM in addressing pertinent complaints lodged during operation.

Table 8.1: Institutional Responsibilities for Environment Management

Institution	Prior to Construction	During Construction	During Operation
CCDA	▪ Firm up the necessary collaboration with the CEPA for the Project's compliance with PNG's environmental safeguard requirements and secure environment permit and other permits required for BRCC activities. ▪ Ensure the availability of the PISC to support the project ▪ Ensure adequate funding available for the PMU and the PIU. ▪ Disclose project information including safeguard documents, as appropriate.	▪ Review reports submitted by the PIU and disclose accordingly. Coordinate meetings of the PSC and PAC as required. Facilitate smooth implementation of the program and projects. ▪ Assist in resolving complaints brought through the GRM that have not been resolved at lower levels.	▪ Submit report prepared by the Operator to ADB, on investigation of wharf structure: (i) after an extreme weather event; (ii) after an earthquake event; and (iii) after any accident/adverse incident that involved the wharf structure, caused by a ship/boat or another party.
CCDA-PMU	▪ Coordinate with the detailed design consultants Team to ensure the design incorporates the environmental safeguard concerns and requirements. ▪ Coordinate with the design on the update of the IEE & EMP based on the design. ▪ Ensure EMP is part of the bidding documents, EMP clauses are incorporated in bidding documents, contracts. ▪ Ensure Environment Permit has been secured prior to awarding of civil works. ▪ Evaluate Contractor's EMP (SEMP) against the EMP.	▪ Coordinate closely with MBPA-PIU. ▪ Conduct inspections and spot checks to monitor the environmental performance of the project. Review reports and provide comments or advice as required to CCDA.	▪ Participate, as may be possible, in any investigation of the wharf structure to be conducted by the Operator: (i) after an extreme weather event; (ii) after an earthquake event; or (iii) after any accident/adverse incident that involved the wharf structure, caused by a ship/boat or another party. ▪ Review report on above prepared by the Operator prior to submission to endorsing the report to CCDA for submission to ADB.
MBPA-PIU	▪ Day-to-day management of the project. ▪ Coordinate environmental safeguard matters with the PMU and project teams. ▪ Firm up the necessary collaboration with relevant provincial agencies on matters ▪ concerning the environmental management. Ensure adequate funding to enable its PIU to fulfill responsibilities. ▪ Disclose safeguard documents, as appropriate. Conduct awareness and consultations as per ▪ the CCP. ▪ Prepare the reporting requirements for submission to the CCDA. Ensure environmental safeguard concerns are ▪ incorporated in the detailed engineering design. Conduct baseline surveys to establish baseline environmental data, as prescribed in the EMP. ▪ Update the IEE and EMP based on the detailed design and submit for clearance.	▪ Submit Quarterly Progress Reports (QPRs) to CCDA and ADB ▪ Submit semi-annual monitoring report to CCDA and ADB. Review and clear the SEMP and advise Engineer to issue instruction to commence works. ▪ Review contractor's monthly reports. Implement the GRM and maintain records of complaints/grievances. ▪ Review the operations manual prepared by MBPTA ▪ for approval by the MBPA. ▪ . Prepare and submit promptly the required MPRs, ▪ QPRs, semi-annual progress reports and EMRs, as ▪ prescribed in the EMP. Ensure the contractor observes the GRM. ▪	▪ Participate in any investigation of the wharf structure to be conducted by the Operator: (i) after an extreme weather event; (ii) after an earthquake event; or (iii) after any accident/adverse incident that involved the wharf structure, caused by a ship/boat or another party. Review report on above prepared by the Operator ▪ prior to submission to CCDA. Ensure/manage the observance of the GRM. ▪

Institution	Prior to Construction	During Construction	During Operation
	▪ Ensure environmental safeguard requirements for an environmentally responsible procurement are carried out, as prescribed in the ADB-cleared EMP. ▪ Assist the CCDA in complying with the country safeguard system during the design stage ▪ Support preparation & implement a SEMP (by the contractor) that addresses as minimum the IEE/EMP requirements. ▪ ▪		
ADB	Review and clear updated IEE/EMP. ▪ Review bidding documents, clear SEMP. ▪	Review Semi-Annual EMR. ▪ Carry out periodic review missions. ▪	Review Annual EMR. ▪ Carry out periodic review missions. ▪
MBPTA (Operator)		Prepare the environmental management section of the ▪ Operations Manual for review by the MBPA-PIU for approval by the MBPA.	Ensure effective implementation of the Operations ▪ Manual. Prepare the necessary report for submission to the ▪ MBPA-PIU. Conduct investigation of wharf structure promptly: ▪ (i) after an extreme weather event; (ii) after an earthquake event; and (iii) after any accident/adverse incident that involved the wharf structure, caused by a ship/boat or another party. Prepare and submit report on the investigation to the MBPA-PIU. Observe the GRM. ▪
PSC and PAC	▪ Steer and advice project teams and provide final endorsement on project recommendations and outputs, including recommendations on necessary institutional and capacity strengthening measures for the implementing agency, MBPA.		

B. Mitigation and Management

168. Section 5 of the IEE identifies the likely issues, concerns and impacts arising from the different stages of project implementation and these have been tracked trough to the EMP table presented in Table 8.2 and monitoring requirements in Table 8.3.

C. Grievance Redress Mechanism

169. The project will elaborate and refine as required the GRM set out in the BRCC's EARF. The GRM is included in the EMP so it is clear what the contractor must do to resolve complaints and concerns. A grievance focal point (GFP) will be established by the Alotau Urban Local Level Government (AULLG) who will be assisted and supported by the PIU and the PISC. The PIU and the contractor will maintain a register of complaints, keep track of their status, and report to the CCDA through the CCDA. The GRM is to facilitate resolution of any project issue and is not exclusively the domain of safeguards even though experience shows most complaints are related to construction impacts and issues best managed with the contractor and PISC.

170. The contact details of the GFP will be disclosed, along with the basic procedures of the GRM to the community in the project area through billboards at strategic locations and brochures or flyers. The GFP will also be assisted by the existing ECO, who will already have a certain amount of experience in engaging with complainants and helping resolve issues and grievances. The GFP will regularly track complaints received, actions taken and the status of resolution. All communications with the complainants and management actions taken to avoid community concerns in the future, will be documented. Complaint forms will be distributed to the GFP to facilitate recording of complaints.

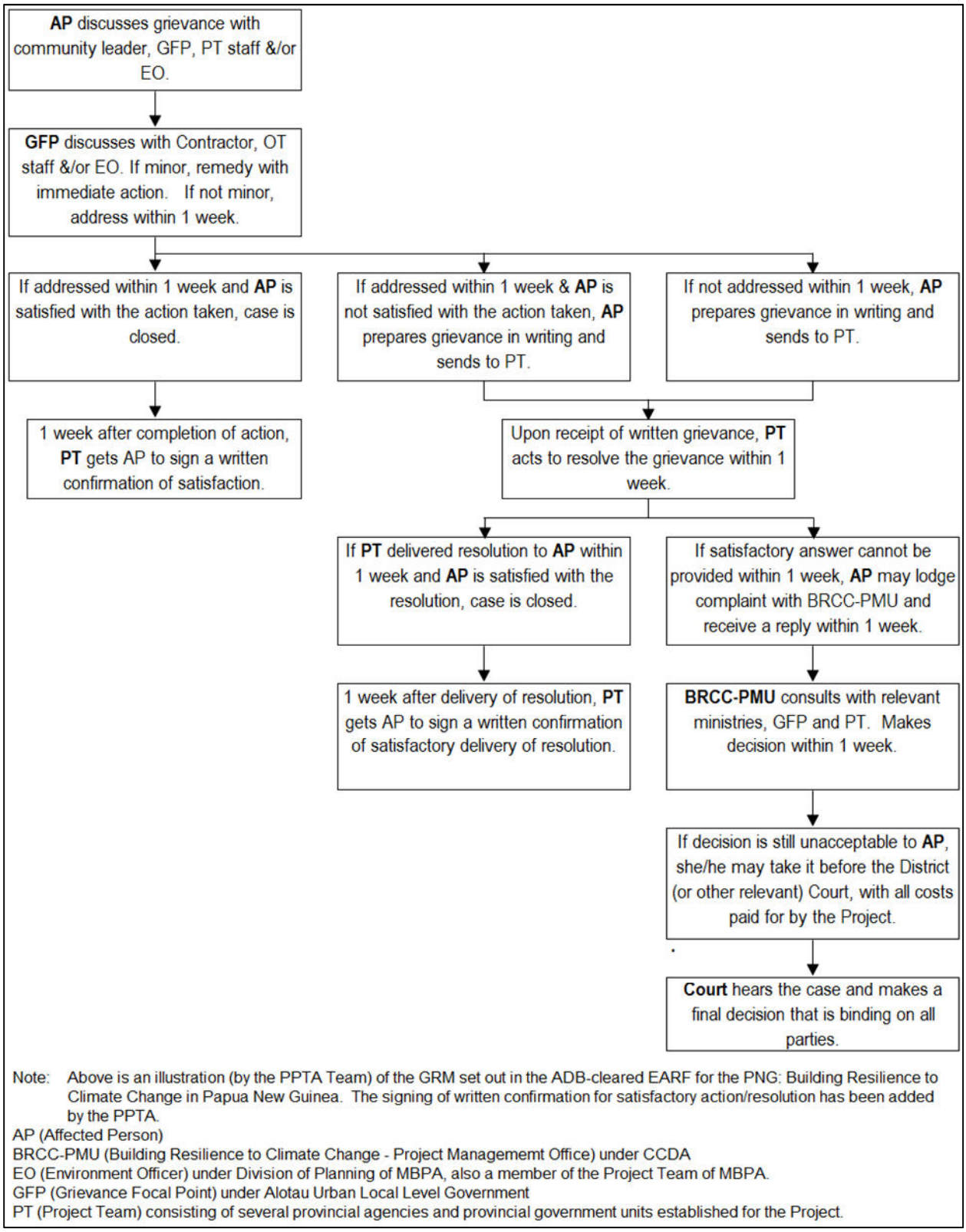
171. **Grievance redress procedure.** The community will be informed, as per the CCP, about how they may ask questions or discuss grievances with their community leader or the GFP by phone or in person, or with project staff visiting the area. The GFP is encouraged to discuss relevant issues with the contractor and their ESO. Minor issues can often be remedied with immediate action. If questions/grievances are not addressed within 1 week, they should be prepared in writing (using the assistance of the local community leader, church, or school if necessary). The complainant will also be informed that national and international project staff could assist them with writing a grievance letter if necessary.

172. Written complaints can be sent or delivered to the PMU or PIU, where they will be registered as being received, and will be treated confidentially. The CCDA will have one week to deliver a resolution to the complainant. If a satisfactory answer cannot be provided, the complainant may lodge the issue with the CCDA and receive a reply within seven days.

173. If the situation is not resolvable, or the complainant does not accept the decision, they will have recourse to the relevant court. All court costs (preparation and representation) will be paid for by the project, regardless of the outcome. Figure 8.1 illustrates the grievance redress procedure.

174. In the post-construction period, there remains the potential for environmental harm to occur through the operation of the new wharf. In such cases, the GRM would revert to existing systems of environmental protection. Persons or groups can seek resolution of a grievance in relation to environmental harm through directly triggering the environmental complaint and investigation mechanism existing within CEPA.

Figure 8.1: Grievance Redress Procedure



Note: Above is an illustration (by the PPTA Team) of the GRM set out in the ADB-cleared EARF for the PNG: Building Resilience to Climate Change in Papua New Guinea. The signing of written confirmation for satisfactory action/resolution has been added by the PPTA.
AP (Affected Person)
BRCC-PMU (Building Resilience to Climate Change - Project Managememt Office) under CCDA
EO (Environment Officer) under Division of Planning of MBPA, also a member of the Project Team of MBPA.
GFP (Grievance Focal Point) under Alotau Urban Local Level Government
PT (Project Team) consisting of several provincial agencies and provincial government units established for the Project.

D. Monitoring and Reporting

175. **Monitoring**. Throughout project implementation, CCDA and ADB will monitor the progress and impact of the project and program, this includes evaluating the overall impacts and benefits of the project and monitoring the implementation and effectiveness of mitigation measures. CCDA is required to implement safeguard measures and to periodically submit monitoring reports on implementation performance. The PIU will monitor contractor's compliance with the approved SEMP during construction, and report to PMU for CCDA to in turn report to the ADB.

176. **Baseline**. Baseline measurements will be undertaken by the PIU during the pre-construction stage and will be used in updating the IEE and EMP and as basis for PIU to monitor changes in environmental indicators during quarterly monitoring. In the SEMP, the Contractor will address the monitoring and reporting requirements as set out in the updated EMP.

177. CCDA and the PIU will:

- Ensure the baseline conditions are recorded and elements to be monitored are properly benchmarked;
- Establish and maintain procedures to monitor progress of project and safeguards implementation;
- Verify the compliance with environmental measures and whether they are achieving the intended outcomes (mitigated level of impact);
- Identify necessary corrective and preventive actions including actions required when the GRM has been triggered i.e. the report will outline where work has not complied with the approved SEMP and what steps (and timeline) were taken to rectify it;
- Document and disclose the monitoring results;
- Follow up on these actions to ensure progress toward the required outcomes;
- Where required, retain qualified and experienced external experts or qualified NGOs to verify monitoring results; and
- Submit periodic monitoring reports on safeguard measures as agreed with ADB.

178. ADB will carry out monitoring actions to supervise safeguards implementation:

- Conduct periodic review and supervision missions (including site visits) with detailed review by ADB's safeguard specialists/officers or consultants;
- Review the quarterly progress reports and semi-annual monitoring reports submitted by CCDA to ensure that adverse impacts and risks are mitigated as planned and as agreed with ADB;
- Disclose the reports in compliance with the Public Communications Policy;
- Work with CCDA to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
- Prepare project completion reports that assess whether the objective and desired outcomes of the EMPs have been achieved, considering the baseline conditions and monitoring results.

179. The PIU will use the quarterly progress reports (QPR) and summaries of the contractor's monthly reports long with its own notes and checklists to compile the semi-annual safeguards monitoring reports which will be reviewed and cleared by ADB, and cleared reports disclosed on ADB's website. After one year, the CCDA-PMU will arrange to review the monitoring program and suggest any adjustments to it, as required. The PMU will inform the CCDA who will inform ADB of any changes that are recommended to be made prior to implementing any changes.

180. During operation, monitoring will be minimal. After each extreme weather event, earthquake event or any accident or adverse incident that involves the wharf structure (caused by a ship or boat or any party), the MBPTA (as operator) and PIU (and thereafter MBPA) shall jointly conduct prompt investigation of the wharf structure and prepare report for submission to the CCDA, which will review the report and forward the report to ADB.

181. Monitoring reports will be prepared as follows: (i) a report at the end of project design, prepared by the PIU for submission to the PMU; (ii) a monthly report prepared by the contractor; (iii) the QPR prepared by the PIU and submitted to the CCDA and ADB which will cover safeguards matters; (iv) semi-annual safeguards monitoring reports prepared by PIU and submitted to the CCDA and ADB; and (v) an annual report prepared by the operator (for period specified by ADB and CCDA).

182. Environmental monitoring results will be evaluated against the following technical standards:

- For marine water quality, Environment (Water Quality Criteria) Regulation 2002.
- For ambient air quality, General Environmental, Health, and Safety Guidelines (EHSG): Environmental. WBG. IFC. 30 April 2007.
- For noise level, General EHSG: Environmental. WBG. IFC. 30 April 2007.
- For sediment quality, CCME Sediment Guidelines for Protection of Aquatic Life.

183. **Reporting**. Monitoring reports will be prepared as follows: (i) a report at the end of project design, prepared by the PIU for submission to the PMU; (ii) a monthly report prepared by the contractor; (iii) the QPR prepared by the PIU and submitted to the CCDA and ADB which will cover safeguards matters; (iv) semi-annual safeguards monitoring reports prepared by PIU and submitted to the CCDA and ADB; and (v) an annual report prepared by the operator (for period specified by ADB and CCDA).

Table 8.2: Environmental and Social Management Plan

Issue/Activity	Mitigations				
	Measures and Actions	Standard/ Ref.	Responsible Entity	Timing	Cost
DESIGN AND PRE-CONSTRUCTION					
Limited open land in the project's vicinity to situate temporary construction facilities and for facilitated entry and exit of construction vehicles/equipment to/from the project site.	▪ Undertake adequate consultations and coordination with stakeholders and jointly plan on, among others: (i) location of temporary facilities and work areas, e.g., stockpiles, storage, site office, parking area; and (ii) measures to mitigate anticipated traffic along the access road to the wharf and congestion at the intersections of the access road with Abel Highway and the internal road beside the informal market leading to the Transit Hotel ---- to mitigate public health and safety risks and disruption of socio-economic activities in the vicinity.	IEE/EMP, General EHSG, Public Health Act 1978	MBPA-PIU	During design	c/o design cost
Lack of baseline data on environmental quality (water quality, marine ecology, benthic flora and fauna).	▪ CCDA (supported by PIU management support) to prepare TOR for the baseline; ▪ Recruit suitable agency(ies) to undertake and report the surveys. Conduct the appropriate surveys to fill gaps and establish the baseline data for marine water quality, marine flora & fauna including benthic, seabed sediment; and (at Transit Hotel site) vibration. ▪ Update EMP, as required, based on the baseline results.	IEE/EMP, General EHSG; PNG's Environment (Water Quality Criteria) Regulation 2002; EHSG Ports, Harbors & Terminals 2017 (sediment quality monitoring parameters); CCME Sediment Quality Guidelines for the Protection of Aquatic Life.	MBPA-PIU	During design	Project cost
Institutional preparedness of executing and implementing agencies in implementing environmental safeguards	▪ Ensure CCDA has employed its Environmental Safeguard Officer (ESO) and MBPA-PIU, its Social Officer (SO) in the design stage. ▪ Ensure support from PISC to PIU includes international and national environmental specialists ▪ Conduct an orientation workshop for CCDA and MBPA-PIU on EMP and training on monitoring and reporting on Contractor's performance in EMP implementation. ▪ Prepare the monitoring and reporting forms. ▪ PISC to deliver mentoring and training to CCDA and MBPA-PIU staff as required on environmental safeguards	IEE/EMP	ESS & ESO, CCDA, MBPA-PIU	During design	Project cost
Project's compliance with CSS and SPS requirements.	▪ Engage with CEPA. Prepare and submit notice of preparatory works. Subject the project to screening and scoping by CEPA as per requirements of Environment Act 2000 ("the Act"). ▪ If required an environmental assessment report, submit the IEE/EMP cleared by ADB to CEPA for approval and subsequent application for an environment permit.	EMA 2000. IEE/EMP	CCDA, CCDA	Following clearance by CEPA and prior to tender preparation	If Level 2A, permit application is PGK100 (USD 32). If Level 2B, application fees for EIA & permit is PGK 12,000 (USD 3,787).

Issue/Activity	Mitigations				
	Measures and Actions	Standard/ Ref.	Responsible Entity	Timing	Cost
Ensuring environmentally responsible procurement.	▪ Include the updated EMP in the bidding and contract documents. ▪ Append the EMP to the Contract for basis in the preparation of the Contractor's EMP (SEMP) that will address as minimum the requirements in the ADB-cleared EMP. ▪ Ensure contractor prepares and submits for approval, their SEMP, at least one month before start of physical works; ▪ Ensure resident/supervision engineer, based on advice from MBPA-PIU & CCDA/PISC, approves the SEMP in writing prior to commencement of physical works; ▪ Ensure Contract requires the submission by Contractor of a monthly environmental monitoring report, outline to be appended to the Contract. ▪ Ensure Contract clearly identifies and stipulates penalties for non-compliance.	IEE/EMP	CCDA	During design in the preparation of tender/ bidding documents	c/o design cost
Preparation of, and obtaining clearance for, the SEMP Level of preparedness of the Contractor's Team in SEMP/ EMP implementation. .	▪ Ensure Contractor has engaged his environmental management officer (EMO) before the preparation of the SEMP. ▪ Prepare SEMP, based on the updated EMP --- to include construction methodology, site-specific drawings and plans, and sub-plans as required: : (i) Aggregates Management Plan; (ii) Sediment Control Plan; (iii) Solid and Hazardous Materials and Wastes Management Plan; (iv) Spills Response Plan; (v) Marine Traffic Management Plan ; (vi) Public Health and Safety Plan; (vii) Workers' Health and Safety Plan; and aggregates management plan (including applications for EPs) ▪ Evaluate SEMP quantitatively and qualitatively against the ADB-cleared EMP. ▪ Clear SEMP before start of any mobilization work. ▪ Prepare Contractor's Team on SEMP implementation (at the latest 1 week prior to construction mobilization) through the conduct of orientation on the SEMP/EMP. ▪ Ensure Contractor has set up & adequately equipped his Emergency Response Team (ERT) and has linked ERT to the MBP's Disaster Risk Response Team.	IEE/EMP	MBPA-PIU MBPA-PIU, ESS & ESO MBPA-PIU MBPA-PIU, ESS & ESO	After award of Contract, prior to start of any mobilization work	c/o Contractor's cost c/o CCDA counterpart budget -
Community preparation for construction.	▪ Conduct intensive IEC (following the Stakeholders Communications Plan) at the latest 1 month prior to construction mobilization --- to inform the affected communities of the: (i) implementation period, contact and other details, such as probably restricted area to use along access road or potentially blocking of access road from pedestrians, (ii) potential communicable/ transmittable diseases brought with the entry of	IEE/EMP, Stakeholder Communications Plan	CCDA, MBPA-PIU, ESS & ESO	At latest 1 month prior to construction mobilization	c/o CCDA and MBPA counterpart budgets and

Issue/Activity	Mitigations				
	Measures and Actions	**Standard/ Ref.**	**Responsible Entity**	**Timing**	**Cost**
	workers, (iii) overall health and safety hazards during construction, and (iv) GRM. ▪ Post details on project implementation at strategic location in the main area of influence at the latest one month prior to construction mobilization. Details to include, among others – implementation period, name and contact details of the Contractor and focal persons of CCDA and MBPA-PIU.				
CONSTRUCTION					
Deposits on/contamination of seabed from the following: ▪ Demolition of existing wharf and pile extraction ▪ Pile driving, sand compaction and concrete works associated with building the new wharf	▪ Conduct seabed sediment quality monitoring, at least once, within 15 days after construction demobilization, following the EHSG Ports, Harbors and Terminals (sediment quality monitoring parameters). ▪ Assess monitoring results against standards in CCME Sediment Quality Guidelines for the Protection of Aquatic Life. ▪ Install containment booms fitted with turbidity/silt curtain, extending to the seabed and at least 0.15 m above water line, around the effective area for the construction works over water, prior to the pile extraction. ▪ Install a moveable silt curtain around the piles to be extracted each day in the event excessive turbidity is observed in the first few extractions. ▪ Monitor and record the effectiveness of the silt curtain at least twice daily. Promptly apply corrective actions, when necessary.	IEE/EMP. EHSG Ports, Harbors and Terminals (on water and sediment quality monitoring parameters). CCME Sediment Quality Guidelines for the Protection of Aquatic Life.	MBPA-PIU	At least once, within 15 days after construction demobilization, Throughout construction period	c/o Contractor's cost
Reduction in local air quality due to the following: ▪ Suspended particulates/ dust in air from: - demolition works - transport & loading/ unloading of cement, natural aggregates, demolition debris & rubble, dry solid wastes & other materials - movements of vehicles on unpaved roads/surfaces - stockpile of cement and dry natural aggregates and demolition debris	▪ Conduct air quality monitoring on quarterly basis, following the EHSG on air emissions & ambient air quality. ▪ Assess monitoring results against EHSG. ▪ Spray water on concrete decks and structural elements to be demolished. ▪ Avoid demolition & dust generating works during high winds. ▪ Securely cover trucks hauling aggregates, cement and other similar materials. Maintain min. 2 feet freeboard. ▪ Minimize drop heights when loading/unloading natural aggregates, demolition debris & rubble, solid wastes and residual soils onto trucks/ground. ▪ Spray water on access roads at least twice daily. ▪ Limit maximum speed of construction vehicles to 30 kph in Project's main area of influence. ▪ Manage the delivery of natural aggregates, cement and other similar materials to the site to minimize having	IEE/EMP, EHSG	MBPA-PIU	Throughout construction period (activities generating dust and gas)	c/o Contractor's cost

Issue/Activity	Mitigations				
	Measures and Actions	**Standard/ Ref.**	**Responsible Entity**	**Timing**	**Cost**
- wind action on stockpiles of cement, fine natural aggregates, rubble and solid wastes - on-site concrete mixing for the reinforced concrete topping slab	more stockpiles than necessary. Water/cover stockpiles. ▪ Set up temporary fences/walls (as applicable) between work/stockpile areas and sensitive receptors at the provincial jetty and reclamation area (Transit Hotel) and along access road. ▪ Implement a prompt disposal of demolition and other construction debris and solid wastes to avoid stockpiling them on site for more than 2 days. ▪ Ensure concrete batch plants to have dust prevention equipment, e.g., water sprays, enclosures, hoods, curtains, fabric filters, among others. ▪				
▪ Gas emissions from: - operation of construction equipment/vehicles, including generator sets and engine idling - burning of solid and hazardous construction wastes - storage and use of high VOC-emitting products such as fuel and specialty applications, e.g., coatings for corrosion protection	▪ Reduce vehicular movements, such as through coordinated/managed transport of materials, spoils & waste and use of bigger capacity trucks for hauling of wastes/spoils, where access roads allow. ▪ Ensure construction vehicles/equipment are regularly serviced and maintained to industry standards. ▪ Use only construction vehicles/equipment, with an emission test certificate. ▪ Turn off equipment/vehicle when not in use. Limit engine idling to a maximum of 5 minutes. ▪ Use clean-fueled (green) power generator sets. ▪ No burning of wastes. ▪ Adopt/use alternative low or no VOC-emitting processes & materials.	IEE/EMP, EHSG	MBPA-PIU	Throughout construction period (activities generating dust and gas)	c/o Contractor's cost
Noise generated by the following: ▪ processes/activities such as demolition of existing wharf deck and associated structural elements and pile driving and extraction ▪ operating equipment/ vehicles (diesel-fed & without efficient mufflers) ▪ unloading of aggregates	▪ Conduct noise monitoring on weekly basis following the EHSG on environmental noise management. ▪ Assess monitoring results against EHSG. ▪ Apply alternative concrete demolition techniques that emit lower noise, e.g., improved expansive grout, micro-blasting, hydrodemolition (whichever would be most applicable to the project situation) ▪ Avoid conventional pile extraction and driving. Apply lower noise alternative technologies, e.g., press-in piling. ▪ Set up noise barriers such as temporary fence (without gaps) around active work area. Barriers to be as close to the source or to the receptor location. ▪ Install sound-absorbing enclosures around generators. ▪ Select equipment with lower sound power levels, e.g., electrically powered equipment with efficient mufflers. ▪ Restrict use of noisy equipment from 8 AM-5 PM. ▪ Overtime work should not go past 10 PM, observe regulated noise level, not use noisy equipment,	IEE/EMP, EHSG	MBPA-PIU	Throughout construction period (activities generating noise)	c/o Contractor's cost

Issue/Activity	Mitigations				
	Measures and Actions	Standard/ Ref.	Responsible Entity	Timing	Cost
	coordinated accordingly and informed to affected communities at least 2 days in advance. ▪ Turn off equipment/vehicles when not in use. ▪ Restrict heavy equipment/vehicles to move over the reclaimed area where the Transit Hotel is located. ▪ Install vibration isolation for mechanical equipment.				
Vibration from the movement of construction vehicles and construction activities	▪ Undertake structure condition survey prior to the commencement of construction. ▪ Conduct vibration monitoring (only near Transit Hotel) on a weekly basis. ▪ Restrict heavy equipment/vehicles to move over the reclaimed area where the Transit Hotel is located. ▪ Ensure highly vibrating mechanical equipment have vibration isolation.	IEE/EMP, EHSG	MBPA-PIU	Throughout construction period (activities generating noise)	c/o Contractor's cost
Impacts on marine water quality from the following:	▪ Conduct bay water quality monitoring on quarterly basis and after extreme rainfall events. ▪ Follow the EHSG Ports, Harbors, and Terminals (on water and sediment quality monitoring parameters). ▪ Assess monitoring results on water quality against PNG's Environment (Water Quality Criteria) Regulation 2002.	IEE/EMP. PNG's Environment (Water Quality Criteria) Regulation 2002. EHSG Ports, Harbors and Terminals (on water and sediment quality monitoring parameters).	MBPA-PIU	Throughout construction period (activities causing re-suspension of sediments, introducing new sediments, & generating discharges)	c/o Contractor's cost
▪ Demolition of existing wharf and pile extraction, pile driving, sand compaction and concrete works associated with building the new wharf. ▪ Uncontrolled sediments from silt-laden runoffs from stockpiles, from accidental spills of fine aggregates.	▪ Apply appropriate equipment and alternative techniques/ technologies in demolition, pile extraction and driving, sand compaction and deck construction/installation --- that generate least re-suspension of existing sediments; mitigate deposition of rubble/chips; and mitigate the occurrence of accidental spills. ▪ Avoid pouring concrete during wet weather. ▪ Provide proper formwork around cast-in-place concrete works to prevent concrete discharges. ▪ Implement the Sediment Control Plan in the SEMP accordingly. ▪ Use floating booms and barriers/silt curtains. ▪ Use any combination of the following to mitigate sedimentation from stockpiles: - Stockpile natural aggregates on flat grounds and away from, not obstructing, main surface drainage routes. - Use silt fences, sandbags, barrier nets at effective side/s of stockpiles. - Divert offsite runoff around the project site. - Locate stockpile at least 20m from the bay edge.	IEE/EMP. PNG's Environment (Water Quality Criteria) Regulation 2002. EHSG Ports, Harbors, and Terminals (on water and sediment quality monitoring parameters).	MBPA-PIU	Throughout construction period (activities causing re-suspension of sediments, introducing new sediments, & generating discharges)	c/o Contractor's cost

Issue/Activity	Mitigations				
	Measures and Actions	Standard/ Ref.	Responsible Entity	Timing	Cost
▪ Inadequately managed debris/rubble, other solid wastes and hazardous wastes	▪ Implement the Solid & Hazardous Wastes Management Plan in the SEMP accordingly and be guided by the EHSG on waste management. ▪ Implement an eco-friendly system of managing solid and hazardous wastes: - Enforce waste minimization, reuse and segregation. - Have adequate covered storage bins/containers, color-coded, clearly marked to avoid mixing, especially hazardous wastes. - Have separate enclosed storage areas for solid & hazardous wastes that can contain spills, clearly marked/labelled. - Link with private entities that are into waste recovery & recycling to reduce wastes brought to landfills. - Dispose of residual wastes at the appropriate or designated disposal site. - Coordinate with the AULLG for the disposal of hazardous wastes. - Enforce upon workers and waste contractors to observe safety measures/systems when handling wastes, particularly hazardous wastes. - Require waste contractor to promptly submit a manifest from the AULLG for every disposal, from the recyclers/junkshops for every delivery of re-usable construction spoils/wastes.				
▪ Inadequate wastewater management ▪ Inadequate management of hazardous materials	▪ Provide adequate sanitation facilities, adequate water supply. ▪ Strictly enforce observance of good sanitation practices. ▪ Implement the Hazardous Materials Management Plan in the SEMP accordingly and be guided by the EHSG on hazardous materials management. ▪ Use any combination of the following to mitigate impacts from hazardous substances: - Use less hazardous substances. Ensure all are legibly marked and labelled. - Have safe storage for hazardous substances, installed with visible caution signage, secure from unauthorized entry or use, can contain spillage and away from the bay edge (at least 20 m). - Have equipment clearly leaking oil repaired at once but off-site or replaced. - Restrict vehicle/equipment repair, maintenance and refueling on-site. - Have the appropriate spill kit in every vehicle transporting hazardous substances. Have appropriate number of trained staff for spill response.	IEE/EMP, EHSG	MBPA-PIU	Throughout construction period	c/o Contractor's cost

Issue/Activity	Mitigations				
	Measures and Actions	**Standard/ Ref.**	**Responsible Entity**	**Timing**	**Cost**
▪ Accidental spills on site	▪ Implement the Spills Response Plan in the SEMP in the event of spillage accordingly. ▪ Set up an on-site first-response team equipped with qualified staff. ▪ Provide for a response station equipped with adequate spill clean-up materials/kits for all types of hazardous substances used in the works. Have kits readily available on site, but only for access and use by authorized trained response staff during spillage.				
Impacts on marine ecology from the following:: ▪ Re-suspension of sediments during extraction of existing piles, driving of new piles and sand compaction	▪ Conduct monitoring of marine flora and fauna, including benthic, at least once, within 15 days from construction demobilization. ▪ Assess against the baseline data established during the design. ▪ Implement the following plans in the SEMP accordingly: - Sediment Control Plan - Solid and Hazardous Waste Management Plan - Hazardous Materials Management Plan - Spills Response Plan ▪ Implement the recommended measures to mitigate impacts on marine water quality.	IEE/EMP, Baseline data on flora & fauna established during the design	MBPA-PIU	Throughout construction period	c/o Contractor's cost
▪ Uncontrolled sediments from on-site works/silt-laden runoff enters marine enviornment. ▪ Inadequately managed debris/rubble, other solid wastes and hazardous wastes ▪ Inadequate wastewater management ▪ Inadequate management of hazardous materials ▪ Accidental spills on site.	▪ Implement the following plans in the SEMP accordingly: - Sediment Control Plan - Solid and Hazardous Waste Management Plan - Hazardous Materials Management Plan - Spills Response Plan ▪ Implement the recommended measures to mitigate impacts on marine water quality.	IEE/EMP, Baseline data on flora & fauna established during the design	MBPA-PIU	Throughout construction period	c/o Contractor's cost
Impacts on the sustainability of urban services: ▪ drainage channels along the access road and potentially along Abel Highway from wastes, silt and aggregate stockpiling	▪ Manage stockpiles: - Stockpile natural aggregates away from main surface drainage routes. - Use silt fences, sandbags, barrier nets at the effective side/s of stockpiles. - Divert offsite runoff around the project site. - Dispose of excess soil as soon as possible. ▪ Manage solid waste, as suggested in succeeding row.	IEE/EMP, EHSG	Contractor	Throughout construction period	c/o Contractor's cost

Issue/Activity	Mitigations				
	Measures and Actions	Standard/ Ref.	Responsible Entity	Timing	Cost
▪ solid waste collection services and disposal services at Gehu from the large volumes of solid waste generated, particularly from jetty deck demolition and pile extraction works	▪ **Manage the large volume of wharf demolition waste**: - Enforce waste minimization, reuse and segregation. - Arrange with private recyclers for the recovery of recyclables and the management of the recyclables as soon as these are generated to mitigate concerns on storage and disruptions in the Project's main are of influence – especially steel piles. Require a manifest on the volume recovered. - Arrange with a private contractor for the prompt collection of residuals and hazardous wastes. - Offer residual rubble as free filling materials for other projects, as appropriate. - Ensure coordination with AULLG on the solid and hazardous waste management and agreement with AULLG on the disposal site/s for these wastes. - Require residual waste contractor to promptly submit a manifest from the AULLG for every disposal.				
Traffic congestion (vehicular & pedestrian) at the intersection of the access road to the wharf with Abel Highway and the road leading to the Transit Hotel.	▪ Implement the Traffic Management Scheme in the SEMP accordingly. ▪ Coordinate traffic management scheme implementation with the local traffic authorities & affected communities. ▪ Post traffic (flag) persons during entire working hours. ▪ Spread out schedule for materials delivery in non-peak hours. ▪ Manage arrivals/departures of trucks. ▪ Ensure stockpiles do not impede/obstruct traffic flow.	IEE/EMP, EHSG (Traffic Safety)	MBPA-PIU	Throughout construction period	c/o Contractor's cost
Local flooding from indiscriminate stockpiles and other blockage.	▪ Stockpile natural aggregates on flat grounds and away from, not obstructing, main surface drainage routes. ▪ Implement a prompt disposal of demolition and other construction debris and solid wastes to avoid stockpiling them on site for more than 2 days.	IEE/EMP	MBPA-PIU	Throughout construction period	c/o Contractor's cost
Potential **social conflicts** from hiring workers from outside.	▪ Coordinate with AULLG and District LLG for the hiring of locals skilled in construction works. ▪ Ensure awareness of construction workers regarding potential social conflict.	IEE/EMP	MBPA-PIU	Throughout construction period	c/o Contractor's cost
Disruption of socio-economic activities.	▪ Provide safe alternative access for pedestrians, for patrons and vendors of the informal market, for patrons of business establishments in the main area of influence. ▪ In case of accidental damage to existing water and power lines, advise concerned utility company at once for action.	IEE/EMP	MBPA-PIU	Throughout construction period	c/o Contractor's cost
Public health and safety hazards.	▪ Implement the Public Health and Safety Plan in the SEMP accordingly and be guided by PNG's Public	IEE/EMP. EHSG (Community Health &	MBPA-PIU	Throughout construction period	c/o Contractor's cost

Issue/Activity	Mitigations				
	Measures and Actions	**Standard/ Ref.**	**Responsible Entity**	**Timing**	**Cost**
	Health Act 1978 and EHSG on community health and safety. ▪ Ensure stockpiles do not pose public safety hazard. ▪ Provide safe access for communities. ▪ Install adequate temporary lighting to augment the existing lighting in the main area of influence. ▪ Install adequate, legible, reflectorized signage relevant to public safety. ▪ Do not allow children to swim near the effective construction area at Sanderson Bay. ▪ Observe good sanitation practices. ▪ Observe the GRM.	Safety). PNG's Public Health Act 1978.			
Workers' health and safety hazards.	▪ Implement the Workers' Health and Safety Plan in the SEMP accordingly and be guided by PNG's Employment Act 1978 and EHSG on occupational health and safety. ▪ Strictly enforce use of PPE, e.g., eye & nose masks, ear mufflers, helmets gloves, appropriate footwear. ▪ Install adequate lighting, safe access to/from work areas. ▪ Provide safe accommodations with reliable supply of potable water, adequate sanitation facilities. ▪ Emergency response team equipped with adequate equipment, tools, supplies, including fire-fighting. ▪ Ensure appropriate frequency of emergency drills (e.g., fire, disaster management) are conducted.	IEE/EMP, EHSG, PNG's Employment Act 1978	MBPA-PIU	Throughout construction period	c/o Contractor's cost
OPERATION					
Extreme weather event, earthquake event, and/or any accident or adverse incident involving the wharf structure caused by a ship/boat or any party.	▪ Conduct prompt investigation of the wharf structure: (i) after every extreme weather event; (ii) after every earthquake event; and/or (iii) after an accident or adverse incident involving the wharf structure caused by a ship or boat or any party. ▪ Conduct regular inspection of wharf's structure and elements. Act on any damage/s promptly. ▪ Submit report promptly to MBPA-PIU and CCDA to submit to ADB.	IEE/EMP.	MBPTA (Operator) and MBPA-PIU to conduct joint investigation and prepare report	After every extreme weather event, earthquake event or any accident or adverse incident involving the wharf structure caused by a ship/boat or any party.	c/o MBPTA annual budget for operations

ADB - Asian Development Bank; AULLG - Alotau Urban Local Level Government; CCDA - Climate Change and Development Authority; SEMP – contractor's site-specific environmental management plan; CEPA - Conservation and Environmental Protection Authority; EHSG - Environmental, Health and Safety Guidelines; EMP – Environmental Management Plan; ESS - Environmental Safeguard Specialist; GRM - grievance redress mechanism; IEE– Initial Environmental Examination; MBPA - Milne Bay Provincial Administration; MBPTA - Milne Bay Province Transport Authority; PMU - Project Management Unit ; PNG - Papua New Guinea; PPE - personal protective equipment; PIU - Project Implementation Unit; PISC - Project implementation and supervision consultant

Table 8.3: Environmental Monitoring Plan

Issue/activity	Monitoring				
	Measures and actions	Performance Indicator	Responsibility	Timing	Cost
DESIGN AND PRE-CONSTRUCTION					
Limited open land in the project's vicinity to situate temporary construction facilities and for facilitated entry and exit of construction vehicles/equipment to/from the project site.	▪ Undertake adequate consultations and coordination with stakeholders and jointly plan on, among others: (i) location of temporary facilities and work areas, e.g., stockpiles, storage, site office, parking area; and (ii) measures to mitigate anticipated traffic along the access road to the wharf and congestion at the intersections of access road with Abel Highway and internal road beside the informal market leading to the Transit Hotel --- to mitigate public health & safety risks & disruption of socio-economic activities in the vicinity.	Notes of Consultations, with attendance sheets and photos taken.	CCDA, ESS & ESO	During design	c/o CCDA counterpart budget
Lack of baseline data on environmental quality.	▪ Conduct the appropriate surveys to establish the baseline data for ambient air quality, marine water quality, marine flora & fauna including benthic, seabed sediment; and (at Transit Hotel site) vibration.	Baseline data on air quality, marine water quality, flora & fauna including benthic, seabed sediment; & (at Transit Hotel) vibration, established.	CCDA, ESS & ESO	During design (for input into updated EMP)	c/o CCDA counterpart budget
Supply (and extraction) of gravel, sand, soil, crushed rock to meet construction demand.	▪ Prepare an Aggregates Management Plan (AMP), confirming locations of sources, estimating supply of and demand for aggregates during construction. This will serve as framework for Contractor's AMP. ▪ Specify in bidding documents Contractor's obligation to obtain aggregates only from quarries & crushing plants still operating within allowed threshold per an active permit to operate.	Aggregates Management Plan prepared. Contractor's obligation is specified in the bidding documents.	CCDA, ESS & ESO	During design (prior to start of procurement process)	c/o CCDA counterpart budget
Institutional preparedness of executing and implementing agencies in monitoring and reporting on EMP implementation.	▪ Ensure CCDA has employed its Environmental Safeguard Officer (ESO) and MBPA-PIU, its Social Officer (SO) in the design stage. ▪ Conduct an orientation workshop for CCDA and MBPA-PIU on EMP and training on monitoring and reporting on Contractor's performance in EMP implementation. ▪ Prepare the monitoring and reporting forms.	CCDA & PIU. Documentations on orientation workshop & training available. Monitoring & reporting forms finalized.	ADB	During design (after completion of updated EMP)	c/o ADB
Project's compliance with country's legal environmental safeguard requirements.	▪ Engage with CEPA. Subject the project to screening and scoping by CEPA as per requirements of Environment Act 2000 ("the Act"). ▪ If required an environmental assessment report, submit the IEE/EMP cleared by ADB to CEPA for approval and subsequent application for an environment permit.	Project's Environment Permit from CEPA	ADB	Prior to tender preparation	c/o ADB

Issue/activity	Monitoring				
	Measures and actions	**Performance Indicator**	**Responsibility**	**Timing**	**Cost**
Ensuring environmentally responsible procurement.	▪ Include the ADB-cleared EMP in the bidding documents. ▪ Append the EMP to the Contract for basis in the preparation of the Contractor's EMP (SEMP) that will address as minimum the requirements in the ADB-cleared EMP. ▪ Ensure Contract requires the submission by Contractor of a monthly environmental monitoring report, outline to be appended to the Contract. ▪ Progress payments and performance bond tied to SEMP performance and compliance	Updated EMP integrated in the bidding documents Contract form stipulating: Contractor's obligation to submit monthly reports; Implement approved SEMP etc	Combination of the following entities, whichever is appropriate to item monitored: CCDA, ESS & ESO, ADB	During design in the preparation of tender/ bidding documents	c/o ESS cost
	▪ Ensure Contract stipulates some tie up of progress payment and collection of performance bond with the performance in SEMP implementation.	performance in SEMP implementation.			
Preparation of, and obtaining clearance for, the SEMP Level of preparedness of the Contractor's Team in SEMP/ EMP implementation. .	▪ Ensure Contractor has engaged his environmental management officer before the SEMP preparation. ▪ Prepare SEMP, based on the updated EMP --- to include construction methodology, site-specific drawings and plans, and sub-plans as required: : (i) Aggregates Management Plan; (ii) Sediment Control Plan; (iii) Solid and Hazardous Materials and Wastes Management Plan; (iv) Spills Response Plan; (v) Marine Traffic Management Plan ; (vi) Public Health and Safety Plan; (vii) Workers' Health and Safety Plan; and aggregates management plan (including applications for EPs) ▪ Evaluate SEMP quantitatively and qualitatively against the ADB-cleared EMP. ▪ Clear SEMP before start of any mobilization work. ▪ Prepare Contractor's Team on SEMP implementation (at the latest 1 week prior to construction mobilization) through the conduct of orientation on the SEMP/EMP. ▪ Ensure Contractor has set up & adequately equipped his Emergency Response Team (ERT) and has linked ERT to the MBP's Disaster Risk Response Team.	PIU-cleared SEMP which contains the prescribed plans/ scheme. ADB review	CCDA, ESS & ESO, ADB (review)	Prior to start of construction mobilization	c/o CCDA counterpart budget
Community preparation for construction.	▪ Conduct intensive IEC (following the Stakeholders Communications Plan) at the latest 1 month prior to construction mobilization --- to inform the affected communities of the: (i) implementation period, contact and other details, such as probably restricted area to use along access road or potentially blocking of access road from pedestrians, (ii) potential communicable/ transmittable diseases brought with the entry of workers, (iii) overall health and safety hazards during construction, and (iv) GRM. ▪ Post details on project implementation at strategic location in the main area of influence at the latest one month prior to construction mobilization. Details to	Documentations on the conduct of IEC with attendance sheets and photos taken Posters & billboards on project implementation details posted/installed at strategic locations in the main area of influence	ESS & ESO, ADB	At latest 1 month prior to construction mobilization	c/o ESS cost

Issue/activity	Monitoring				
	Measures and actions	**Performance Indicator**	**Responsibility**	**Timing**	**Cost**
	include, among others – implementation period, name and contact details of the Contractor and focal persons of CCDA and MBPA-PIU.				
Level of preparedness of the Contractor's Team in SEMP/ EMP implementation.	▪ Ensure Contractor has engaged his environmental and social safeguards before the preparation of the SEMP. ▪ Prepare Contractor's Team on SEMP implementation (at the latest 1 week prior to construction mobilization) through the conduct of orientation on the SEMP/EMP. ▪ Ensure Contractor has set up & adequately equipped his Emergency Response Team (ERT) and has linked ERT to the MBP's Disaster Risk Response Team.	ESS employed as part of the PISC Documentation on SEMP orientation with attendance sheets and photos taken.	CCDA, MBPA-PIU, ESS & ESO	Completed at latest 1 week prior to construction mobilization	c/o CCDA counterpart budget
Deposits on/contamination of seabed from the following: ▪ Demolition of existing wharf and pile extraction ▪ Pile driving, sand compaction and concrete works associated with building the new wharf	▪ Conduct seabed sediment quality monitoring, at least once, within 15 days after construction demobilization, following the EHSG Ports, Harbors and Terminals (sediment quality monitoring parameters). ▪ Assess monitoring results against standards in CCME Sediment Quality Guidelines for the Protection of Aquatic Life. Parameters monitored will be those that have exceeded or are close to the standard limits as shown in the results of the baseline survey conducted during the design. ▪ Assess monitoring results against standards in CCME Sediment Quality Guidelines for the Protection of Aquatic Life and the baseline data. ▪ Install containment booms fitted with turbidity/silt curtain, extending to the seabed and at least 0.15 m above water line, around the effective area for the construction works over water, prior to the pile extraction. ▪ Install a moveable silt curtain around the piles to be extracted each day in the event excessive turbidity is observed in the first few extractions. ▪ Monitor and record the effectiveness of the silt curtain at least twice daily. Promptly apply corrective actions, when necessary.	Report on sediment quality monitoring available 1 month after construction demobilization. Monitoring reveal results to be: - Within CCME standards, - Within baseline values, OR -Within agreed on X% exceedance over baseline values. (acceptable X% exceedance over baseline value to be agreed on during design) No grievance lodged on seabed sediment quality concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, implement GRM	MBPA-PIU, ESS & ESO	Only once, one month after construction demobilization	c/o MBPA counterpart budget
Reduction in local air quality due to the following:	▪ Conduct air quality monitoring on quarterly basis, following the EHSG on air emissions & ambient air quality (in the absence of PNG national guidelines).Parameters monitored will be those that have exceeded the standard limits or are close to the limits as shown in the results of the baseline survey conducted during the design. ▪ Assess monitoring results against EHSG standards and baseline data.	Report on ambient air quality monitoring available within 15 days after end of each quarter. Monitoring reveal results to be: Within EHSG standards, Within baseline values, OR	MBPA-PIU, ESS & ESO	Throughout construction period	c/o MBPA counterpart budget

Issue/activity	Monitoring				
	Measures and actions	Performance Indicator	Responsibility	Timing	Cost
▪ Suspended particulates/ dust in air from: - demolition works - transport & loading/ unloading of cement, natural aggregates, demolition debris & rubble, dry solid wastes & other materials - movements of vehicles on unpaved roads/surfaces - stockpile of cement and dry natural aggregates and demolition debris - wind action on stockpiles of cement, fine natural aggregates, rubble and solid wastes - on-site concrete mixing for the reinforced concrete topping slab	▪ Spray water on concrete decks and structural elements to be demolished. ▪ Avoid demolition & dust generating works during high winds. ▪ Securely cover trucks hauling aggregates, cement and other similar materials. Maintain min. 2 feet freeboard. ▪ Minimize drop heights when loading/unloading natural aggregates, demolition debris & rubble, solid wastes and residual soils onto trucks/ground. ▪ Spray water on access roads at least twice daily. ▪ Limit maximum speed of construction vehicles to 30 kph in Project's main area of influence. Manage the delivery of natural aggregates, cement and other similar materials to the site to minimize having more stockpiles than necessary. Water and cover stockpiles. ▪ Set up temporary fences/walls (as applicable) between work/stockpile areas and sensitive receptors at the provincial jetty and reclamation area (Transit Hotel) and along access road. ▪ Implement a prompt disposal of demolition and other construction debris and solid wastes to avoid stockpiling them on site for more than 2 days. ▪ Ensure concrete batch plants to have dust prevention equipment, e.g., water sprays, enclosures, hoods, curtains, fabric filters, among others.	Within agreed on X% exceedance over baseline values (acceptable X% exceedance over baseline value to be agreed on during design) No grievance lodged on air quality concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, progress of actions taken in line with GRM.			
▪ Gas emissions from: - operation of construction equipment/vehicles, including generator sets and engine idling - burning of solid and hazardous construction wastes - storage and use of high VOC-emitting products such as fuel and specialty applications, e.g., coatings for corrosion protection	▪ Reduce vehicular movements, such as through coordinated/managed transport of materials, spoils & waste and use of bigger capacity trucks for hauling of wastes/spoils, where access roads allow. ▪ Ensure construction vehicles/equipment are regularly serviced and maintained to industry standards. ▪ Use only construction vehicles/equipment, with an emission test certificate. ▪ Turn off equipment/vehicle when not in use. Limit engine idling to a maximum of 5 minutes. ▪ Use clean-fueled (green) power generator sets. ▪ No burning of wastes. Adopt/use alternative low or no VOC-emitting processes & materials.				
Noise generated by the following:	▪ Conduct noise monitoring on weekly basis following the EHSG on environmental noise management. ▪ Assess monitoring results against EHSG standards and baseline data.	Report on noise monitoring available within 7 days after each monitoring. Monitoring reveal results to be: - Within EHSG standards, - Within baseline values,	MBPA-PIU, ESS & ESO	Throughout construction period	c/o MBPA counterpart budget
▪ processes/activities such as demolition of existing wharf deck and associated	▪ Apply alternative concrete demolition techniques that emit lower noise, e.g., improved expansive grout,				

Issue/activity	Monitoring				
	Measures and actions	Performance Indicator	Responsibility	Timing	Cost
structural elements and pile driving and extraction ▪ operating equipment/ vehicles (diesel-fed & without efficient mufflers) ▪ unloading of aggregates	micro-blasting, hydrodemolition (whichever would be most applicable to the project situation) ▪ Avoid conventional pile extraction and driving. Apply lower noise alternative technologies, e.g., press-in piling. ▪ Set up noise barriers such as temporary fence (without gaps) around active work area. Barriers to be as close to the source or to the receptor location. ▪ Install sound-absorbing enclosures around generators. ▪ Select equipment with lower sound power levels, e.g., electrically powered equipment with efficient mufflers. ▪ Restrict use of noisy equipment from 8 AM-5 PM. ▪ Overtime work should not go past 10 PM, observe regulated noise level, not use noisy equipment, coordinated accordingly and informed to affected communities at least 2 days in advance. ▪ Turn off equipment/vehicles when not in use. ▪ Restrict heavy equipment/vehicles to move over the reclaimed area where the Transit Hotel is located. ▪ Install vibration isolation for mechanical equipment.	OR - Within agreed on X% exceedance over baseline values. (acceptable X% exceedance over baseline value to be agreed on during design) No grievance lodged on noise concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved,			
Vibration from the movement of construction vehicles and construction activities	▪ Undertake structural condition survey of Transit Hotel prior to the commencement of construction ▪ Conduct structure condition survey of Transit Hotel once every month during the peak construction period and assess the results against the findings prior to construction. ▪ Conduct vibration monitoring (only near Transit Hotel) on a weekly basis. ▪ Assess monitoring results against the most relevant standards from other countries and against the baseline data. ▪ Restrict heavy equipment/vehicles to move over the reclaimed area where the Transit Hotel is located. ▪ Ensure highly vibrating mechanical equipment have vibration isolation. ▪ Turn off equipment/vehicles when not in use. ▪ Restrict heavy equipment/vehicles to move over the reclaimed area where the Transit Hotel is located. ▪ Install vibration isolation for mechanical equipment.	Report on vibration monitoring available within 7 days after each monitoring. Monitoring reveal results to be: Within EHSG or other most relevant standards, Within baseline values, OR Within agreed on X% exceedance over baseline values. (acceptable X% exceedance over baseline value to be agreed on during design) No grievance lodged on vibration concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved – as per GRM	MBPA-PIU, ESS & ESO MBPA-PIU, ESS & ESO	Throughout construction period Throughout construction period	c/o MBPA counterpart budget c/o MBPA counterpart budget
Impacts on marine water quality from the following:	▪ Conduct bay water quality monitoring on quarterly basis and after extreme rainfall events. ▪ Follow the EHSG Ports, Harbors, and Terminals (on water and sediment quality monitoring parameters).	Report on water quality monitoring available within 15 days after each monitoring.	MBPA-PIU, ESS & ESO	Throughout construction period	c/o MBPA counterpart budget

Issue/activity	Monitoring				
	Measures and actions	**Performance Indicator**	**Responsibility**	**Timing**	**Cost**
▪ Demolition of existing wharf and pile extraction, pile driving, sand compaction and concrete works associated with building the new wharf. ▪ Uncontrolled sediments from silt-laden runoffs from stockpiles, from accidental spills of fine aggregates. ▪ Inadequately managed debris/rubble, other solid wastes and hazardous wastes	▪ Assess monitoring results on water quality against PNG's Environment (Water Quality Criteria) Regulation 2002 and the baseline data. Parameters to monitor will be those that have exceeded the standard limits or are close to the limits as shown in the results of the baseline survey conducted during the design. ▪ Apply appropriate equipment and alternative techniques/ technologies in demolition, pile extraction and driving, sand compaction and deck construction/installation --- that generate least re-suspension of existing sediments; mitigate deposition of rubble/chips; and mitigate the occurrence of accidental spills. ▪ Avoid pouring concrete during wet weather. ▪ Provide proper formwork around cast-in-place concrete works to prevent concrete discharges. ▪ Implement the Sediment Control Plan in the SEMP accordingly. ▪ Use floating booms and barriers/silt curtains. ▪ Use any combination of the following to mitigate sedimentation from stockpiles: - Stockpile natural aggregates on flat grounds and away from, not obstructing, main surface drainage routes. - Use silt fences, sandbags, barrier nets at effective side/s of stockpiles. - Divert offsite runoff around the project site. - Locate stockpile at least 20 m away from edge of bay ▪ Implement the Solid and Hazardous Wastes Management Plan in the SEMP accordingly and be guided by the EHSG on waste management. ▪ Implement an eco-friendly system of managing solid and hazardous wastes: - Enforce waste minimization, reuse and segregation. - Have adequate covered storage bins/containers, color-coded, clearly marked to avoid mixing, especially hazardous wastes. - Have separate enclosed storage areas for solid and hazardous wastes that can contain spills, clearly marked/labelled.	Report on sediment quality monitoring available within 21 days after monitoring. Monitoring reveal results to be: - Within PNG's or CCME standards, - Within baseline values, OR - Within agreed on X% exceedance over baseline values. (acceptable X% exceedance over baseline value to be agreed on during design) No grievance lodged on water or sediment quality concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, as per GRM. Presence (at the project site) of adequate covered storage bins/ containers, color-coded, clearly marked. Copies of manifests for having disposed of wastes at Alotau town's dumpsite and for having delivered recyclables to junkshops or recyclers received at CCDA.			
	- Link with private individuals/entities that are into waste recovery & recycling to reduce wastes brought to landfills. - Dispose of residual wastes at the appropriate or designated disposal site.	No grievance lodged on concern associated with wastes. If any: (i) confirmation of satisfactory action signed	MBPA-PIU, ESS	Throughout construction period	c/o MBPA counterpart budget

Issue/activity	Monitoring				
	Measures and actions	Performance Indicator	Responsibility	Timing	Cost
	- Coordinate with the AULLG for the disposal of hazardous wastes. - Enforce upon workers and waste contractors to observe safety measures/systems when handling wastes, particularly hazardous wastes. - Require waste contractor to promptly submit a manifest from the AULLG for every disposal, from the recyclers/junkshops for every delivery of re-usable construction spoils/wastes.	by AP; or (ii) if not yet resolved, progress of actions taken in line with GRM.			
▪ Inadequate wastewater management	▪ Provide adequate sanitation facilities, adequate water supply. ▪ Strictly enforce observance of good sanitation practices.	Adequate sanitation facilities and water supply available at the project site. No grievance lodged on sanitation concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, progress of actions taken in line with GRM.			
▪ Inadequate management of hazardous materials	▪ Implement the Hazardous Materials Management Plan in the SEMP accordingly and be guided by the EHSG on hazardous materials management. ▪ Use any combination of the following to mitigate impacts from hazardous substances: - Use less hazardous substances. Ensure all are legibly marked and labelled. - Have safe storage for hazardous substances, installed with visible caution signage, secure from unauthorized entry or use, can contain spillage and away from the bay edge (at least 20 m). - Have equipment clearly leaking oil repaired at once but off-site or replaced. - Restrict vehicle/equipment repair, maintenance and refueling on-site. - Have the appropriate spill kit in every vehicle transporting hazardous substances. Have appropriate number of trained staff for spill response.	Presence of safe storage facilities for hazardous substances, with visible caution signage, secure from unauthorized entry or use, can contain spillage, situated at min. 20m away from the bay. No grievance lodged on hazardous substance concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, progress of actions taken in line with GRM.			

Issue/activity	Monitoring				
	Measures and actions	Performance Indicator	Responsibility	Timing	Cost
▪ Accidental spills on site	▪ Implement the Spills Response Plan in the SEMP in the event of spillage accordingly.	Presence of a first-response team and	MBPA-PIU, ESS	Throughout construction period	c/o MBPA counterpart budget

Issue/activity	Monitoring				
	Measures and actions	**Performance Indicator**	**Responsibility**	**Timing**	**Cost**
	▪ Set up an on-site first-response team equipped with qualified staff. ▪ Provide for a response station equipped with adequate spill clean-up materials/kits for all types of hazardous substances used in the works. Have kits readily available on site, but only for access and use by authorized trained response staff during spillage	adequately equipped response station on-site. No grievance lodged on spillage concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, as per GRM.			
▪ **Impacts on marine ecology** from the following:: ▪ Re-suspension of sediments during extraction of existing piles, driving of new piles and sand compaction ▪ Uncontrolled sediments from the demolition of concrete decks and structural elements of existing wharf; from on-site concrete works; from silt-laden runoffs from stockpiles; from accidental spills of fine aggregates. ▪ Inadequately managed debris/rubble, other solid wastes and hazardous wastes ▪ Inadequate wastewater management ▪ Inadequate management of hazardous materials Accidental spills on site	▪ Conduct monitoring of marine flora and fauna, including benthic, at least once, within 15 days from construction demobilization. ▪ Assess against the baseline data established during the design. ▪ Implement the following plans in the SEMP accordingly: - Sediment Control Plan - Solid and Hazardous Waste Management Plan - Hazardous Materials Management Plan - Spills Response Plan ▪ Implement the recommended measures to mitigate impacts on marine water quality.	Report on flora and fauna including benthic available within 21 days after monitoring and assessment against baseline data. Assessment reveals reveal results to be: No change from baseline, OR Within agreed on X% exceedance over baseline data. (acceptable X% exceedance over baseline data to be agreed on during design)	MBPA-PIU, ESS & ESO	At the end of construction works or post demobilization Throughout construction period	c/o MBPA counterpart budget
Impacts on the sustainability of urban services: ▪ drainage channels along the access road and potentially along Abel Highway from wastes, silt and aggregate stockpiling	▪ ▪ Manage stockpiles: - Stockpile natural aggregates away from main surface drainage routes. - Use silt fences, sandbags, barrier nets at the effective side/s of stockpiles. - Divert offsite runoff around the project site. - Dispose of excess soil as soon as possible. ▪ Manage solid waste, as suggested in succeeding row.	No grievance lodged on flooding due to ineffective drainage. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, progress of	MBPA-PIU	Throughout construction period	c/o MBPA counterpart budget

Issue/activity	Monitoring				
	Measures and actions	**Performance Indicator**	**Responsibility**	**Timing**	**Cost**
▪ Solid waste collection services and disposal services at Gehu from solid waste generated, particularly from demolition and pile extraction works	▪ **<u>Manage the huge volume of solid waste</u>**: - Enforce waste minimization, reuse and segregation. - Arrange with private recycler for the recovery of recyclables (especially steel piles) and for the management of the recyclables as soon as these are generated to mitigate concerns on storage and disruptions in the Project's main are of influence. Require a manifest on the volume recovered. - Arrange with a private contractor for the prompt collection of residuals and hazardous wastes. - Offer residual rubble as free filling materials for other projects, as appropriate. - Ensure coordination with AULLG on the solid and hazardous waste management and agreement with AULLG on the disposal site/s for these wastes. ▪ Require residual waste contractor to promptly submit a manifest from the AULLG for every disposal.	actions taken in line with GRM. Contract with private recycler/s. Contract with private contractor for the collection and disposal of residual wastes (including hazardous wastes. Copies of manifests for having disposed of wastes at Gehua or at other disposal site/s designated by AULLG. Copies of manifests from contracted recycler/s for volume recovered. No grievance lodged on concern associated with solid wastes. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, as per GRM.			
Traffic congestion (vehicular & pedestrian) at the intersection of the access road to the wharf with Abel Highway and the road leading to the Transit Hotel	▪ Implement the Traffic Management Scheme in the SEMP accordingly. ▪ Coordinate traffic management scheme implementation with the local traffic authorities & affected communities. ▪ Post traffic (flag) persons during entire working hours. ▪ Schedule for materials delivery in non-peak hours. ▪ Manage arrivals/departures of trucks. ▪ Ensure stockpiles do not impede/obstruct traffic flow.	No grievance lodged on spillage concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, as per GRM.	MBPA-PIU, ESS & ESO	Throughout construction period	c/o MBPA counterpart budget
Local flooding from indiscriminate stockpiles and other blockage	▪ Stockpile natural aggregates on flat grounds and away from, not obstructing, main surface drainage routes. ▪ Implement a prompt disposal of demolition and other construction debris and solid wastes to avoid stockpiling them on site for more than 2 days.	Current extent of puddles during rains not worsened. Must have baseline photos taken during mobilization. No grievance lodged on flooding concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, as per GRM.	MBPA-PIU, ESS & ESO	Throughout construction period	c/o MBPA counterpart budget

Issue/activity	Monitoring				
	Measures and actions	**Performance Indicator**	**Responsibility**	**Timing**	**Cost**
Potential **social conflicts** from hiring workers from outside	▪ Coordinate with AULLG and District LLG for the hiring of locals skilled in construction works. ▪ Ensure awareness of construction workers regarding potential social conflict.	No grievance lodged on non- or low-hiring of locals. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, progress of actions taken in line with GRM.	MBPA-PIU, ESS & ESO	Throughout construction period	c/o MBPA counterpart budget
Disruption of socio-economic activities	▪ Provide safe alternative access for pedestrians, for patrons and vendors of the informal market, for patrons of business establishments in the main area of influence. ▪ In case of accidental damage to existing water and power lines, advise concerned utility company at once for action.	Presence of safe alternative accesses for people. No grievance lodged on blocking of access. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, progress of actions taken in line with GRM	MBPA-PIU, ESS & ESO	Throughout construction period	c/o MBPA counterpart budget
Public health and safety hazards	▪ Implement the Public Health and Safety Plan in the SEMP accordingly and be guided by PNG's Public Health Act 1978 and EHSG on community health and safety. ▪ Ensure stockpiles do not pose public safety hazard. ▪ Provide safe access for communities. ▪ Install adequate temporary lighting to augment the existing lighting in the main area of influence. ▪ Install adequate, legible, reflectorized signage relevant to public safety. ▪ Do not allow children to swim near the effective construction area at Sanderson Bay. ▪ Observe good sanitation practices. ▪ Observe the GRM.	No grievance lodged on public health and safety concern. If any: (i) confirmation of satisfactory action signed by AP; or (ii) if not yet resolved, progress of actions taken in line with GRM	MBPA-PIU, ESS & ESO	Throughout construction period	c/o MBPA counterpart budget
Workers' health and safety hazards	▪ Implement the Workers' Health and Safety Plan in the SEMP accordingly and be guided by PNG's Employment Act 1978 and EHSG on occupational health and safety. ▪ Strictly enforce use of PPE, e.g., eye & nose masks, ear mufflers, helmets gloves, appropriate footwear. ▪ Install adequate lighting, safe access to/from work areas. ▪ Provide safe accommodations with reliable supply of potable water, adequate sanitation facilities. ▪ Set up emergency response team equipped with adequate staff, equipment, tools & supplies, including for fire-fighting.	No record of any one accident causing serious injury, disability or death. No worker on duty without wearing the appropriate PPE. Secure workers' camps with reliable supply of potable water, adequate sanitation facilities.	MBPA-PIU, ESS & ESO	Throughout construction period	c/o MBPA counterpart budget

Issue/activity	Monitoring				
	Measures and actions	**Performance Indicator**	**Responsibility**	**Timing**	**Cost**
	Ensure appropriate frequency of emergency drills (e.g., fire, disaster management) are conducted.				
OPERATION					
Extreme weather event, earthquake event, and/or any accident or adverse incident involving the wharf structure caused by a ship/boat or any party.	▪ Conduct prompt investigation of the wharf structure: (i) after every extreme weather event; (ii) after every earthquake event; and/or (iii) after an accident or adverse incident involving the wharf structure caused by a ship or boat or any party. ▪ Conduct regular inspection of wharf's structure and elements. Act on any damage/s promptly. ▪ Submit report promptly to MBPA-PIU, which shall forward report to the CCDA for CCDA to submit to ADB.	Photos taken during investigation. Report on the investigation and action planned and made	CCDA, ADB	During operation	c/o CCDA counterpart budget

IX. CONCLUSIONS AND RECOMMENDATIONS

184. This IEE concludes that the proposed project is not located in or adjacent to any environmentally sensitive areas or natural/critical habitats. The extent of adverse impacts during construction is expected to be local, confined within the Project's main area of influence. Except during windy days, heavy rainfall and extreme weather event, fugitive dust, fine aggregates, sediments and wastes would not be the transported beyond the Project's main area of influence. With mitigation measures in place and ensuring that bulk of the works are completed (or at least almost complete) prior to the onset of the rainy season, the potential adverse impacts during construction would modest and more site-specific.

185. The few significant adverse impacts during construction will be temporary and short-term (i.e., most likely to occur only during peak construction period). These will not be sufficient to threaten or weaken the surrounding resources. The preparation and implementation of a Contractor's EMP that will address as a minimum the requirements of the ADB's SPS, and comply with PNG national environmental standards will mitigate the anticipated impacts. Simple and uncomplicated mitigation measures, basically integral to socially and environmentally responsible construction practices, are commonly used at construction sites and are known to Contractors. Hence, mitigation measures would not be difficult to design and institute.

186. Based on the above conclusions, the Project's classification as Category B. is confirmed.

References

2011 National Population and Housing Census of Papua New Guinea - Final Figures. National Statistical Office. Papua New Guinea. https://www.nso.gov.pg/

A Rapid Biodiversity Assessment of the Coral Reefs of Milne Bay Province, Papua New Guinea. Conservation International. 1998.

Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research. Volume 1: Regional Overview. Volume 2: Country Reports.

Environment Act 2000. Environment (Prescribed Activities) Regulation 2002. Environmental (Permits and Transitional) Regulations 2002. Conservation and Environmental Protection Authority. http://pngcepa.com/

Environmental and Social Management Framework. Papua New Guinea Tourism Sector Development Project. Incorporating Indigenous Peoples' Planning Framework and Resettlement Policy Framework. PNG Tourism Promotion Authority. 17 November 2016.

Environmental Assessment and Review Framework. PNG: Building Resilience to Climate Change in Papua New Guinea. Project No. 46495-002. March 2015.

Government of Papua New Guinea (2015) National Marine Conservation Assessment for Papua New Guinea; Conservation and Environment Protection Authority, 51pp.

"Information on Alotau – Sanderson Bay". Information on the existing environment collated by the Environment Unit, Milne Bay Provincial Administration. 21 March 2017.

Initial Environmental Examination (IEE). Proposed Upgrading and Rehabilitation of Gurney Airport. Milne Bay Province. Papua New Guinea. June 2009.

Memorandum of Understanding. PNG: Building Resilience to Climate Change in PNG (BRCC) – Additional Financing. Review Mission. Port Moresby and Alotau, Papua New Guinea. 10-13 January 2017.

Natural Hazards and Disasters in Papua New Guinea. Sue Lauer. 2004.

Samanta, S. and Pal, D.K. (2016) Change Detection of Land Use and Land Cover over a Period of 20 Years in Papua New Guinea. Natural Science, 8, 138-151. http://dx.doi.org/10.4236/ns.2016.83017

Sanderson Bay Foreshore Development Environment Impact Brief. Milne Bay Province Administration, Division of Planning and Coordination. 18 Feb 2010.

Sheppard, S and Cranfield, LC, 2012, Geological framework and mineralization of Papua New Guinea — an update: Mineral Resources Authority, Papua New Guinea, 65p.

Wave Climate Report – Alotau. Waves and Coasts in the Pacific. Obtained from http://gsd.spc.int/wacop/

World Database of Protected Areas 2016. www.protectedplanet.net

Annex A: Details on Wave Climate and Wind[24]

Average wave conditions

In Alotau, the average sea state is calm, dominated by wind and seas from the Southeast. There are seldom more than a few different wave directions/period components. Wave conditions tend to be consistent, meaning that they vary little within a few hours.

Table I.2 Mean wave conditions calculated between 1979 and 2012 for Alotau

Mean wave height	0.09m
Mean wave period	2.23s
Mean wave direction [° True North]	121 °
Mean number of wave components	0.46
Mean annual variability [m] (%)	0.02 m (21.5 %)
Mean seasonal variability [m] (%)	0.10 m (110.1 %)

Annual mean wave rose

The waves reaching Alotau are generally produced by the trade winds blowing the wave across hundreds of kilometers. The conditions are often calm, often calm and almost never rough. The principal direction, where waves occasionally come from is the Southeast (120°).

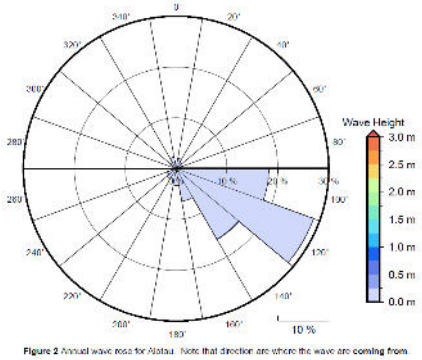


Figure 2 Annual wave rose for Alotau. Note that direction are where the wave are coming from.

Seasonal wave rose summary

In summer the dominant wave condition (occurring frequently) is calm, the waves are frequently calm and almost never rough, and the principal wave direction is from the East (100°). In autumn the dominant wave condition (occurring often) is calm, the waves are often calm and almost never rough, and the principal wave direction is from the Southeast (120°). In winter the dominant wave condition (occurring sometimes) is smooth, the waves are occasionally calm and almost never rough, and the principal wave direction is from the Southeast (120°). In spring the dominant wave condition (occurring often) is calm, the waves are often calm and almost never rough, and the principal wave direction is from the Southeast (120°).

[24] Extracted from: Wave Climate Report – Alotau. Waves and Coasts in the Pacific. Obtained from http://gsd.spc.int/wacop/

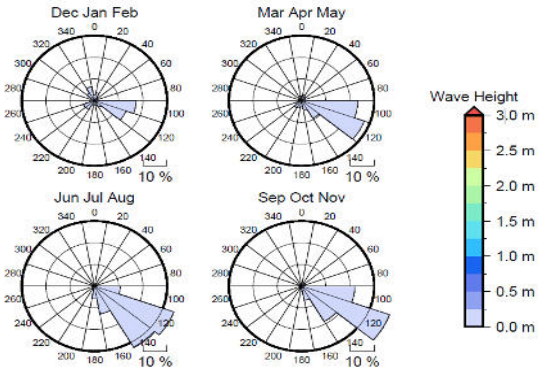


Figure 3 Seasonal wave roses for Alotau

Wave variation - monthly wave height, period and direction

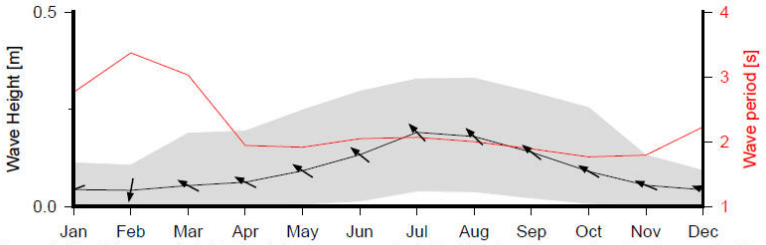


Figure 4 Monthly wave height (Black line), wave period (Red line) and wave direction (arrows). The grey area represents the range of wave height between calm periods (10% of lowest wave height) and large wave events (10% of highest wave height)

Wave variation - annual wave height, period and direction

In Alotau, the inter−annual variability (or coefficient of variation) for wave height is 21.5%, The Pacific average region variability in typically 7%. In Alotau the mean annual wave height has remained relatively unchanged since 1979.

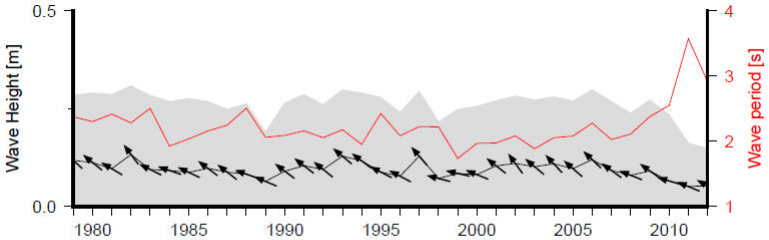


Figure 5 Annual wave height (Black line), wave period (Red line) and wave direction (arrows). The grey area represents the range of wave height between calm periods (10% of lowest wave height) and large wave events (10% of highest wave height)

Large and Severe Waves

In Alotau the threshold for large waves is 0.3m; for severe waves is 0.4m. The dominant direction for wave height larger than 0.3m is from the Southeast (140◦).

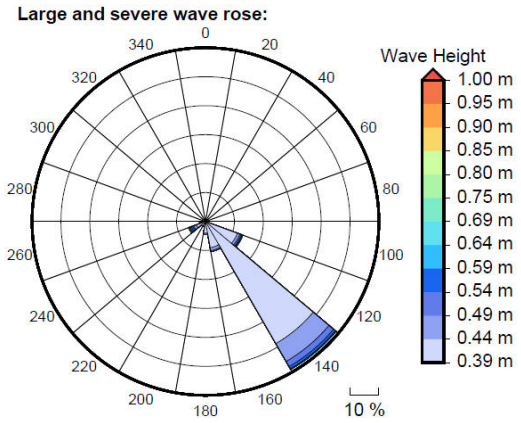


Figure 6 Large, severe and extreme wave roses for Alotau

Largest events

The largest event that reached Alotau since 1979 was on the 19−03−1997 and exceeded 1m, which is considered smooth.

Table 3 List of the 30 largest wave events in Alotau .

30 largest events				
Rank	Date	Height (m)	Period (s)	Dir. (°)
1	19−03−1997	0.99	4	249
2	26−09−1983	0.75	3	132
3	25−09−1993	0.73	5	128
4	15−03−1997	0.72	3	253
5	09−09−1998	0.72	5	123
6	06−08−1999	0.69	4	138
7	14−08−1985	0.68	5	127
8	08−08−1980	0.67	4	141
9	22−07−2005	0.65	4	134
10	17−06−1985	0.64	3	134
11	11−08−1991	0.63	4	135
12	14−05−1993	0.63	4	124
13	09−08−2006	0.61	4	139
14	27−07−1988	0.59	4	124
15	15−08−2001	0.59	3	153
16	28−06−1993	0.59	3	133
17	22−07−2006	0.59	3	143
18	23−06−1988	0.58	5	129
19	03−09−1994	0.58	5	129
20	05−07−1990	0.57	3	140
21	10−08−1995	0.57	3	140
22	21−06−1995	0.57	3	147
23	06−07−2003	0.57	5	133
24	30−12−1992	0.57	3	244
25	28−05−1998	0.57	3	136
26	02−09−1981	0.56	5	126
27	07−09−1980	0.56	3	144
28	11−07−1982	0.56	3	136
29	23−07−1988	0.55	4	127
30	09−08−1999	0.55	3	136

Wind

Wind is the origin of all waves and although swells are created by distant wind events, local winds can significantly affect the local waves. In Alotau the prevailing wind is dominated by South Easterly trade winds, with a mean wind speed of 3.64ms^{-1} (7.08knts) from the 134°.

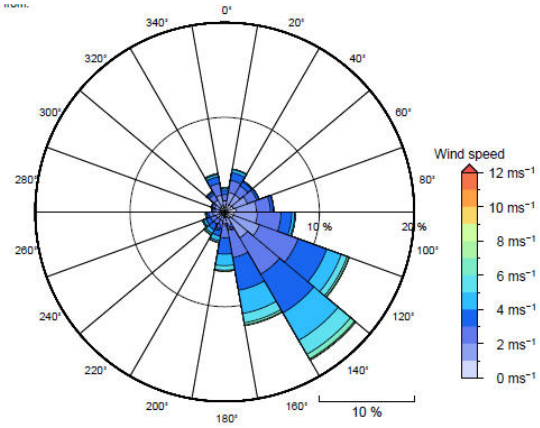


Figure 11 Annual wind rose for Alotau. Note that directions are where the wind is **coming from**.

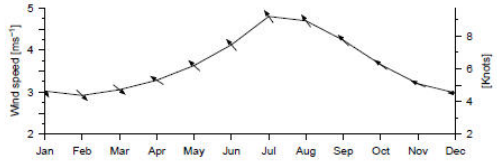


Figure 12 Monthly wind speed (Black line) and wind direction (arrows).

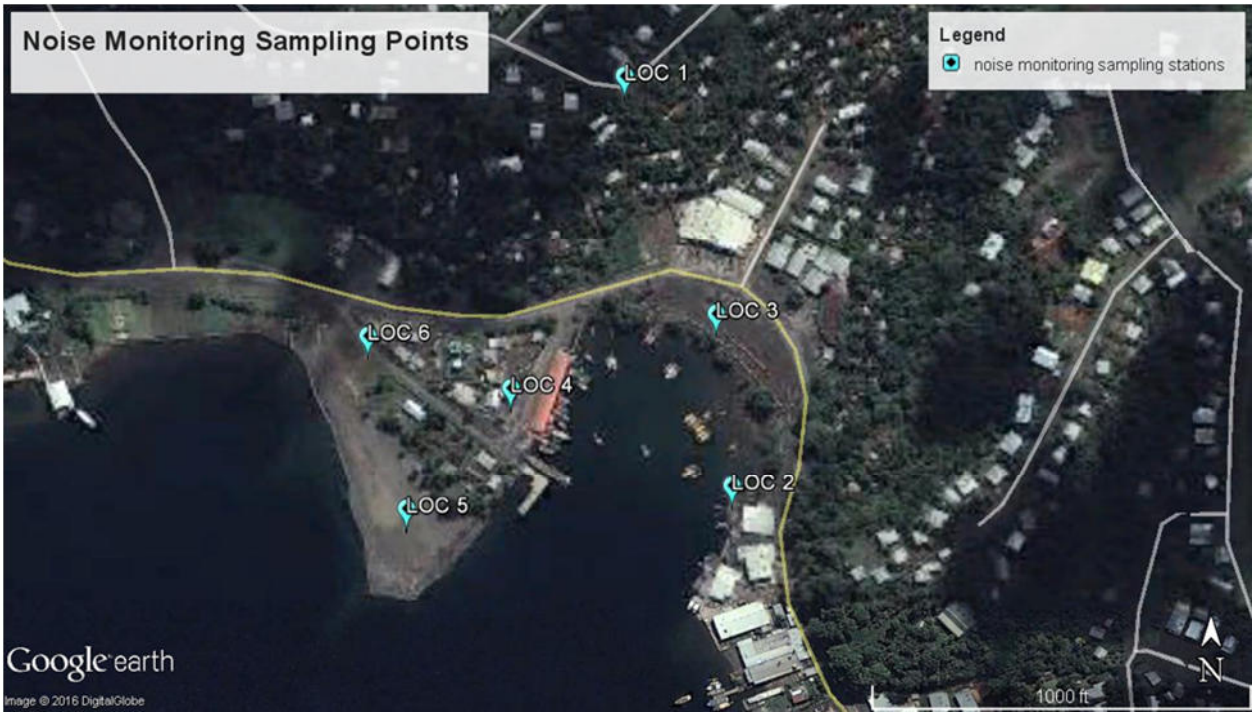
Annex B: Results of Ambient Noise Level Survey - March & April 2017*

Name	Common noise sources (at least 3 measurements)	Distance from noise source
1 Look-Out Point, Middle Town	Birds and people talking, roosters crowing	From 0 to 20-30 m
	Vehicles running on Abel Highway	At least 150-160m
	Dogs barking, hammering wood	Within 50 m
	Dinghies arriving and departing	At least 200 m
	Lukianos' engine running while bunkering	About 320 m
2 NAKO Fisheries, Ltd.	Boat loading cargo, people talking, birds, bay water splashing on sea wall	From 0 to 20 m
	Vehicles running on Abel Highway	At least 45 m
	Dinghy or boat arriving/departing, boat engine idling	Within 150 m
	Lukianos' engine running while bunkering	About 150 m
3 Dinghy mooring area	Vehicles running on Abel Highway	At least 80 m
	People talking, birds, bay water splashing on shore	From 0 to 15 m
	Dinghies departing/arriving	From 10 to 175 m
4 PikN-Pay Supermarket	People talking/singing/shouting, large electric fan, loud music inside the supermarket	From 0 to 10 m
	Vehicles coming and going	From 0 to 25 m
	Lukianos' engine running while bunkering	About 75-80 m
5 Transit Hotel	People talking, vehicles passing by/arriving/departing	From 0 to 20 m
	Lukianos' engine running while bunkering	Within 100 m
6 Informal market	People talking, vehicles arriving & departing, loud music inside market	From 0 to 10 m
	Vehicles passing by	From 0 to 35 m

* Note: The measurements were taken using Android apps sound meter to establish initial data.

^ Look-Out Point - middle town approx. 50 m elevation. Distance (320m) estimated distance from wharf is horizontal distance.

** Approximate distances. Measured from google maps.



Location 1: Look-Out Point, Middle Town: 320 m from wharf (March 2017)

	10 March 2017 (dB)				13 March 2017 (dB)				14 March 2017 (dB)			
	AM		PM		AM		PM		AM		PM	
Time	06:37	06:57	02:18	02:30	06:46	07:00	01:34	01:45	06:52	07:03	01:34	01:45
Min (dB)	31	30	27	18	30	28	17	41	33	33	37	17
Avg (dB)	42	41	45	44	40	42	42	47	42	42	47	38
Max (dB)	66	73	83	80	70	70	79	72	77	75	77	79

Sources of Sound		
10 Mar AM	06:37	Birds, vehicles running on Abel Highway, roosters crowing, people talking
	06:57	Birds, vehicles running on Abel Highway, roosters crowing, people talking, dog barking, hammering wood
10 Mar PM	02:18	Birds, vehicles running on Abel Highway, people talking, hammering wood, a loud whistle
	02:30	Birds, vehicles running on Abel Highway, people talking, 2 children talking nearby
13 Mar AM	06:46	Birds, vehicles running on Abel Highway, roosters crowing, people talking, dog barking
	07:00	Birds, vehicles running on Abel Highway, roosters crowing, people talking, dog barking, dinghy arriving
13 Mar PM	01:34	Birds, vehicles running on Abel Highway, roosters crowing, people talking, dog barking, dinghies departing and arriving, Lukianos' engine running while refilling, windy
	01:45	
14 Mar AM	06:52	Birds, vehicles running on Abel Highway, roosters crowing, people talking, dog barking, dinghies departing and arriving, Lukianos' engine running while refilling, vehicle backing up with sound
	07:03	Birds, vehicles running on Abel Highway, roosters crowing, people talking, dog barking, dinghies departing and arriving, Lukianos' engine running while refilling
14 Mar PM	01:34	Few birds, vehicles running on Abel Highway, people talking, hammering wood, dinghies departing/arriving, rain on umbrella
	01:45	

Location 2: NAKO: 150 m from wharf (March 2017)

	10 March 2017 (dB)				13 March 2017 (dB)				14 March 2017 (dB)			
	AM		PM		AM		PM		AM		PM	
Time	07:31	07:42	03:27	03:38	07:29	07:41	02:06	02:18	07:27	07:38	02:11	02:23
Min (dB)	31	24	31	34	38	36	43	41	47	46	22	18
Avg (dB)	43	40	41	45	48	44	50	50	52	51	41	39
Max (dB)	72	75	75	72	80	76	74	71	76	70	78	75

Sources of Sound		
10 Mar AM	07:31	Boat loading NAKO products, ship engine running, people talking, birds, vehicles running on Abel Highway, dinghy departing, transistor radio, bay water splashing on sea wall and anchored/moored boats
	07:42	
10 Mar PM	03:27	Boat loading cargo, people talking, birds, vehicles running on Abel Highway, bay water splashing on sea wall, hammering
	03:38	Boat loading cargo, people talking, birds, vehicles running on Abel Highway, bay water splashing on sea wall, hammering, person talking on mobile phone nearby, dinghy starting motor and departing Sanderson Bay
13 Mar AM	07:29	Engine idling of a small boat docked at NAKO, bay water splashing on sea wall and anchored/moored boats, people talking, birds, vehicles on Abel Highway, boat discharging water
	07:41	People talking, birds, vehicles running on Abel Highway, bay water splashing on sea wall, dinghy passing along the provincial jetty, boat passing between the two beacons, another boat departing
13 Mar PM	02:06	People talking, birds, bay water splashing on sea wall, dinghy departing, Lukianos' engine running while refilling
	02:18	People talking, birds, bay water splashing on sea wall, dinghy arriving, Lukianos' engine running while refilling, electric tool noise from NAKO
14 Mar AM	07:27	People talking, dinghy arriving/departing, Lukianos' engine running while refilling, small craft within 25 m had engine running while anchored
	07:38	
14 Mar PM	02:11	People talking, birds, vehicles on Abel Highway, noise inside NAKO (hammering, truck backing up and loading noise, departed)
	02:23	People talking, birds, vehicles on Abel Highway, noise inside NAKO (hammering), dinghy departing/arriving, small craft departing, water splashing on sea wall

* Note:

The March 2017 measurements were taken using an Android apps Sound Meter to establish initial data. This data was validated using a calibrated hand held sound meter manufactured to the IEC651 Type 2 standard in April 2017.

Location 3: Abel Highway: 175 m from wharf (in front of dinghy mooring area) (March 2017)

	10 March 2017 (dB)				13 March 2017 (dB)				14 March 2017 (dB)			
	AM		PM		AM		PM		AM		PM	
Time	08:18	08:30	04:05	04:20	08:24	08:35	02:34	03:07	08:56	09:11	02:40	02:51
Min (dB)	43	46	43	44	44	43	18	17	45	38	18	40
Avg (dB)	54	54	53	52	54	53	51	50	54	51	49	53
Max (dB)	81	69	79	76	81	77	82	80	79	71	80	71

Sources of Sound		
10 Mar AM	08:18	Vehicles running on Abel Highway, bay water splashing on shore, people talking, birds
	08:30	
10 Mar PM	04:05	Vehicles running on Abel Highway, people talking, birds, dinghy departing
	04:20	
13 Mar AM	08:24	Vehicles running on Abel Highway, bay water splashing on shore, people talking/shouting, birds, boat departing, dogs barking
	08:35	Vehicles running on Abel Highway, people talking, birds, dinghy departing, dogs barking
13 Mar PM	02:34	Vehicles running on Abel Highway, people talking, birds, bay water splash on shore, windy
	03:07	Vehicles running on Abel Highway, people talking, dinghies starting their engines, PMV engine idling while waiting for passengers
14 Mar AM	08:56	Vehicles running on Abel Highway, people talking, birds, dinghy departing/arriving, water splash on shore
	09:11	
14 Mar PM	02:40	Vehicles running on Abel Highway, people talking, birds, dinghy departing/arriving
	02:51	

Location 4: In front of Pick-N-Pay Supermarket: 50 m from wharf (across the provincial jetty) (March 2017)

	10 March 2017 (dB)		13 March 2017 (dB)				14 March 2017 (dB)			
	AM	PM	AM		PM		AM		PM	
Time	Not monitored.		09:24	09:35	03:27	03:41	09:33	09:45	03:08	03:19
Min (dB)			50	28	47	53	52	52	38	49
Avg (dB)			57	57	60	60	58	58	58	58
Max (dB)			75	79	78	79	75	73	77	81

Sources of Sound		
10 Mar AM 10 Mar PM	Not monitored	
13 Mar AM	09:24 09:35	People talking/singing/shouting, large electric fan, Lukianos' engine running while refilling, vehicles coming and going, cargo loading at jetty, truck's backing up sound, garbage storage bins being picked up and returned in place
13 Mar PM	03:27 03:41	People talking, large electric fan, Lukianos' engine running while refilling, vehicles coming and going, music in the store
14 Mar AM	09:33 09:45	People talking, large electric fan, Lukianos' engine running while refilling, vehicles coming and going, music in the store
14 Mar PM	03:08 03:19	People talking, large electric fan, vehicles coming and going, loud music inside the store People talking, large electric fan, vehicles coming and going, loud music inside the store, garbage storage bin pulled for disposal and returned in place

Location 5: Transit Hotel: 100 m from wharf (March 2017)

	10 March 2017 (dB)				13 March 2017 (dB)				14 March 2017 (dB)			
	AM		PM		AM		PM		AM		PM	
Time	09:37	09:54	05:07	05:23	09:56	10:07	04:00	04:11	10:33	10.44	04:13	04:24
Min (dB)	17	42	38	39	53	53	53	53	52	46	41	43
Avg (dB)	51	55	53	52	57	59	60	58	60	56	53	52
Max (dB)	78	77	80	79	64	73	75	76	74	67	81	75

Sources of Sound		
10 Mar AM	09:37	People talking, passing truck
	09:54	People talking, taxi arriving and departing
10 Mar PM	05:07	People talking, taxi arriving and departing, loud music, helicopter
	05:23	People talking, taxi arriving and departing, vehicle passed by
13 Mar AM	09:56	Lukianos engine running, people talking, hammering inside transit hotel, public motor vehicle (PMV) arrived with loud radio sound
	10:07	Lukianos engine running, people talking, hammering inside the transit hotel, PMV backed up with sound, another PMV left.
13 Mar PM	04:00	Lukianos engine running, people talking, cruise ship at the Alotau International Port sounded horn, PMV passed by, windy
	04:11	Lukianos engine running, people talking, windy
14 Mar AM	10:33	Lukianos engine running, people talking, NMSA construction noise, vehicles passing by
	10:45	Lukianos engine running, people talking, NMSA construction noise, vehicles passing by, music inside TH
14 Mar PM	04:13	People talking, child shouting while running in front of me, dinghies passing by
	04:24	People talking, vehicles passing by, dinghies passing by

Location 6: Informal Market: 175 m from wharf (March 2017)

	10 March 2017 (dB)		13 March 2017 (dB)				14 March 2017 (dB)			
	AM	PM	AM		PM		AM		PM	
Time	Not obtained		10:28	10:41	04:30	Phone's battery ran out.	10:56	11:07	05:00	05:11
Min (dB)			53	19	46		50	53	52	54
Avg (dB)			62	57	56		59	61	60	62
Max (dB)			81	80	80		78	80	81	78

Sources of Sound		
10 Mar AM 10 Mar PM	Not monitored	
13 Mar AM	10:28 10:41	People talking, vehicles coming in and out of the parking area and passing by the informal market
13 Mar PM	04:00	People talking, at least 6 PMVs passing by the informal market, use of construction electrical tool.

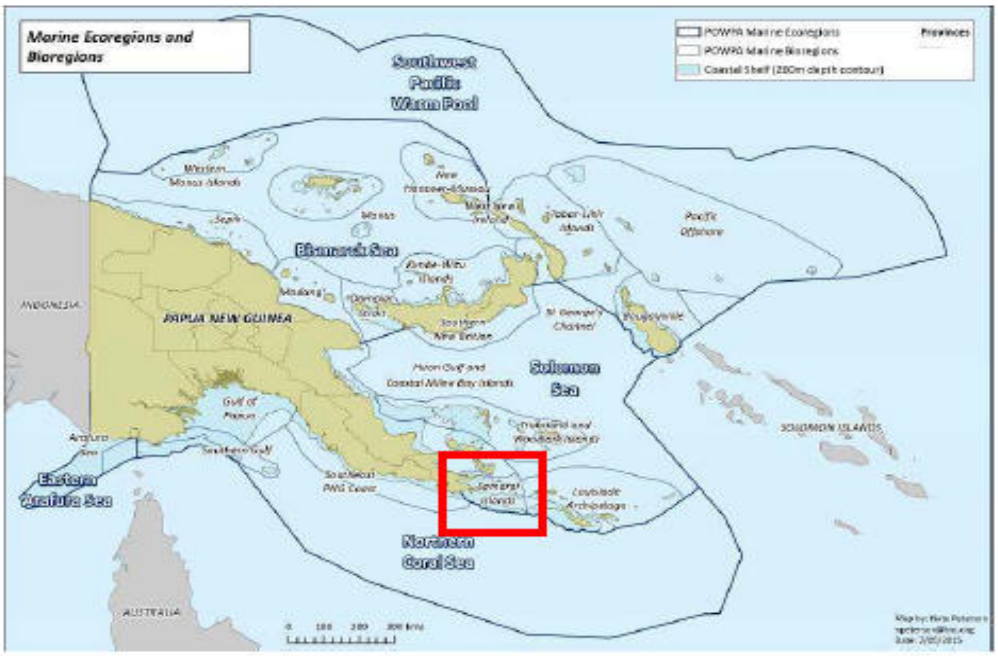
	-	Phone's battery ran out.
14 Mar AM	10:56	People talking, vehicles coming in and out of the parking area and passing by the informal market, loud music inside
	11:07	
14 Mar PM	05:00	
	05:11	

April 10 2017 at 4 pm at locations shown below in dB

Observation	Sanderson Bay Supermarket	4 Provincial Wharf	3 Dinghy Jetties	2 Sanderson Bay Main Road	5 Transit Hotel	6 Informal Market
Max impulsive noise	74	79	72	81	77	88
Max Continuous noise	74	65	72	77	72	86
Min continuous noise	63	53	47	58	58	55
Ave continuous noise	65	59	60	67	66	70

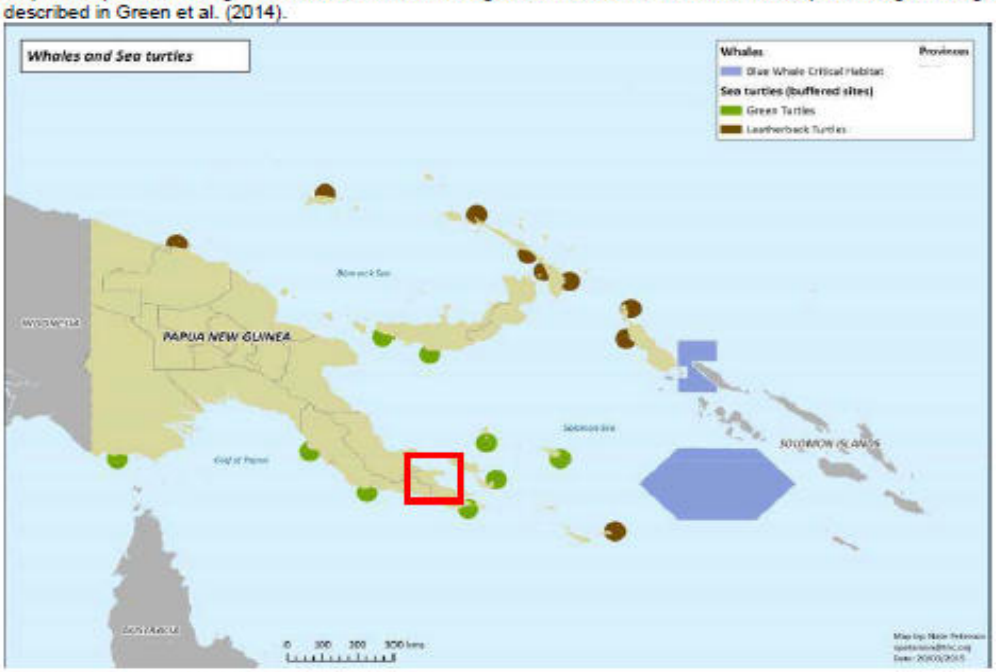
All readings were taken using the "A" weighted dBA scale on the low noise scale (30-100dBA). Maximum impulsive noise measurements were made using the maximum hold function and FAST time weighting (125mS logarithmic average) and the continuous noise measurements of maximum, minimum and average noise levels were made using SLOW time weighting (1 sec logarithmic average).

Annex C: Relevant Maps from National Marine Conservation Assessment[25]



Map 2: Marine Ecoregions and Bioregions for PNG

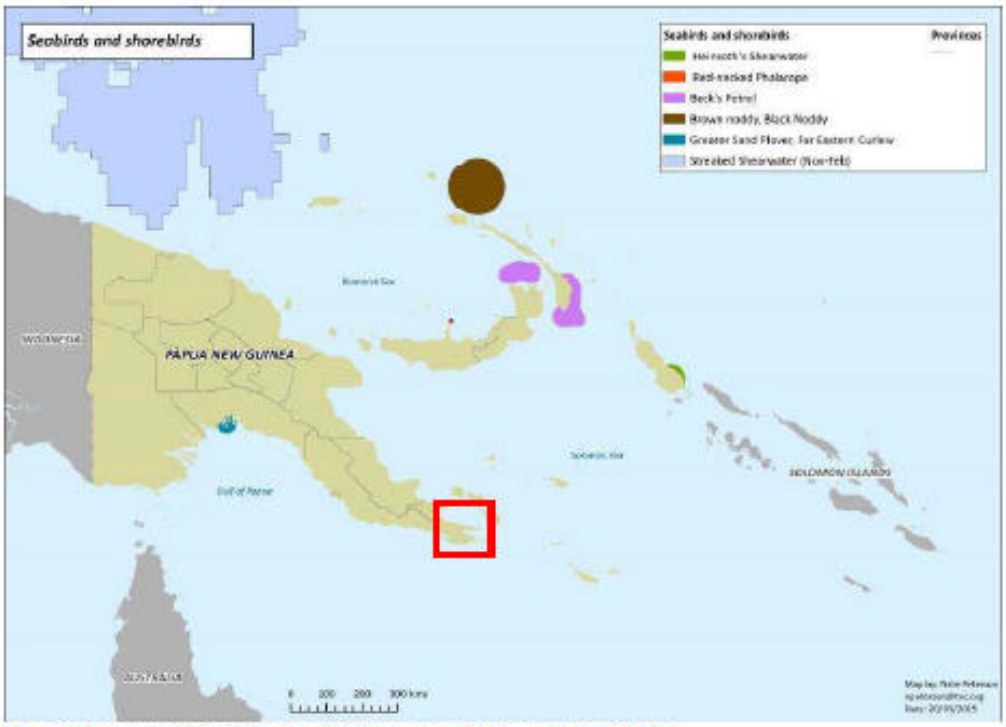
Map of deep water ecoregions and shallow water bioregions for PNG's marine area. Developed through the regionalization exercise described in Green et al. (2014).



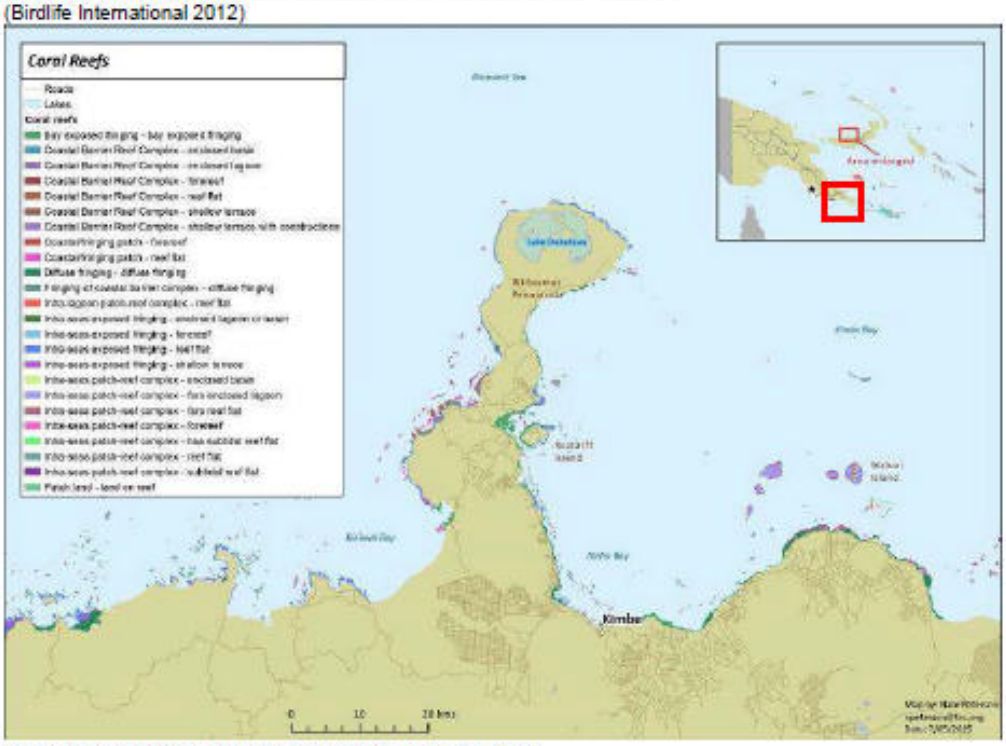
Map 3: Turtle and Whale Critical Areas

Leatherback and green turtles aggregation areas (WWF-Malaysia and seaturtle.org) and Blue Whale critical habitat (Kahn and Vance-Borland 2014)

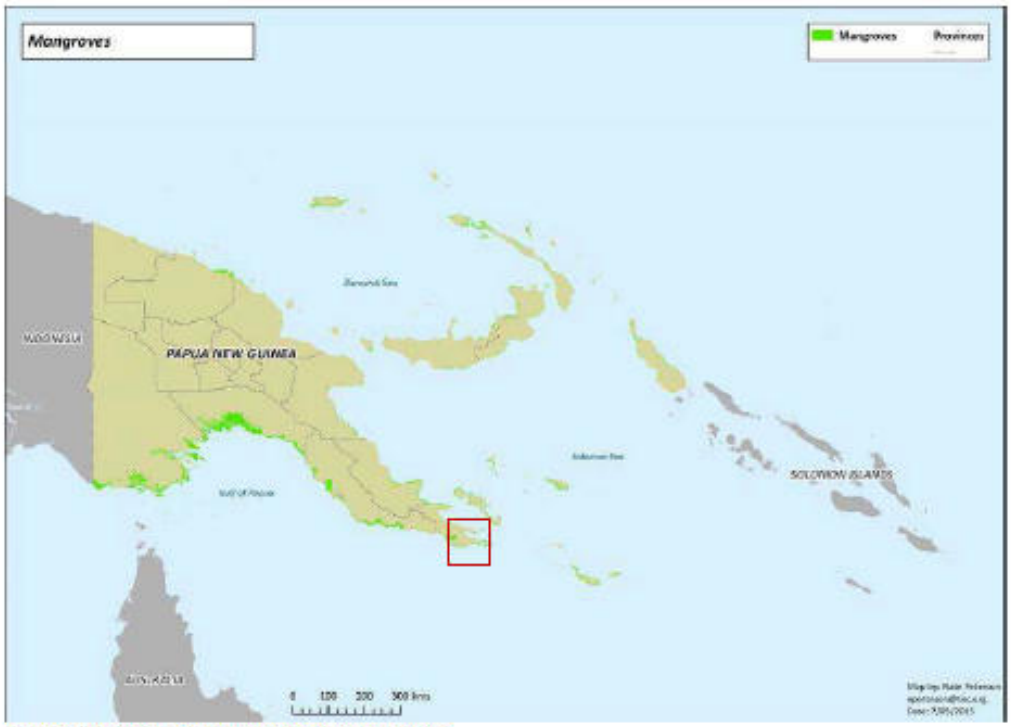
[25] Government of Papua New Guinea (2015) National Marine Conservation Assessment for Papua New Guinea; Conservation and Environment Protection Authority, 51pp.



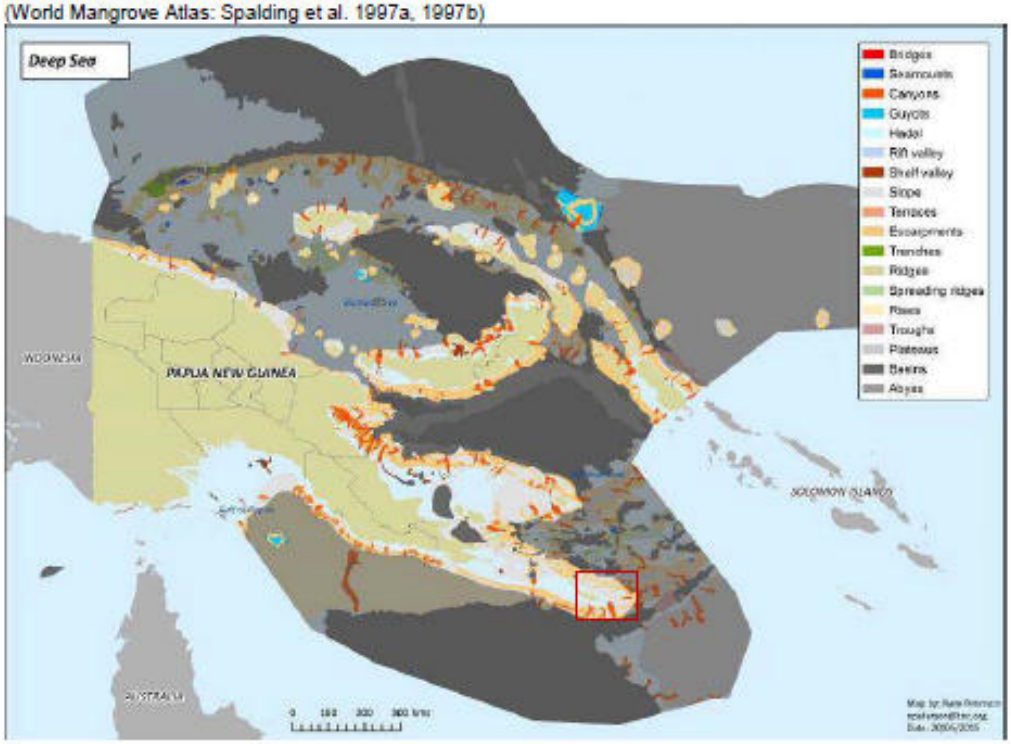
Map 4: Important Bird Areas (IBA) for seabirds and shorebirds
(Birdlife International 2012)



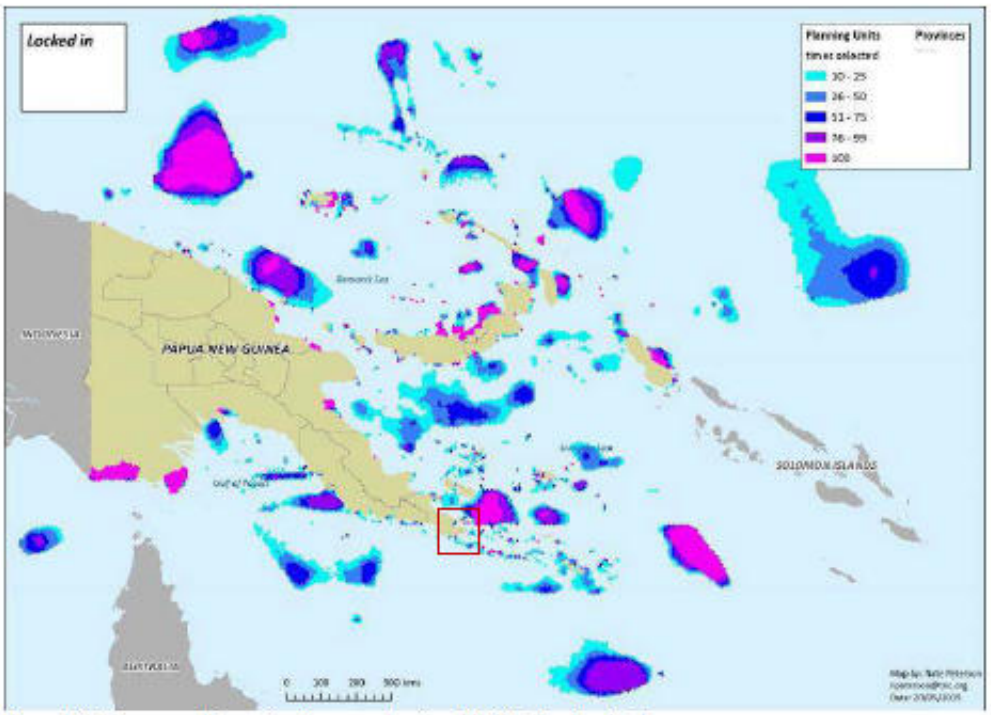
Map 5: Indicative map of coral reefs classification
(Millennium Coral Reef Mapping Project: Andrefouet et al., 2006; UNEP-WCMC, WorldFish Centre, WRI, TNC 2010)



Map 6: Distribution of Mangroves in PNG
(World Mangrove Atlas: Spalding et al. 1997a, 1997b)



Map 7: Indicative map showing classification structure for deep water features
(based on GEBCO global 30 arc-second grid: IOC, IHO and BODC 2003 and GRID-Arendal: Harris et al., 2014)



Map 11: Conservation priorities analysis – MPAs "locked-in"
Sum solution with existing protected areas "locked in" (n=100)

Annex D: Stakeholders Consultations and Participation during the PPTA *

A. Mission 2 (15-23 February 2017) – Alotau

A.1 Meeting with Climate Change and Development Authority (CCDA)

Date/Time: Venue: Present:	14 February 2017, 10:00 AM CCDA Office, POM Mr. Jacob Ekinye, BRCC Project Director Ms. Silina Tagagau-Seri, Social Dimension, PMU Ms. Joy Samo, Planning Officer, CCDA Mr. Joseph Kunda, Project Coordinator, PMU Mr. Rob Richard, Finance Specialist, PMU Mr. Peter Iki, Sr. Adaptation Officer, CCDA Ms. Izha Lao, PPTA Team Ms. Delfa Uy, PPTA Team Mr. Robert Brown, PPTA Team	**Highlights:** o Presently wharf caters to cargo and passenger transport from the outer islands of the Province. o Preliminary project options being considered: (i) refurbishment of the existing wharf; (ii) a floating pontoon or deck; and (iii) a fixed wharf structure with climate-resilient design features. A 500mm increase in height deck is being considered as one of the climate-resilient design features. o Relocation of Islands Petroleum Ltd. (IPL) will mitigate the safety and security risk in the wharf area. Although, the transfer of the fuel tanker ships to the Alotau International Port would incur loss in revenue for the MBPA. o With a new wharf in the future, MBPA would need capacity building support in operation & maintenance and revenue and asset management. o The TA team may consider checking with: - Nawae Construction, a local contractor, with numerous experience in port construction; - National Maritime Safety Authority, for vessel regulations, tonnage, and any GHG emission data; - PPCL regarding compliance in construction/development within port limits; - Tourism Bureau, regarding tourism statistics; - CEPA, on environmental permit requirements and procedures; - PNG Water Board, regarding water supply in Alotau; and - PNG Women in Maritime, an NGO in Alotau, handling maritime safety awareness raising activities. o Alotau is known for its annual 'kenu and kundu' festival in November, wherein locals from the outer islands gather at the town center for a celebration. Foreign tourists on cruise ships also visit the town during the festival. o The CCDA will assist the MBPA-PMU in securing all required permits for the project.

A.2 Meeting with Milne Bay Provincial Administration (MBPA)

Date/Time: Venue: Present:	15 February 2017, PM Media Center, Alotau Mr. Michael Viula, Deputy Administrator, Technical Services, MBPA Ms. Lulu Osembo, Environment Officer, MBPA Mr. Wesley Katobwan, Project Officer, Works Supervision Unit, MBPA Mr. Didimus Epo, Principal Advisor, Commerce & Mine, MBPA Mr. Alfred Kidjon, Acting Principal Advisor, Community Development, MBPA Mr. Billy Camillo, Manager, MBPTA Mr. Jonathan Kapoka, Principal Advisor, PDAL Mr. Lindsay Alesana, District Administrator, ADDA Mr. Peter Ruing, Business Manager, PPCL-Alotau Ms. Joy Samo, Planning Officer, CCDA Ms. Izha Lao, PPTA Team Ms. Delfa Uy, PPTA Team Mr. Robert Brown, PPTA Team	**Highlights:** o PPTA team those present on the scheduled activities of Mission 2, the expected outputs; and requested MBPA for support in the conduct of the site reconnaissance, on–site random interviews, meetings with relevant government agencies, NGOs, and other stakeholder groups. o MBPA briefed the Mission 2 Team. - Provincial wharf is now also used for bunkering operations. MV Lukianos, a tanker of 90 m OAL, docks fortnightly to deliver fuel to nearby tanks of Islands Petroleum. - Kerosene, petrol and diesel are transported to outer island in 200-liter container drums via small vessels. - For consumption in Alotau town center, fuel is transported in 20- to 30-liter container drums. - Islands Petroleum's bunkering operations will be moved to the Alotau International Port in March 2017, a positive development for the safety of the people in the area. It is expected that the existing fuel pipeline from/to the Islands Petroleum's tank farm will be dismantled by then. o Raised suggestions: - To promote tourism, the design of the new wharf to accommodate berthing of large cruise ships. In some months, two cruise ships would call in to dock in Alotau. but only one large ship can be accommodated in the at the International Port at a time. - TA team to check with the informal market in the area, currently managed by the Alotau District Women's Representative, and the Transit Hotel, managed by the 16 local level government units of the Province. o There will be revenue loss during construction of new wharf. Province to decide on revenue-making options to offset the loss. o The new wharf is expected to reap economic benefit from increased arrivals of/use of wharf by tourist vessels. With a new wharf, the Province expects increased use of the wharf by tourist vessels.

A.3 Interviews with Provincial Jetty Users

Date/Time: Venue: Interviewees:	15 February 2017, PM Provincial Jetty Mr. Andy Lawasi, owner, MV WASE Mr. Willie Eluida, worker, MV MELTELI Mr. Denis George, boat engineer, MV RAYJAY II	**Highlights:** o The wharf is dangerous, it could go anytime, like a time bomb. Public safety is at risk. Government must prioritize the wharf. And not only for big boats. o Sanderson Bay getting shallower. Rocks posing hazard to navigation. The Department of Works has no equipment to get rid of these obstacles. At the center of the 2 existing beacons is a small growing reef. Debris of old ropes coming from boats and litters can be found in the waters. Sediments flowing out at drainage discharge points. o Cited safety concerns: (i) When boats are loading drums, passengers also go in and out of the boat. (ii)No security from theft. At night, boat operators and crews will have to look after each other (buddy system). o Other concerns: (i) water from the taps at the jetty not potable; (ii) boat toilets without holding tanks; hence, there is direct disposal of raw sewage, when boats are docked overnight or for days; (iii) oil and grease from boats contaminating bay water; (iv) wind-blown dust. o Suggested measures to lessen issues and concerns: (i) signs on anti-littering; (ii) clean up Sanderson Bay; (iii) provide toilets and shower; (iv) boats to handle oil and grease well; (vi) provide access to potable water; (v) secure the area with gate; pave access roads and parking area; (vi) dredge out the obstacles then he beacons can be taken out, more space; (vii) passengers should wait until cargo loading done, waiting area for passengers. o When toilets are there, boats on dock should not use boat toilets. Signage to remind important. There should be regulation. But toilets nearby should be provided first. o The quality of water and soil below should be checked if already too bad. Then actions can be planned.

A.4 Interview with Department of Works (DOW)

Date/Time: Venue: Present:	16 February 2017, AM Department of Works, Alotau Mr. Thomas Dei, Provincial Works Manager, DOW Mr. Harry Maiua, Provincial Civil Engineer, DOW	**Highlights:** o Environment permit from CEPA is required for construction permit. Extraction of natural aggregates would require a quarry permit from CEPA. o Sources of natural aggregates: Hauma and Goilanai, both of which are less than 3 km from town center. o Construction wastes are brought to the town's disposal site for municipal solid waste. Dredged materials may be used for backfill. o Management of construction wastewater should be specified in the environmental management plan and reflected in the Contractor's contract. o No wastewater treatment plant in Alotau. o 4 units of diesel-powered gensets generate the power supply for Alotau. The need to increase generation to meet increasing demand is being discussed. o Environmental issues with the wharf: (i) inadequate environmental management as indicated by a lot of unmanaged wastes in the vicinity; (ii) in the past two fire incidents nearby, debris from the fire dispersed to the sea during rain events; (iii) combined drainage, also serving the hospital, discharges at the Bay, discharge from said drainage must be investigated; (iv) large oil spill from tankers are fire hazards, a high risk factor, and there is inadequate capacity to respond; (v) sediments from slide of slope soils causing bay to get shallower; (vi) not dredged ever since, but any dredging activity should be preceded with under water investigation. o Alotau attractions include the WWII memorial and untouched environment. o On dealing with PCRs, old trees may have traditional significance. Must consult, discuss, and negotiate with the community. In one WB road project, community did not allow the old trees, believed to be hosting ancestral spirits, to be touched; hence road had to realign bypassing the old trees safely.

A.5 Meeting with Provincial Disaster Response Office (PDRO)

Date/Time:	16 February 2017, 2:00 PM	**Highlights:**
Venue:	Media Center, Alotau	○ The PDRO has 6 staff—3 from provincial office, 2 from IOM DRR, and 1 disaster coordinator.
Present:	Mr. Steven Tobesa, Coordinator Mr. Brian Kanini, DRR Coordinator Ms. Lulu Osembo, Environment Officer, MBPA Ms. Joy Samo, Planning Officer, PMU, CCDA Ms. Izha Lao, PPTA Team Ms. Delfa Uy, PPTA Team	○ MBPA is reviewing its DRRM framework to expand the standard operating procedures, including focus on the vulnerable groups, encouraging them to be involved, and training them, in community DRRM. IOM assists the MBPA in the review. ○ PDRO faces the challenges of insufficient staff, inadequate equipment, and insufficient support from partners. ○ One recent significant in the port area involved a boat shipping copra that caught fire offshore. A fire water vehicle responded to extinguish the fire.

A.6 Meeting with Lands and Physical Planning Division (LPPD) of MBPA

Date/Time:	16 February 2017, 3:00 PM	**Highlights:**
Venue:	MBPA-LPPD Office,	○ Sites of provincial wharf and jetty is under MBPA property by virtue of an underwater lease agreement with the Government of PNG. Wharf is within Portion 316 of the underwater lease. Therefore no land acquisition under the Project.
Present:	Mr. Laino Awalomwai, Principal Advisor, LPPD Mr .David Newaget, Prov'l Physical Planner, LPPD Ms. Lulu Osembo, Environment Officer, MBPA Ms. Joy Samo, Planning Officer, CCDA Ms. Izha Lao, PPTA Team Ms. Delfa Uy, PPTA Team	○ The 200-m access road to the wharf is government property, as road reserve. ○ Assessment of old wharf --- it is now useless. ○ Grievances are lodged with the Provincial Administrator. Generally, no procedure followed. ○ Environment permit a pre-requisite for construction permit.

A.7 Meeting with Tourism Bureau of MBPA

Date/Time:	17 February 2017, 10:00 AM	**Highlights:**
Venue:	Tourism Bureau Office	○ Tourists enter Alotau via cruise ships, online tours, and as independent tourists. Estimated number of passengers per cruise ship is 1,500 to 2,500.
Present:	Mr. Mooa Kula Kunuyobu, OIC, Tourism Bureau Ms. Lulu Osembo, Environment Officer, MBPA Ms. Joy Samo, Planning Officer, CCDA Ms. Izha Lao, PPTA Team Ms. Delfa Uy, PPTA Team Mr. Robert Brown, PPTA Team	○ In 2015, 17 cruise ships called in at Alotau International Port. In 2016, 16 cruise ships. In Q1 of 2017, 31. ○ Provincial wharf and jetty insufficient to cater to the rising demand of influx of cruise ships coming to Alotau, particularly as another entry point for tender boats from cruise ship. ○ World Bank is assisting MBPA in the physical master planning and physical works development for the foreshore area of Sanderson Bay. Alotau will be receiving a total of $10 million in tranches the development, to include seawall projects, street lights, establishment of recreational areas, parks, and other beautification projects along the bay. The province has received $1 million as first tranche. ○ Suggested improvements at the provincial wharf and jetty area: (i) access to potable water and sanitation facilities; (ii) tourism information kiosk for monitoring of incoming/outgoing tourists, information for visitors, and other services.

A.8 Meeting with Alotau District Administration Authority (ADDA)

Date/Time:	17 February 2017, 11:00 AM	**Highlights:**
Venue:	ADDA Office	○ Provincial wharf and jetty area is considered as people's port. Majority of users are the general public, mostly coming from the outer islands of the Province. Cargo is mostly goods to be sold for local consumption, e.g., retail goods, construction materials, etc. The provincial wharf and jetty are essential in the delivery of emergency relief and in the transport of emergency/critical patients.
Present:	Mr. Leleki Tarosomo, 1st Secretary to the Minister Mr. Lindsay Alesana, District Administrator, ADDA Ms. Joy Samo, Planning Officer, PMU, CCDA Ms. Izha Lao, PPTA Team Ms. Delfa Uy, PPTA Team	○ Some recommendations in wharf improvement: (i) Current operations not quite good for tourism. Designate a spot/spots in Milne Bay for anchorage, where boats can stay anchored after unloading, and not stay docked at the mooring area or jetty. This way, operations is more organized. (ii) It is very important to engage the key stakeholders, including the ADAA, at all the stages of the project, from planning to implementation – for a strong sense of stakeholders' ownership in the project. ○ Tourists arrive Alotau by air or sea, then proceed to outer islands. Not so much touristic activities in Alotau town center, but for the annual canoe festival. ○ Alotau District needs improvements in water supply, solid waste management, power supply, sanitation and wastewater management, health care services, and security. ○ Social conflict due to hiring of labor/people from outside for construction and operation is a potential concern. The Provincial Works Unit can provide information on the existing capacity and skills available in the Province. ○ Proposed projects under the district include a 1.5 MW hydropower plant and oil palm biogas development.

A.9 Meeting with PNG Ports Alotau

Date/Time: Venue: Present:	17 February 2017, 2:00 AM ADDA Office Mr. Peter Ruing, Business Manager, PNG Ports Alotau Ms. Scholly Masueng, M. Planner/Port Moresby, PPCL Mr. Andrew Tamadeo, Works Officer, PNG Ports Alotau Ms. Joy Samo, Planning Officer, PMU, CCDA Ms. Izha Lao, PPTA Team Ms. Delfa Uy, PPTA Team Mr. Robert Brown, PPTA Team	**Highlights:** o International Port has 2 wharves—56m coastal and 93m overseas. Operating 24 hours, catering to cruise ships, cargo vessels, and large coastal vessels. o Coastal wharf was upgraded in 2014 to comply with international standards. o Wharves can accommodate cargo vessels and cruise ships with 90 to 280 LOA. Ships' cranes are used for loading/unloading cargo. No landside cranes available. o Overseas wharf was upgraded in 2015 for purpose of accommodating cruise ships. Upgrading included new fenders and dolphins, mooring dolphins, cathodic protection, sacrificial anodes, among others. The port has good lighting system, security, temporary storage, first aid kits, and fire extinguishers and hydrants. It has a designated emergency assembly point. o In 2015, about 20 cruise ships called in; in 2016, about 36 cruise ships. o Cruise ships usually dock for 12 hours. o Large coastal vessels call in twice weekly. o Tender boats are accommodated at the Water Front Lodge jetty when cruise ships are at the overseas wharf. One tender boat can be accommodated at the Water Front Lodge jetty at a time; at the provincial wharf, some 2 to 3. o PNG Ports undertakes a sustainable coast line program through coastal or beach cleans up in partnership with local NGOs, youth, residents, private sector, and provincial government. But not yet at the provincial wharf. o PNG Ports issue construction permits for developments within their port limits. Since the provincial wharf is within the declared port limits, the application for construction permit will be lodged with PNG Ports. o The biggest emergency or disaster event was in 2010 where a cargo vessel carrying copra and crude oil caught fire. o Emergency/disaster response drills are regularly conducted.

A.10 Interview with Provincial Jetty Users

Date/Time: Venue: Interviewee:	17 February 2017, 2:00 PM Provincial Jetty Mr. Bobby Baloiloi, boat passenger	**Highlights:** o Environmental issues and concerns include: - rubbish thrown into the sea from boats, boat operators and passengers no awareness on management of wastes; - oil from maintenance seems to be thrown into Sanderson Bay; - wharf is rotten, needs to be replaced but wider; - a big hole in the deck, which has always been left open; - no toilet provision; - mix of passengers and oil-filled drums at the waiting area (there should be separate terminal for passengers); and - wharf has become smelly when the transit hotel opened.

A.11 Interview with Dinghy Mooring Area Users

Date/Time: Venue: Interviewee: :	18 February 2017, AM Dinghy Mooring Area Mr. Simmy Joseph, dinghy owner	**Highlights:** o Environmental issues and concerns include: - The wharf is old. It needs to be rebuilt or replaced. Hopefully dinghies can be served. - There should be a seawall along Abel Highway. - Beach not kept clean. - Need for security. So many dinghies victimized by robberies. - He uses public toilet, but now it is closed - No access to potable water supply. - Bay water has oil. Not sure is sea soil contaminated. - Sea pirates, allegedly from MBP, victimize boats 2-3 times monthly. Boat needs security while at sea. No coast guard/s.

A.12 Interview with Alotau Urban Local Level Government

Date/Time: Venue: Interviewee:	20 February 2017, AM AULLG Office Mr. Mickey Gehinem, Town Manager	**Highlights:** o Alotau District has 7 wards: 1 urban and 6 rural. o There is no set poverty threshold. No designated office to set this. o Underground drainage facility available only in the CBD. The CBD is the area around Milne Bay Place Street and Preston White Street. 90-99% of Alotau Town is surface draining. o In most roads only carriageways have been developed. o All legally subdivided lands have solid waste collection services, but collection efficiency is ot 100%. There are missed collections. o Solid waste management is a responsibility under AULLG. Collection frequency in public places is daily. At the wharf, only once a week, but tries to collect twice a week. Current equipment include: 1 unit of 8m3 compactor (more than 8 years old); 1 unit of 6m3 compactor (less than 5 years old); 1 unit of 2-tonne open dump truck; and 1 unit of 3-tonne open dump truck. Local church helps in terms of awareness in hygiene and anti-littering. o Existing solid waste disposal site is at Gehua, 2.5 km from the town center. It is the only disposal site for Alotau Town. Was started after World War II. The site if filling up. AULLLG is now looking for a new site and plans to develop an environment-friendly system of solid waste disposal. o Most sanitation facilities have septic tanks. A few households use pit latrines. o There is no sewerage system in Alotau. Septic tanks discharge to water bodies or seepage pit. Septics generally have only one chamber. The septic tanks of the Alotau General Hospital and one secondary school discharge to drainage channels. o AULLG has no desludging equipment; engages private desludging services. o Public health care services are provided by 1 health center and the Alotau General Hospital (150 bed capacity). A second health center unit is programmed for 2017. The land for this second unit has been obtained. Additional units of health center will depend on land availability. o Environmental concerns regarding the wharf area: - Litters, solid waste - Sediments - Public sanitation facilities, where one can use the toilet and/or shower at 1 PGK, located along the access road to the wharf, has been closed. Issue of backflow. AULLG maintains the facility. AULLG was not consulted during design. Design was prepared by the Provincial Government's Works Supervision Unit.

A.13 Interview with Eco-Custodian Advocates

Date/Time: Venue: Interviewee:	20 February 2017, AM Eco-Custodian Advocates Office Mr. David Mitchell, Director	**Highlights:** o Islands Petroleum undertook EIA for their new site at the Alotau International Port some 4 years ago. It may have information on water quality & flora and fauna (& benthic). Not necessarily in Sanderson Bay, but quite close. o Means of offsetting environmental impacts: - partnership in activities of conservation international - financial support to a conservation of a local marine area somewhere around the coast, etc. sponsorship of plastic bags or gloves in a coastal clean-up activity. o In 2000, 1st coastal clean-up took place from Sanderson Bay up to the Main Market; school kids participated. o Boat sewage directly go to the bay; boat toilets no holding tanks. o In the future, government should think of ferries. o Natural; hazards to consider would include: - SW winds increasing in intensity and frequency; - 1.8mm sea level rise each year; - potential storm surge due to low pressure. o PPTA Team requested unit costs in monitoring water quality, marine ecology, soil quality. o ECO-Custodian has a marine biologist who could do baseline survey and monitoring of the above. PNG does not have soil quality standards, use Australia's or New Zealand's standards. o PNG probably has standards for ambient air quality and ambient noise level.

A.14 Focus Group Discussion

Date/Time: Venue: Present:	21 February 2017, 10:00 AM Media Center, Alotau Ms. Gwen Jack, member, PNGWIMA Ms. Dorothy Malana, member, PNGWIMA Ms. Jane Iobu, President, PNGWIMA Ms. Sarah Mogi, Secretary, PNG Customs Mr. Michael Touuokon, PEHO-Health, MBPHA Mr. Moda Kula Kunuyobu, Tourism Officer, TB Mr. Lindsay Alesana, District Administrator, Ms. Angela Nelson, Women's Representative, Mr. Billie Camillo, Manager, MBPTA Ms. Mauri Kavop, Executive Assistance, PDRO Mr. Steve Tobessa, Coordinator, PDRO Ms. Silina Tagagau, Social & Gender Specialist, Ms. Lulu Osembo, Environment Officer, MBPA Mr. Wesley Katobwan, Project Officer, WSU Ms. Izha Lao, PPTA Team Ms. Delfa Uy, PPTA Team	**Highlights:** o PPTA team presented the objectives of the project and Mission 2 and the findings of Mission 2. o Potential benefits of the proposed project were noted. But focusing only on the wharf is a piece-meal approach to addressing the needed improvements in area. If government is to do improvements, it should be done comprehensively, aiming at the safety and accessibility for all boats, the usage of the facilities by every boat user, and basing on a comprehensive development plan for the area. o The old wharf could be impacted when raised. o Water from the existing taps at the provincial jetty comes from the borehole in Goilanai, not treated, not potable. o Design of new wharf should consider the adjacent barge ramp, an office complex, and a government kiosk for quick services (by MBPTA, Customs, Health, Quarantine and Tourism). o Islands Petroleum's transfer is an opportunity for government to plan for re-arrangement of the area. o The supermarket should be out of the area for public safety and security. o Set up a sub-committee of key stakeholders in the area, to include relevant organizations such as Youth Groups. o Transit Hotel was raised could be adversely affected by vibration during pile driving. o If dredging is deemed necessary, it should cover the entire Sanderson Bay. o Potential social conflicts arising from hiring of labor/employees from outside should be considered. There are qualified skilled local workers who can be employed during construction and operation. o Stakeholder participation in the monitoring of the implementation of the environmental management plan will be strongly encouraged.

A.15 Interview with Alotau - Water PNG

Date/Time: Venue: Interviewee:	22 February 2017, AM Eco-Custodian Advocates Office Mr. Tau Siamweni Lauwasi, Team Leader, Customer Service, Alotau-Water PNG	**Highlights:** o Sources of water are both surface water and groundwater. o As of December 2016, 1640 households (or about 74% of total households) of Alotau Town were connected to the piped water supply system. o For the piped water supply, surface water is drawn from Goilawaligina Creek, which has a constant flow; while groundwater is extracted through boreholes at Koiabule (KB) and Raven. o Water from Goilawaligina Creek and the KB boreholes is conveyed to the Garuboi Water Treatment Plant. The system has 5 reservoirs, i.e., one main reservoir at the back of the water treatment plant

A.16 Interview with Works Supervision Unit, MBPA

Date/Time: Venue: Interviewee:	22 February 2017, PM Eco-Custodian Advocates Office Mr. Wesley Katobwan, Project Officer, Works Supervision Unit, MBPA	**Highlights:** o Roles of the following in the project: - Provincial Works Supervision Unit, supervision of works - DOW, to be involved in the standards and technical specifications - PPCL, to approve/certify the design since the wharf is located within port limit and the cost of the project is USD 5 million (>PGK 10 million). o Management of construction waste/debris: - recycle metals; store dredged or residual soil at the open land at the back of the WSU office until there is demand for backfill; burn wood or use as firewood. o Sources of natural aggregates: Hauma sand & gravel pit & Kaloi River, 3 & 13 km from town center, respectively. o PNG Quality Construction Ltd., 5 km out of town, is the sole supplier of asphalt and crushed rock. o PNG Power has 4 gensets. It is trying to rectify the grid, most likely to go hydropower. But yet in proposal stage. o Within town, there are underground drains, open concrete-lined drains, spoon drains (outside town center). o Causes of flooding are rain and cutting of big trees. o On solid waste disposal, government is trying to look for a new site. o In Alotau town, not every ward has an elementary school yet. There are two secondary schools, 1 vocational school, I branch of a university in Port Moresby, and 1 tertiary school (for nursing). It is estimated that teacher-student ratio is 1:30.

B. Mission 2 (24 February 2017) – Port Moresby

B.1 Meeting with Conservation and Environmental Protection Authority (CEPA)

Date/Time: Venue: Present:	24 February 2017, 10:00 AM CEPA Office Mr. Walimu Apaka, Sr. Scientific Officer, CEPA Ms. Rebecca Rani, Sr. Scientific Officer, CEPA Mr. Audesia Aiyo, Sr. Scientific Officer, CEPA Mr. Peter Iki, Sr. Project Officer, PMU, CCDA Ms. Silina Tagagau, Social and Gender Specialist, PMU, CCDA Ms. Joy Samo, Planning Officer, PMU, CCDA Ms. Delfa Uy, PPTA Team	**Highlights:** o Level 1 project, not required environment permit (EP), just provided with a letter of approval and provided with guidelines. o Level 2 and 3 projects are to follow the regulatory process, 60-90 days before permit. o A Level 2 project will: (i) submit an application for EP together with an environmental management and monitoring plans; (ii) application and document/s will be subject to internal review, review by relevant agencies and public review. CEPA will visit the project site and meet with the concerned province and communities. An assessment report is prepared with recommendation, and forwarded and presented to the Council. Council reviews and comments and recommends to the Minister. Minister has 25 days to respond and sign approval/denial. o A Level 3 project will: (i) require registration of intention to carry out project; (ii) after assessment of intention, be advised to submit an inception report; after assessment of inception report, be advised to submit an EIS. The EIS will be subject to internal review, review by relevant agencies and public review. CEPA will visit the project site and meet with the concerned province and communities. An assessment report is prepared with recommendation, and forwarded and presented to the Council. Council reviews and comments and recommends to the Minister. Minister has 25 days to respond and sign approval/denial. o Since there are no details on the project yet, CEPA initially categorize the project as either Level 2b or 3. o CCDA was advised to submit notification of its intention to undertake project preparation.

B.2 Interview with PNG Ports Corporation Ltd. (PPCL)

Date/Time: Venue: Interviewee:	24 February 2017, 10:00 AM PPCL Office Ms. Hane Kila, Chief Maritime Compliance Officer	**Highlights:** o Project Proponent is to send an application for development permit and attached the requirements. o For safe shipping operations and berthing place, need to know depth and if dredging would be needed to bring the planned ships in. o If dredging equipment is available, Nawae Construction, based in Alotau, would know how to dredge. o Some hazards experienced by ports in PNG and to be considered: - In Wewak, East Sepik Province, there was a “king tide”, some 2-3 years ago. Tide of height 2m greater than normal came in and placed the Wewak Wharf underwater. NMSA was engaged in putting in tide gauge. - One time some years ago in Port Moresby, low tide was dragged to the sea and came back much higher. o Study more the geotechnical considerations, e.g., ebb flow; if dredging would be useful at this time or not. Geotechnical study may render the site not effective. Dredging is very expensive, may just do it one every 10 years. o NMSA is the custodian of all maritime/marine legislation and holds local ship registry. NMSA implements and enforces the Marine Pollution Acts and regulations. It regulates and registers vessels. Checks holding tanks of boat toilets.

C. Mission 3 (08-14 March 2017) – Alotau

C.1 Interviews with Informal Market Group

Date/Time: Venue: Interviewees:	09 March 2017, PM Informal Market Management Office Mr. Tala Tardsi, security officer Mr. Rohan Bate, vendor, from Alotau Town Ms. Molly, vendor, from Sariba Mr. Petueli Budihara, Transit Hotel lodger and patron of Informal Market, from Normoanby Mr. Kiaron Peter, Transit Hotel lodger and patron of the Informal Market, from West Fergusson	**Highlights:** o Anticipated impacts during construction and suggested mitigation: - more dust from construction vehicles, mitigate by watering road - more dust from stockpiles - vibration felt at transit hotel when vehicles pass by, construction trucks must not be allowed in the transit hotel area - access road now has many potholes, construction trucks will dig more potholes - more noise, should not to have activities at night - construction rubbish, these must be managed well - don't think there would be conflicts with hired laborers from outside, but would be good to get more people from here - public safety at risk, mitigate by (i) blocking the interior roads during construction hours then open them only during off-construction hours; (ii) stockpiling away from where most people are; (iii) Install signage; (iv) Don't use Transit Hotel area; (v) Contractor to install at least temporary lights along the access road, to augment and improved current lighting in the area during construction; (vi) Construction vehicles to observe safety when driving on access road. - blocking access of people to the supermarkets, blocking deliveries to supermarkets, mitigation would be to have dedicated lanes for people and deliveries to the supermarkets - if public toilet is re-opened for use, workers may use the public toilet and there will be more users, congestion, workers compete for the use of the toilet, not adequate. Contractor should provide workers with their own toilet facilities. - Congestion in the area, not much land space, risk to public safety. Management of stockpiles and movement of vehicles and equipment must be well planned. Drop off/loading of vehicles and parking must be looked at. o Anticipated impacts during operation and mitigation: - None, but benefits. o Benefits of a new wharf: - Employment opportunities during construction and probably during operation. - During construction, workers would eat in the market, an opportunity for market to have additional customers and for vendors to earn more. - When market knows the schedules of tourist arrivals, then market can prepare the setting of displays of local products. - If new wharf allows use by dinghy, dinghy users will no longer be exposed to dirty water. - Loading and unloading would be better and safer. Best if Option 4a is followed, and small boats would be accommodated. As of now most small boats do not use the wharf. Maybe NMSA restricts use for safety reasons. They only use the wharf when refueling. - The wharf could collapse anytime. Risk to public safety. A climate-proofed wharf can be used anytime, benefit of peace/ security. Option 4a would be friendly to less-abled passengers and in bringing in patients from the outer islands. - If access road improved, convenient walking, no more flooding or puddles, no more dust, goods sold will less or not dusty. - Local employment may not only benefit those from Alotau but also those from outer islands. o Features they wish to be incorporated in the project: - Access road to be sealed, because despite the drainage channels on both sides, the road puddles during heavy rains. Sealed road reduces dust and benefits food vendors and diners. - Doesn't matter what design option will come out as long as there is a change of wharf. - Option 4a is better, logical and makes sense, most boats are smaller.

C.2 Interview with NAKO Fisheries, Ltd.

Date/Time: Venue: Interviewee:	10 March 2017, AM NAKO Fisheries, Ltd. Office Mr. Murray Abel, Marine Manager	**Highlights:** o There would be no impacts on them during construction. Even during the reclamation of the site of Transit Hotel, they were not bothered by the noise. The NAKO build boats and generate noise within their compound. NAKO also runs a generator set during power outage. o No benefit as well, because has their own wharf.

C.3 Interviews with Dinghy Mooring Area User

Date/Time: Venue: Interviewees:	10 March 2017, AM Dinghy Mooring Area Mr. Niko David, dinghy operator, ROXY Mr. David Masepa, dinghy passenger, from Sideia	**Highlights:** o Anticipated impacts during construction and mitigation: - Congestion in Sanderson Bay, because a portion of the bay is expected to be closed to maritime traffic. Also pose safety risk. Mitigation would be: (i) installation of signboards, and guides for traffic flow; (ii) organized navigation flow and limit layovers to accommodate demand for use of the jetty and dinghy mooring area; (iii) dinghies to temporarily use the wharf at the main market. - Construction wastes, MBPTA should require Contractor to make sure wastes are managed properly and not aggravate the litters and solid wastes and sediments that are now in the Bay. - Potential spill of dangerous materials, also oil. o Benefits: If Option 4a would allow new wharf to accommodate dinghies, then dinghy operators and user will have safer loading and unloading, no longer have to wade through quite dirty water and get wet.

C.4 Interview with Provincial Wharf User

Date/Time: Venue: Interviewee:	10 March 2017, AM Provincial Wharf Mr. Moses Gada, boat captain, MV Two Nahs, from Misima	**Highlights:** o Anticipated impacts during construction and mitigation: - Where to dock. Will have to arrange with other wharfs, provincial jetty, or with other companies that have jetties. o Benefits: - Bigger space. More vessels can dock at the same time. - Vehicles could also come in and loading will then be facilitated. o Features they wish to be incorporated in the project: - Cannot dispute your plans. - Remove the bunker station. Do not allow tanker. - Prefer Option 4a. But maintain the existing area between jetty and wharf.

C.5 Interview with Staff of Milne Bay Province Transport Authority (MBPTA)

Date/Time: Venue: Interviewee:	10 March 2017, AM Provincial Wharf Mr. James Reuben, staff, MBPTA	**Highlights:** o Anticipated impacts during construction and mitigation: - Congestion in the area (landside and bayside). There should be management of vessel traffic. Maybe some should temporarily dock elsewhere. Vehicles on the landside (access road from the informal market to the wharf and access road between Pik-N-Pay and jetty) should be managed. There should be a plan for this. o Because of these controls, there will be impact on Pik-N-Pay and Milne Chain. Plan with those affected

C.6 Interviews with Transit Hotel Group

Date/Time: Venue: Interviewees:	10 March 2017, AM Transit Hotel Mr. Peter Ewens, caretaker, Maramatana Mr. Sylvester Locrasae, caretaker, Goodenough Ms. Aida de la Cruz, lodger, from Yabam	**Highlights:** o Anticipated impacts during construction and mitigation: - Dust, noise, vibration (Transit Hotel is on reclaimed land, vibration from movement of vehicles over the reclaimed land is felt.) Sea wall is settling down. Every unit in Transit Hotel has cracks. Footings not rested on piles. - Public safety risks o Benefits - Improved wharf operations. If new wharf accommodates dinghies, then a lot of Transit Hotel lodgers will benefit from the better and safer getting in and getting off the dinghies. o Features they wish to be incorporated in the project: - A terminal for shelter of passengers. When it rains, waiting passengers at the jetty terminal get wet.

C.7 Interviews with Provincial Jetty User

Date/Time: Venue: Interviewees:	10 March 2017, AM Provincial Jetty Mr. Mark Lese, boat owner, MV Rosenty Mr. Arthur Peter, small craft passenger, from Ware	**Highlights:** o Anticipated impacts during construction and mitigation: - Dust, noise, traffic, congestion. Temporarily control of non-construction vehicles from entering the area. Leave the wharf's face near the jetty and use the other side for safety. - Social conflict expected if more people from outside are hired for construction labor & employment in operations. - Construction wastes, to further pollute Bay water. - Public safety at risks from equipment, vehicles. o Benefits: - Bigger wharf and a big change/improvement in the area. - Easier loading and off-loading. - Good if Option 4a is followed, as it can also accommodate smaller boats. o Features they wish to be incorporated in the project: - Access to potable water, toilet and shower facilities. - Design to ensure public safety.

C.8 Interview with Management of Pik-N-Pay Supermarket

Date/Time: Venue: Interviewee:	13 March 2017, AM Pik-N-Pay Supermarket Mr. James Lin, member of management team	**Highlights:** o Anticipated impacts during construction and mitigation: - If access roads will be blocked, will affect deliveries. Pik-N-Pay is building a permanent warehouse, should be done in a few months. - Additional noise, maybe. There may be additional dust, but supermarket is quite enclosed. Management lives upstairs. They don't expect to be bothered because their rooms are with air-conditioners, always closed. o Benefits: - Presently, tourist will just buy drinks, which is not much. Some tourists buy, but not much really.

C.9 Interview with Dinghy Moor Area User

Date/Time: Venue: Interviewee:	13 March 2017, PM Dinghy Mooring Area Mr. Kaina Ananna, dinghy owner, from Logea	**Highlights:** o Anticipated impacts during construction and mitigation: - Maritime traffic during construction. Will have to abide if told to move to another jetty temporarily. o Benefits: - Economic benefit, facilitates growth of outer islands. - Social benefit, facilitates the access by people from outer islands to the services in Alotau. o Features they wish to be incorporated in the project: - Access to potable water, toilet and shower facilities. Adequate shelter. Security. - Option 4a appears to accommodate lower boats. - Bus stops/bus connection.

C.10 Interview with Resident close to Look-Out Point, Middle Town

Date/Time: Venue: Interviewee:	14 March 2017, AM Look-Out Point, Middle Town, Alotau Ms. Stella Peter	**Highlights:** o If there is construction at the wharf, noise from the construction reaches them. Even the noise from vehicles along Abel Highway. Sound of dinghies arriving and departing. o Benefits of a new wharf: - Economic benefits, if vessels will pay. - A better, safer facility. Faster operations.

C.11 Interviews with Provincial Jetty User and Staff of National Maritime Safety Administration (NMSA)

Date/Time: Venue: Interviewees:	14 March 2017, AM Provincial Jetty Mr. Abel Atau, Boat Captain, MV Triumph, from Fergusson Mr. Elami Wilson, Assistant Manager, NMSA	**Highlights:** o Anticipated impacts during construction and mitigation: - Congestion, entering and leaving of vessels will be constrained, because construction will have to block some sizeable area of Sanderson Bay. - Dust, noise. - No social conflict with hiring workers from outside unless they behave poorly. o Features they wish to be incorporated in the project: - Fenced wharf, passengers inside and people sending off should stay outside - Lighting - Separate vessels carrying cargo and those carrying passengers - Access to potable water, toilet and shower facilities - For vessels carrying both cargo and passengers, load cargo first before passengers could board boats. - Fire-fighting facilities.

C.12 Interviews with NAKO Wharf Users

Date/Time: Venue: Interviewees:	14 March 2017, PM NAKO Fisheries, Ltd Wharf Mr. Henry Kawesila, small craft passenger, from Sudest Mr. Matthew Tau, small craft passenger, from West Fergusson Mr. Sam Pwate, Boat Captain, MV Weltuso, from Sudest Island	**Highlights:** o Anticipated impacts during construction and mitigation: - Dust, noise, maritime traffic, public safety risk. Manage ins and outs of boats during construction. o Benefits: - Economic benefits for Alotau and the Province as a whole - Good for people from outer islands. Facilitates access to services and economic opportunities in Alotau. - No benefits to them because they use NAKO wharf. NAKO gives good services to the islands.

C.13 Interview with Dinghy Mooring Area Users

Date/Time: Venue: Interviewees:	14 March 2017, PM Dinghy Mooring Area Mr. David Taudui, dinghy operator, FIN	**Highlights:** o Anticipated impacts during construction and mitigation: - Disturbances, traffic build up, safety concerns. Rearrange the area, put dinghies on the safer side. - Dust, noise, oil/grease, wastes (rusty/corroded materials from demolition, will go down, settle at the bottom of bay. o Benefits: - For government and port authority. - If new wharf will accommodate dinghies, safer operations for dinghies. Safer than docking at the beach. (Beach has eroded. Beach was farther in previous years.) No more wet feet when getting off and on the dinghy.

C.14 Interviews with Provincial Wharf Users

Date/Time: Venue: Interviewees:	14 March 2017, PM Provincial Wharf Mr. Dyson Stanley, Boat Captain, MV Jazz III, from Misima Mr. Moses Yawsihi, Supervisor, MV Sara Lee, from Misima Mr. Japeth Kenneth, Water Police, from Fergusson	**Highlights:** o Anticipated impacts during construction and mitigation: - Boat owner to decide where to dock. Provincial jetty area is shallow. Not suitable for MV Jazz III. MV Sara Lee can dock at the jetty, but at the edge. - Grease and oil drippings/spill. - Wastes, sediments, dust, noise. o Benefits: - Option 4a will allow small crafts, and probably including dinghies. - Easy to walk out. - There would be order in operations. - Safety and hope it will be wider than the present for more ease in movements. o Features they wish to be incorporated in the project: - Access to potable water supply, power supply, lighting, toilet and bathing facilities. - Passenger waiting shed with seats - Ice machine plant for small boats

C.15 Interviews with Transit Hotel Group

Date/Time: Venue: Interviewees:	14 March 2017, PM Transit Hotel Mr. Simeon Isaac, lodger, from Nuakata Mr. Matthew Dailu, lodger, from Topura Village Mr. Bent, lodger, Goodenough	**Highlights:** o Anticipated impacts during construction and mitigation: - Dust, noise, vibration. Transit Hotel sensitive to vibration. Hopefully no construction trucks allowed to move over the reclaimed land. - Safety risks, if open land close to the wharf will be used for any construction associated storing. Must not use this open space over the reclaimed land. - Traffic along access road. Must plan with provincial government and informal market and Transit Hotel management. o Benefits: - Safer wharf. Better operations. - Option 4a is good as it will accommodate small boats

Note: Includes mostly those conducted by the PPTA Environmental safeguard Specialist and those jointly conducted with the PPTA Social Safeguard Specialist and Economist.

AULLG	Alotau Urban Local Level Government
PMU	Project Management Unit
CCDA	Climate Change and Development Authority
CEPA	Conservation and Environmental Protection Authority
ADDA	Alotau District Development Authority
DOW	Department of Works
DRR	Disaster Risk Reduction
IOM	International Organization for Migration
LPPD	Lands and Physical Planning Division
MBPA	Milne Bay Province Administration
MBPHA	Milne Bay Province Health Authority
MBPTA	Milne Bay Province Transport Authority
NMSA	National Maritime Safety Administration
PDAL	Provincial department of Agriculture and Livestock
PDRO	Provincial Disaster Response Office
PNG	Papua New Guinea
PNGWIMA	PNG Women in Maritime Association
PPCL	PNG Ports Corporation Limited
TB	Tourism Bureau