# Initial Environmental Examination

July 2011

# TON: Tonga-Fiji Submarine Cable Project

Prepared by Tonga Cable Limited for the Asian Development Bank.

Tonga Cable Limited

# Fiji-Tonga Cable System:

# Environmental Assessment

**FINAL**

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# Fiji-Tonga Cable System: Environmental Assessment

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# Contents

# Executive Summary

This report addresses the requirements of the World Bank for an Environmental Assessment under World Bank Operational Policy 4.01 (World Bank 2007a), and the requirements of the Asian Development Bank for an Initial Environmental Examination under ADB guidelines for a Category B project.

The Fiji–Tonga Cable System is a proposal to bring high-capacity, high-speed telecommunications to Tonga. It will establish a connection point in Tonga to the global telecommunications network via a new fibre-optic link to Fiji. A new cable station located in Sopu, Nuku'alofa, will provide facilities for downstream service providers to connect their domestic networks to the cable on a 'level playing field' basis. The two current retail providers, Tonga Communications Corporation and Digicel have already signalled their interest in connecting.

The link will be a new fibre-optic submarine cable terminating in Suva where it will join to the western arm of the Southern Cross network. Southern Cross is a telecommunications loop that links Australia and New Zealand with the continental USA via Fiji and Hawaii. The Fiji–Tonga cable will have a scalable capacity that can grow with demand over a design life of 25 years.

Funding is expected via a grant from the World Bank and a part-grant/part-loan from the Asian Development Bank. An analysis of the project has revealed strong financial and business cases for the development.

The Fiji–Tonga Cable System is a significant development for the Kingdom of Tonga. It will help bridge the 'digital divide' that besets countries with small populations, dispersed over great oceanic distances with limited connectivity to the outside world. The proposed development is a first step in bringing the advantages of secure, high-capacity, high-speed and lower cost communications to Tonga, with an expected positive outcome in terms of improved economic and social development and a country better able to play its part in the Pacific and World community.

The need for an Environmental Assessment (EA) for this proposed development is clear:

- It is a multi-million dollar investment funded by loans and grants from the World Bank and the Asian Development Bank,
- It has connections to the land territories of two island nations, both of whom have well-articulated environmental legislation and a growing awareness of environmental sustainability, and
- It traverses over 800 km of ecologically-sensitive, and seismically, volcanically and tectonically active seabed about which our knowledge grows year after year.

Beginning at the Fiji end, the cable makes a connection to the western arm of the Southern Cross cable in the Suva cable station presently managed by FinTel. A 'landing party agreement' has been established between FinTel and Tonga Cable Ltd to facilitate and manage this connection. From the station, the cable will likely be buried as it crosses an open grassed field to the beach and thence a wide tidal mudflat into the gradually deepening water and soft sediments of Laucala Bay.

The cable emerges from Laucala Bay, most likely through the Nukubuco reef passage, into water that rapidly deepens to beyond 1000 m, reaching its deepest point 150 km into the route to the south of Moala Island in the Lau island group where depths reach 3500 m. For the next 200 km there is a shallowing trend as the cable rises to cross the Lau arc-front at a depth of around 600 m, although it is probable that the marine route survey, a precursor to cable-laying, will plot a route between areas of elevated seabed and keep the cable below 1000 m over the Lau arc-front. Thereafter the cable enters the Eastern Lau Spreading Centre, an area of complex bathymetry in which cable depth fluctuates between 1800 m and 2800 m. In this area seamounts and hydrothermal fields are encountered and locally mineralized areas may be the subject of future mining activity. All such areas need to be avoided. Finally, within 50 km of its destination, the cable ascends once more into the Tonga arc-front and its passage into Nuku'alofa Harbour. A profile of this oceanic passage is presented in Figure 4.6.

Within a few kilometres of the outer islands and reefs of Tongatapu, the cable rises swiftly from depths below 500 m to around 30 m as it enters the shipping channel. The cable follows the shipping channel, wending its way along the sandy bottom between coral outcrops into the western harbour where it departs the channel to cross a tidal reef platform to the shore. Less than 70 m away, is the site of the new Nuku'alofa cable station – planned as an elevated, 2-storey concrete structure with detached generator building nearby.

At the Fiji end, the development effectively parallels an existing cable system to an established infrastructure so there is no 'new ground being broken' here, and the additional cabling does not compound any pre-existing environmental impact. There are, however, local arrangements to be made with Fiji authorities in respect to routing, logistics, and approvals, and there are local community interests that may require negotiation of an easement for the cable through two customary fishing grounds.

Detailed maps of the seafloor will not be created until the marine route survey but the extensive literature search and consultation programme employed by the EA Team has revealed sufficient information about the general nature of the deep oceanic passage between Fiji and Tonga, and the potential impacts of the development, to formulate an environmental plan to guide implementation. The findings for the oceanic environment are almost equally divided into factors that *affect* the cable and factors that are *affected by* the cable. Hazards *to* the cable exist from fishing around seamounts, hydrothermally altered water in volcanic vent zones, and future mining in mineralised areas. The simplest mitigation measure (and the one recommended) in these situations is avoidance (by a suitable margin). The most significant hazards *from* the cable (or the cable-laying operation) are to cetaceans, caused by sonar operations by survey and cable-laying vessels. The mitigation measures recommended here are a combination of avoidance (of the whale migrating season) and suspension of activities where conflict is anticipated or observed. After mitigation the project effect is reduced to one of low to no-significant residual impact in the deep ocean environment.

In the Tongan coastal environment there are potential threats *to* the cable from fishing, shipping and dredging, which requires mitigation in the form of notification and operational awareness. Potential impacts *from* the cable are in respect to coral reef communities, seagrass beds, aquaculture, and subsistence fishing. Mitigation measures proposed to reduce these effects to low or not-significant levels are a combination of avoidance and minimisation.

The proposed new cable station in Tonga is very close to the intended landing site, thus requiring minimal earthworks in trenching. There is a displacement effect to individuals presently occupying the site, but this was scheduled to occur anyway as these and adjacent

properties came up for sale. The residual impact on the neighbourhood after establishment is overall positive.

The cable station site is in an area that is vulnerable to natural events such as cyclone/storm surge and tsunami – factors that should be mitigated for by resilience in design.

The Mitigation Plan recommended by the EA Team for the three component phases of the project (Design, Construction and Operations) has the following key elements:

During Design:

- Conduct a marine route survey to identify a path for the cable that:
    - Avoids, coral formations
    - Avoids active and, where proposed as mining sites, extinct hydrothermal vents by 2 km
    - Avoids seamounts by 2 km from their base
    - Ensures the cable remains at least 3 km from marine protected areas
    - Follows terrain of gentle relief to avoid suspended segments of cable
- Recognising the potential affect of sonar on cetaceans:
    - Avoid intensive sonar activity during the whale migrating season (Jul–Nov)
    - Follow best practice for operating vessels in proximity to marine animals
- Design trenching in tidal and terrestrial areas to be as low impact as possible:
    - Minimise the extent of the disturbance
    - Minimise the duration of the disturbance
    - Restore sites when complete using original materials where appropriate
- Specify avoidance of sediment discharges from construction/excavation sites by:
    - Minimising bare ground exposure
    - Installing sediment traps and settling ponds as appropriate
- Specify avoidance of discharge of pollutants to soil and water by:
    - Containing fuels, lubricants, transmission fluids, etc. in secure places
    - Maintaining a contingency plan to address spills and leaks
- Work toward mutually-satisfactory outcomes with:
    - Customary fishing groups with use rights over the Suva approaches
    - Deep-sea mining companies with prospecting licences west of Tongatapu
    - Neighbours potentially affected by building of the Tonga cable station
    - Other infrastructure agencies potentially affected by the development
- Demonstrate social responsibility by:
    - Instituting a Health and Safety Management Plan
    - Adopting a waste management policy (within constraints imposed by in-country conditions)
    - Designing toilets and a sewerage system for the Tonga cable station that avoids contamination or enrichment of the environment

During Construction:

- Avoid conflict with sensitive areas by:
    - Laying cable exactly along the design path as determined in the marine route survey
- When trenching to bury the cable in tidal and terrestrial areas:
    - Minimise the extent of the disturbance
    - Minimise the duration of the disturbance
    - Restore sites when complete using original materials where appropriate

- Avoid sediment discharges from construction/excavation sites by:
    - Minimising bare ground exposure
    - Installing sediment traps and settling ponds as appropriate
- Avoid discharge of pollutants to soil and water by:
    - Containing fuels, lubricants, transmission fluids, etc. in secure places
    - Maintaining a contingency plan to address spills and leaks
- Ensure cable presence is formally notified to marine users through:
    - Issue of a 'Notice to Mariners'
    - Updates to electronic and paper navigational charts
    - Targeted notification of local users by port authorities and marine radio
    - Dialogue with particular users as appropriate
    - Placing warning markers along cable line in particular areas if appropriate
- Demonstrate social responsibility by:
    - Instituting a Health and Safety Management Plan
    - Adopting a waste management policy (within constraints imposed by in-country conditions)

During Operations:

- Minimise carbon footprint by:
    - Maintaining generators and plant
    - Using lowest footprint power provider where practical
    - Utilising electronic conferencing as a substitute for travel where practical
- Avoid discharge of pollutants to soil and water by:
    - Containing fuels, lubricants, transmission fluids, etc. in secure places
    - Maintaining a contingency plan to address spills and leaks
- Demonstrate social responsibility by:
    - Maintaining a Health and Safety Management Plan
    - Following a sound waste management policy (within constraints imposed by in-country conditions)
    - Remaining open to dialogue with other agencies contemplating future infrastructure development

The residual impact of the proposed development after all mitigation measures are applied is one of low, not-significant, or no environmental or social impact and a net positive economic and social development outcome for the Kingdom of Tonga.

# 1 Introduction

This report addresses the requirements of the World Bank for an Environmental Assessment under World Bank Operational Policy 4.01 (World Bank 2007a), and the requirements of the Asian Development Bank for an Initial Environmental Examination under ADB guidelines for a Category B project.

## 1.1 Background

The development of Pacific island countries has long been hampered by dispersed populations, small areas and communities, and vast ocean distances. These circumstances impose large costs on providing services like communications, which have limited the growth of economies and the social well-being of the people. Tonga is typical of this condition and, while having connections to the rest of the world, this connection is heavily reliant on satellite communications with its attendant higher cost, constrained bandwidth and vulnerability to natural disasters. The term *digital divide* was coined in the 1990s to describe the disadvantage experienced by countries, and people, that do not have access to reliable, fast, high-bandwidth communications.

Following global trends, Tonga, like several Pacific island countries, has undergone reform of its communications sector, especially in cellular mobile and internet markets. Competition between the two service providers has seen a sharp rise in usage and a corresponding fall in prices to consumers. But as the markets approach saturation, competition becomes limited by the capacity of upstream networks and further efficiencies are constrained by international bandwidth. Papua New Guinea and Fiji are the only Pacific Island countries that have international submarine cable access at present, though it is under study by other countries, and by Tonga by this proposed development project.

The proposed development is being led by Tonga Cable Limited (TCL). TCL is a wholly-owned subsidiary of Tonga Communications Limited (TCC) which operates in Tonga as a state-owned enterprise under the Public Enterprise Act 2002. In future, perhaps up to 20% of TCL may be offered for sale to outside equity investors.

## 1.2 The proposed scheme

The proposed scheme is to establish and provide domestic providers with a connection point to international networks via a new fibre-optic link to Fiji.

The connection point will be a new cable station located in Sopu, Nuku'alofa (Figure 3.6), with facilities for downstream service providers to connect their domestic networks to the cable. Access by Tongan service providers to the cable is intended to be on the basis of a 'level playing field' without commercial advantage to TCC or other established providers.

The link will be a new fibre-optic submarine cable terminating in Suva where it will join the western arm of the Southern Cross network. Southern Cross is a telecommunications loop that links Australia and New Zealand with the continental USA via Fiji and Hawaii. The Fiji–

Tonga cable will have a scalable capacity that can grow with demand over a design life of 25 years.

Funding is expected via a grant from the World Bank and a part-grant/part-loan from the Asian Development Bank. An analysis of the project has revealed a strong financial and business case for the development.

## 1.3 Project justification

The proposed development will advance the telecommunications reform that is already occurring in Tonga and strengthen the bridge over the *digital divide*. It will do this by providing additional capacity and speed for international traffic – something that is limiting in Tonga at the moment. As such it is a key infrastructural improvement that will assist the Kingdom both economically and socially and, from the point of view of communications security, it diversifies the communications network so that there is a higher likelihood of continued connectivity during natural disasters and failure of a component in the system. Globally, many advantages have been cited for high-speed, high-volume connectivity (something no Tongans currently enjoy), including:

- overcoming geographical and financial barriers to a wide range of educational, cultural and recreational opportunities and resources,
- enabling provision of medical care to un-served and underserved populations through remote diagnosis, treatment, monitoring and consultations with specialists,
- promoting economic development and revitalisation through e-commerce,
- enabling electronic government to help streamline peoples interaction with government agencies and provide information about government policies, procedures, benefits and programmes,
- providing access to new telecommunications technologies such as Voice over Internet Protocol (VoIP).

## 1.4 The need for an Environmental Assessment

Without denying its advantages, this is a significant infrastructural development project, the successful achievement of which may involve some risk to the environment and, perhaps, some unforeseen social cost. The World Bank and the Asian Development Bank both require development projects of this magnitude to comply with their safeguard policies on such theme areas as: the environment, indigenous people and involuntary resettlement.

The need for an Environmental Assessment for this proposed development is clear:

- It is a multi-million dollar investment funded by loans and grants from the World Bank and Asian Development Bank,
- It has connections to the land territories of two island nations, both of whom have well-articulated environmental legislation and a growing awareness of environmental sustainability,
- It traverses over 800 km of ecologically sensitive, and seismically, volcanically and tectonically active seabed about which our knowledge grows from year to year.

Both Fiji and Tonga have environmental legislation that provides for environmental assessments of identified types of development. Both laws are silent in respect to submarine communications cables but both can be invoked at the discretion of the delegated authorities.

**Both Tonga's Ministry for Environment and Climate Change and Fiji's Department of the Environment have indicated verbally to the EA Team that their needs will be satisfied by an environmental assessment to WB/ADB specifications**.

This environmental assessment therefore focuses on the terms of reference addressing WB/ADB requirements (Appendix 1).

### 1.5 The contents and structure of this report

This report presents the results of an Environmental Assessment that was undertaken in the period June-August 2010. The report complies with the Terms of Reference provided by Tonga Cable Ltd (reproduced in Appendix 1). The content of the report is set out as follows:

Section 2 is a review of the policy, legal and administrative framework that could have an influence on environmental assessments and maritime operations in Tonga and Fiji. It includes consideration of the operational and safeguard policies of the funding institutions of this proposed development and concludes with a summary of relevant legislation and agencies responsible in relation to the responsibilities of the project.

Section 3 is a description of the proposed development, and its component phases, including some technical description of fibre-optic cables and cable-laying to provide context to the ensuing sections. The Section concludes with a brief discussion of qualifying criteria for an acceptable route and an alternative landing site considered early in the design phase.

Section 4 is a factual description of baseline conditions prevailing in and around the proposed development's area of influence. These conditions are the reference point for discussions on potential impacts and management in the ensuing sections.

Section 5 is the Environmental Assessment. It considers each potential impact identified by the EA Team and the risk it presents. The net significance of each potential impact is presented in tables summarising the potential impacts at the end of the section.

Section 6 is the Environmental Management Plan. This assimilates the knowledge from the foregoing sections within a management context, and identifies procedures for controlling the occurrence of adverse environmental impacts during the three phases of the development. Also outlined in this section is a monitoring plan to ensure compliance to and effectiveness of the EMP

Section 7 documents the consultative programme conducted by the EA Team. Included among the stakeholders consulted were regulatory authorities, interest groups, individuals and local communities. The information obtained from these stakeholder consultations is summarised in this section and recorded in detail in Appendix 2.

Section 8 presents the overall conclusions of the environmental assessment.

Sections 9 and 10 contain citations to references used and acknowledge the assistance given by various individuals and agencies during the course of the work.

The Appendices at the end of the report contain supporting information including the Terms of Reference for the EA work, the record of consultations and supporting documents.

# 2 Policy, Legal and Administrative Framework

The proposed development aligns well with policies covering communications, economic and social development and the environment in both Tonga and Fiji. The development is compliant with all Fijian and Tongan legislation, subject to the normal formalities of securing necessary approvals, satisfying reporting requirements, and adhering to the rules and regulations established under law and international agreements.

## 2.1 Communications, development and environmental policies

The Pacific Islands ICTs Policy and Strategic Plan (CROP 2002) has the vision of *Information and Communication Technologies for every Pacific Islander* and sets out a framework of guiding principles and policies for Pacific Island Countries and Territories (PICTs). Both Fiji and Tonga participated in this document which, among other things, includes:

- Policy 1.4: Everyone will have equal opportunity access to ICT without barriers with special regard to women, the disadvantaged, the disabled, under-represented minorities, and those in rural and remote communities.
- Policy 2.1: Regional and national ICT networks and support infrastructure will be reliable, secure, fast, cost-effective and adaptive.
- Policy 2.2: PICTs will encourage private sector investment in ICT infrastructure and promote competitive markets for ICT service provision, where appropriate.
- Policy 2.4: Regional and national institutions will work with service providers toward practical Universal Access to ICT.
- Policy 4.4: ICT and related regulatory frameworks will promote open and non-discriminatory access to publicly accessible networks where appropriate.
- Policy 2.1 specifically targets the development of broadband submarine cables and fibre-optic technologies to link Pacific Island countries with the private sector and governments working in partnership to achieve this goal.

Tonga is reported to be drafting a national ICT policy based on CROP 2002.

### Tonga's policy position

Current environmental policy is described in the Government of Tonga's National Strategic Planning Framework (NSPF) (GoT 2009). This document establishes high-level strategies that individual Ministries are encouraged to put into effect through their corporate plans. However, until the Ministry corporate plans are in place, the Government of Tonga Five Year Strategic Development Plan 8 (SDP8) (GoT 2006) still gives useful insight into government policy.

Both the NSPF and SDP8 hold private sector-led economic growth as a key national vision and objective. NSPF has a number of primary objectives, including the following two that are relevant to the project:

- Support private sector growth through better engagement with government, appropriate incentives and streamlining of rules and regulations
- Maintain and develop infrastructure to improve the everyday lives of the people.

The NSPF seeks a primary outcome of facilitating community development by involving district/village communities in decision-making by enabling local governance structures (perhaps including community-based inshore fisheries management – fisheries Strategy 8 of SDP8), and the establishment of a Nuku'alofa Town Council. This could see a devolvement of decision-making from central government to community stakeholders in the near-shore environment over which the Cable will be laid.

SDP8 had three key environmental strategies of relevance to this project:

- Strategy 1: Complete and enforce the legislative framework for environmental conservation and management.
- Strategy 2: Integrate environmental costs and benefits into Government decision-making procedures covering policies, projects and private investment proposals.
- Strategy 3: Implement environmental education programmes and engage communities in remedial measures.

This theme continues through to the NSPF with another primary objective being the integration of environmental sustainability and climate change into the planning and execution of programmes.

We note that the consultation phase conducted in preparation for SDP8 exposed a community concern about foreshore erosion on Tongatapu, with this being cited as a major problem for coastal villages both in the Western and Eastern sides of the island. This suggests the need for caution and consideration in how the landing of the cable is conducted and remediated at the Tonga end.

In the communications sector the overall objective expressed in the Information and Communications Technology Policy Statement of 2001 is: *To improve sector performance to ensure domestic and global connectivity throughout the Kingdom of Tonga. This includes improving quality of service, geographic coverage, service affordability and access to new service applications.* This aligns well with the outcomes expected from this project.

### Fiji's policy position

The former government of Fiji produced a lengthy strategic development plan covering the period from 2007 to 2011 (GoF 2006) that was discarded by the current administration in 2007. This earlier plan has some detail that is lacking in its successor that gives useful insight into Fiji policy in relation to the proposed development.

- The review of social development in Chapter 2 makes reference to Fiji's Environmental Management Act 2005 and the requirement for EA's to be binding on all parties, including Government. This is followed up with a strategy in Chapter 8 (Sustaining Growth) that says:
    - Enforce the Environmental Management Act, giving priority to early full enforcement of provisions for Environmental Assessment and Waste Management and Pollution Control
- The review of economic development in Chapter 3 notes that much greater use of information and communications technology (ICT) is essential for social and economic development in Fiji. This is followed up with a strategy in Chapter 8 (Sustaining Growth) that says:
    - Develop Fiji as an attractive info-communications hub in the region

The last strategy aligns perfectly with the proposed development of the Fiji–Tonga Cable System.

The Fiji Draft People's Charter for Change, Peace and Progress (GoF 2008) replaces the old Strategic Development Plan 2007–2011 above with a more aspirational set of goals arranged under 11 pillars for rebuilding Fiji. As in Tonga, the intent is that Ministries and other arms of government and the private sector will adopt these high-level principles in their own statements of corporate intent, business plans and the like. To date this uplift has not been widespread, but the following gives an indication of some areas of alignment between Government of Fiji policy and the proposed development:

- Pillar 5 (achieving higher economic growth while ensuring sustainability) has a clause to:
    - Strengthen institutional capacity for environmental management
- Pillar 11 (enhancing global integration and international relations) recognises Fiji's need to 'regain its rightful place in the international family of nations' with such measures as:
    - Strengthen local capacity including the participation of the private sector, to engage in the global trading system.
    - Enhance existing bilateral and multilateral relations

## 2.2 Legal framework

### Tonga's legal framework

The **Communications Act 2000** provides the regulatory framework for the communications sector. This is administered by the Ministry of Information & Communication. The Ministry has the functions of: (1) issuing licenses; (2) approving price changes according to a public interest test; (3) technical regulation, including technical standards and spectrum management; (4) enforcing a number of prohibitions on anti-competitive behaviour and collusive agreements; and also enforcing access requirements, including conducting the arbitration of interconnection disputes (GoT 2006).

The Communications Act is a very long one and addresses communications from a legal compliance standpoint. A reading of the Act will note:

- Part V deals with licensing, including network providers
- Part VII deals with technical regulation
- Part IX deals with economic regulation including anti-competitive behaviour, and network access
- Part X deals with installation of network facilities, including:
    - Section 110: Where a licensee erects or constructs any network facility across or over any road, or over or under any navigable waters, the licensee shall not hinder or interfere with the passage of any person or vehicles or the navigation of such waters.

The **Tonga Communications Corporation Act 2000** provides for the establishment of Tonga Communications Corporation (TCC), enables investor participation, and defines the activities and governance of TCC. Section 15 of the Act identifies a key activity of developing infrastructure "… to provide communications services to meet the needs of the users in Tonga". This appears consistent with the objective of the project proposal.

The **Environmental Impact Assessment Act 2003** provides for the establishment of the Department of Environment (now Ministry for Environment and Climate Change (MECC)) and for the application of Environmental Assessment to the planning of development projects. It seeks to ensure that the environmental implications of any development are fully described and assessed, and any relevant conditions attached to reduce possible environmental impacts. It requires that all major projects be accompanied by an environmental assessment. All major projects are referred to the Environment Assessment Committee, whose functions include the review and recommendation to the determining authority, conditions to be attached to major projects and the means by which they should be implemented. Though the proposed project is a significant undertaking for Tonga, nothing of this nature is among the activities categorised as being a 'Major Project' in the Schedule of the Act. This report is nonetheless compliant with the EA requirements of a Major Project under the terms of the Act.

All public enterprises are subject to the **Public Enterprises Act 2002**, with governance oversight by the Minister and Ministry of Public Enterprises and Information. Tonga Communications Corporation, as an enterprise that does not receive financial assistance from the Government and has existed for three years or more, is included in the Second Schedule and therefore subject to only certain provisions of the Act.

The **Marine Pollution Prevention Act 2002** provides for the prevention of, and response to, marine pollution and the dumping of wastes at sea and to give effect to international marine pollution conventions. Its relevance to the proposed development is in relation to the laying and maintenance of the marine cable between Fiji and Tonga:

- Part I Section 2 defines a number of pollutants and identifies eight international conventions that are given force of law in Tonga. These (the SPREP Convention, the London Convention, MARPOL, CLC, HNS Convention, OPRC Convention, FUND and the INTERVENTION Convention) are discussed in Section 2.4
- Part II provides for marine pollution prevention
- Part III provides for marine pollution response
- Part IV provides for marine casualties
- Part V deals with liability and compensation for oil pollution damage
- Part VI regulates dumping and incineration of wastes at sea

Penalties for offences under this Act include heavy fines and imprisonment.

The **Fisheries Management Act 2002** provides for the conservation management and the sustainable utilisation of the fisheries resource. It takes a wide view of the fisheries, recognising, in Section 4, the need to *protect the ecosystem as a whole and the general aquatic environment*:

- Section 13 make provision for the creation and management of Special Management Areas (none affect this development proposal).
- Section 14 provides for the designation of coastal communities (none affect this development proposal).
- Section 17 prohibits fishing with explosives.

Two sections under the **Land Act CAP132** refer to restrictions on disturbing and excavating on the foreshore. These provisions imply a need to secure appropriate permits for earthworks at the cable landing site:

- Section 114 makes provision for the cutting and removal of stone from the foreshore,

having first established (under Section 113) that the foreshore is property of The Crown.
- Section 22 Land (Removal of Sand) Regulations, says that the taking or removal of sand from foreshores without a permit is prohibited.

The **Harbours Act (CAP 137)** contains some provisions for the management of harbours:
- Section 24 requires that no stones, coral, sand, earth or other material shall be removed from the beach or from any part of any harbour as ballast or for any other purpose without permission from the harbour master.
- Section 23 prevents any person from laying down any private buoy, mooring or anchor in any harbour without the permission in writing of the harbour master. [By extension this may influence the laying of cables and their moorings to the seabed].

The **Ports Authority Act 1998** establishes the Authority to manage Nuku'alofa Port. It includes provisions relating to pollution and discharges within ports:
- Section 42 states that it is an offence to throw, discharge or deposit harmful substances into any waters of a port, or to cause, suffer or allow this to be done.
- Section 78 establishes a general regulation-making power in the Minister with the consent of Cabinet.

The Schedule to the Act defines the geographic limits to the Port of Nuku'alofa.

The **Parks and Reserves Act CAP 89** is a vehicle for the declaration and effective management of parks and reserves:
- Section 4 allows the Parks and Reserves Authority, with the consent of the Privy Council may declare any area of land or sea to be a park or reserve.
- Section 9 stipulates that every marine reserve shall be administered for the protection, preservation and control of any aquatic form.
- Schedules 1–5 define five marine reserves; Hakaumama'o Reef, Pangaimotu Reef, Monuafe Island Park and Reef, Ha'atafu Beach, and Malinoa Island Park and Reef. None of these lie within the area of influence of the proposed development.

The **Continental Shelf Act CAP 63** makes provision for the protection, exploration and exploitation of the continental shelf and for the prevention of pollution from activities on the continental shelf:
- Section 3 allows the Prime Minister to make orders preventing ships from entering designated areas for the purpose of protecting installations.
- Section 8 makes it an offence to break or damage any submarine cable.

### Fiji's legal framework

The **Crown Lands Act (CAP 132)** allows for the disposal of State Land permanently or, more commonly, temporarily under lease. Importantly, State Land is defined also to include foreshore land below high water mark and "soil under the waters of Fiji". Under the Act, the granting of a foreshore land lease or lease of any soil under the waters of Fiji must be with the approval of the Minister and shall only be granted after declaration that the granting of such lease does not create a substantial infringement of public rights. It is not clear if such a lease would be required in order to lay the cable over the seabed in Fijis EEZ in accordance with the provisions in UNCLOS Part VI, Article 79.

The **Marine Spaces Act (CAP 158A)** defines the following within Fiji's waters:

- Internal and archipelagic waters
- Territorial sea
- EEZ.

The definitions used rely heavily on those in the UNCLOS. The Act has a split role of definition and also regulation of access by foreign fishing vessels to Fijian fish stocks. The Act allows for the Minister of Fisheries to make regulations over many activities within Fiji's waters; however, no such regulations have to date been made.

The **Continental Shelf Act CAP 149** makes provision for the protection, exploration, and exploitation of the natural resources of the continental shelf:

- Section 6 allows the Minister to make orders prohibiting ships from entering or remaining in any area specified as a 'safety zone'.
- Section 10 allows the Minister to make regulations prescribing things for giving effect to the provisions of the Act

The **Sea Ports Management Act 2005** vests authority over the port of Suva (and other ports) in Fiji Ports Corporation Ltd.

The **Marine Act 1986** and related amendments and regulations contain numerous provisions relating to legal compliance and safety while undertaking a marine operation in Fijian waters.

The **Health and Safety at Work Act 1996** sets out the roles and obligations of employees and employers in respect to workplace health and safety in Fiji, including its territorial waters.

The **Fisheries (Protection of Turtles) (Amendments) Regulations 2004** gives absolute protection to turtles and turtle eggs of any species.

The **Environment Management Act 2005** has a geographic jurisdiction to the limit of Fiji's Exclusive Economic Zone. Its purpose is to apply the principles of sustainable use and development of natural resources and to identify matters of national importance to Fiji.

Section 3 Subsection 3 recognises the following matters to be of national importance:

- The preservation of the coastal environment, margins of wetlands, lakes and rivers;
- The protection of outstanding natural landscapes and natural features;
- The protection of areas of significant indigenous vegetation and significant habitat of indigenous fauna;
- The relationship of Fijians with their ancestral lands, waters, sites, sacred areas and other treasures;
- The protection of human life and health.
- Part 2 institutes a National Environmental Council with operational implementation by a Department of Environment whose Environmental Management Unit is responsible for reviewing Environmental Assessments.
- Section 34 requires that when the preparation of an EA assessment is completed, a public hearing must be conducted by the proponent within the vicinity of the area of the proposed development.
- Schedule 2 is in three parts, corresponding to the respective scale and potential impacts of development proposals. Though this development proposal is not among

the activities listed, its significance and scale, if not its likely impact, suggest it would be categorised under Part 1 of the Act with approval needing to be granted by the EA Administrator of the Department of Environment.

## 2.3 International and regional environmental agreements

The **United Nations Convention on the Law of the Sea** was signed by Fiji in 1982 and by Tonga in 1985:

- Part V, Article 65 (Marine mammals) requires States to *'cooperate with a view to the conservation of marine mammals and in the case of cetaceans shall in particular work through the appropriate international organizations for their conservation, management and study'*. This provision applies not just to the coastal State's Exclusive Economic Zone (under Article 65) but also to the High Seas under Article 120. Figure 2.1 summarises the demarcation of the key maritime zones under UNCLOS.

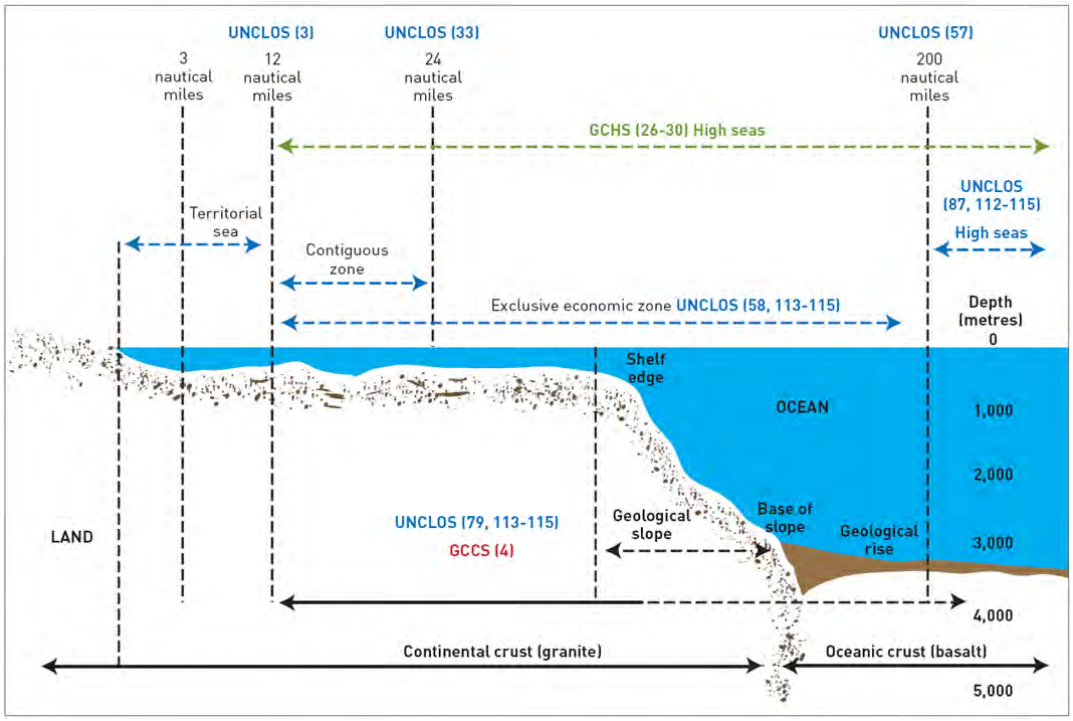



**Figure 2.1** Legal maritime boundaries (and the relevant UNCLOS article numbers) from territorial sea to exclusive economic zone and onto the high seas (after Burnett 2006)

- Part VI, Article 79 contains several provisions related to sub-marine cable and pipelines on the Continental Shelf:
  - All States are entitled to lay submarine cables and pipelines on the continental shelf, in accordance with the provisions of this article
  - Subject to its right to take reasonable measures for the exploration of the continental shelf, the exploitation of its natural resources and the prevention, reduction and control of pollution from pipelines, the coastal State may not impede the laying or maintenance of such cables or pipelines
  - The delineation of the course for the laying of such pipelines on the

continental shelf is subject to the consent of the coastal State
    - Nothing in this Part affects the right of the coastal State to establish conditions for cables or pipelines entering its territory or territorial sea, …
    - When laying submarine cables or pipelines, States shall have due regard to cables or pipelines already in position. In particular, possibilities of repairing existing cables or pipelines shall not be prejudiced.
- Part VII, Article 112 allows any State to lay submarine cables and pipelines on the bed of the high seas beyond the continental shelf, subject to the provisions of Article 79, Paragraph 5 (above).
- Part VII, Articles 113–115 contain provisions relating to breakages of submarine cables and liability for breakages, including indemnity for loss incurred in avoiding injury to a submarine cable.
- Part XII contains provisions for the protection and preservation of the marine environment:
    - Article 192, a general obligation of States to protect and preserve the marine environment.
    - Article 194, measures to prevent, reduce and control pollution
    - Article 199, an obligation of States to develop and promote contingency plans for responding to pollution incidents in the marine environment
    - Article 204, requires States to endeavour, as far as possible to keep under surveillance the effects of any activities which they permit in order to determine whether these activities are likely to pollute the marine environment
    - Article 206 provides for States having reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment, they shall, as far as practicable, conduct an environment assessment.
- Part XVI, Article 303, obliges States to protect objects of an archaeological and historical nature found at sea. [In relation to this development proposal, shipwrecks found by the marine route survey would likely qualify under this provision].
- Annex 1 is a list of highly migratory species of significance under the Convention, including several tuna species, both toothed and toothless whales, mahimahi, and several species of sharks, marlin, swordfish and sailfish.

Both Fiji and Tonga are parties to the **Convention on Biological Diversity** whose aim is to develop national strategies for the conservation and sustainable use of biological diversity. To implement this convention both countries have established National Biodiversity Strategies and Action Plans (NBSAP) (GoT 2004, 2008, GoF 2009). Tonga identifies several actions under the convention in respect to the protection of marine ecosystems, including:

- Reducing the impact of land-based activities (by prohibiting dumping and chemical discharges, prohibiting sand mining, conducting EAs on developments and reducing erosion)
- Increasing the number of marine conservation areas
- Promoting sustainable management of marine ecosystems.

Likewise, Fiji has a strategy to promote and replicate integrated coastal zone management.

As member governments of SPREP, both Fiji and Tonga are Parties to the **Pacific Islands Regional Marine Spill Contingency Plan** (PACPLAN), developed by SPREP as part of their Pacific Ocean Pollution Prevention Programme (SPREP 1999). It was adopted in 2000 and functions as an operational protocol to the Nouméa Convention (to which Fiji is a

signatory but Tonga is not). Under the OPRC Convention (next page) parties are obliged to put in place National Marine Spill Contingency Plans (NATPLANS) for managing Tier 2 (national and local events). PACPLAN serves as a guide for the development of NATPLANS and also provides the framework for managing (Tier 3) more serious or extensive spills. Tier 1 spills are addressed by individual facilities.

Fiji and Tonga are signatories to a number of international conventions dealing with safety of life at sea, safe navigation and pollution prevention including:

- **Convention on the International Maritime Organisation** 1948 with amendments 1964–1993.
- **International Convention for the Safety of Life at Sea** 1974, (SOLAS) with amendments 1974–1988
- **International Convention on Load Lines** 1966, with amended procedure protocol 1988
- **Convention on the International Regulations for Preventing Collisions at Sea** 1972 (COLREGs).

The **Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972** amended by a Protocol of 1996 (London Convention) regulates the dumping of wastes at sea. The 1996 Protocol prohibits the dumping of any wastes or other matter with the exception of those listed in an Annex. The 1996 Protocol adopts the precautionary principle (and so is much more restrictive than the 1972 convention) with permitted materials being confined to: dredged material, sewerage sludge, fish waste, man-made structures, inert inorganic geologic material, organic material of natural origin, and bulky un-harmful material like steel, and concrete. This convention has the force of law in Tonga through the Marine Pollution Act 2004. Fiji is not a signatory to this convention.

The **International Convention for the Prevention of Pollution from Ships 1973**, as modified by the Protocol of 1978 (MARPOL), is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It is a combination of two treaties adopted in 1973 and 1978 respectively and updated by amendments through the years. This convention has the force of law in Tonga through the Marine Pollution Act 2004. Fiji is not a signatory to this convention.

The **International Convention on Oil Pollution Preparedness, Response and Co-operation 1990** (OPRC Convention) provides a global framework for international co-operation in combating major incidents or threats of marine pollution. This convention has the force of law in Tonga through the Marine Pollution Act 2004. Fiji is not a signatory to this convention.

The **International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969**, as modified by the Protocol of 1973 (INTERVENTION Convention), affirms the right of a coastal State to take such measures on the high seas as may be necessary to prevent, mitigate or eliminate danger to its coastline or related interests from pollution by oil or the threat thereof, following upon a maritime casualty. The 1973 Protocol extended the Convention to cover substances other than oil. This convention has the force of law in Tonga through the Marine Pollution Act 2004. Fiji is also a signatory to this convention.

The **International Convention on Liability and Compensation for Damage in connection with the Carriage of Hazardous and Noxious Substances by Sea** 1996 (HNS Convention)

makes it possible for up to 250 million SDR (about US$320 million) to be paid out in compensation to victims of accidents involving Hazardous and Noxious Substances, such as chemicals. This convention has the force of law in Tonga through the Marine Pollution Act 2004. Fiji is not a signatory to this convention.

The **International Convention on Civil Liability for Oil Pollution Damage 1992** (CLC 92) ensures that adequate, prompt, and effective compensation is available to persons who suffer damage caused by spills of oil. This convention has the force of law in Tonga through the Marine Pollution Act 2004. Fiji is also a signatory to this convention.

The **International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 1992** (FUND 92) establishes a Fund for providing compensation for oil pollution incidents beyond that provided for by the CLC Convention. This convention has the force of law in Tonga through the Marine Pollution Act 2004. Fiji is also a signatory to this convention.

Both Fiji and Tonga are parties to the **Convention for the Protection of the Natural Resources and Environment of the South Pacific Region** 1990 (SPREP Convention) and its Protocol for the Prevention of Pollution of the South Pacific by Dumping (SPREP Dumping Protocol) and Protocol concerning cooperation in Combating Pollution Emergencies in the South Pacific Region (SPREP Pollution Emergencies Protocol). The Parties agree to take all appropriate measures to prevent, reduce and control pollution of the Convention area (Article 5), particularly pollution from vessels (Article 6), land-based sources (Article 7), exploration and exploitation of the sea bed (Article 8), airborne pollution (Article 9), dumping (Article 10), and the testing of nuclear devices (Article 12). They are to ensure that the implementation of this Convention does not result in an increase in pollution in the marine environment outside the Convention area (Article 5.2). They undertake to prohibit the storage of radioactive wastes in the Convention area (Article 11) and agree to take all appropriate measures to protect and preserve rare ecosystems and endangered flora and fauna, as well as their habitat, in the Convention area (Article 14) and will cooperate in taking all necessary measures to deal with pollution emergencies in the Convention area. This convention has the force of law in Tonga through the Marine Pollution Act 2004.

Fiji, but not Tonga is a signatory to the **Convention for the Protection of the Natural Resources and Environment of the South Pacific Region** (Nouméa Convention), which was adopted in 1986 and entered into force in 1990. It obliges Parties to endeavour to take all appropriate measures to prevent, reduce and control pollution from any source and to ensure sound environmental management and development of natural resources.

Neither Fiji nor Tonga is party to the **Convention on the conservation of Migratory species of Wild Animals**, although Fiji has signed the Memorandum of Understanding on Pacific Island Cetaceans and Tonga is intending to sign soon. This convention (also known as the CMS or Bonn Convention) aims to conserve terrestrial, marine, and avian migratory species throughout their range.

## 2.4 World Bank and Asian Development Bank requirements

World Bank and Asian Development Bank projects and activities are governed by Operational Policies (World Bank) and a Safeguard Policy Statement (ADB) to ensure they

are socially and environmentally sound and without unintended adverse affects. Specific safeguard policies relevant to this development are discussed below.

**World Bank Operational Policy 4.01 – Environmental Assessment** (World Bank 2007a) requires (i) detailed qualitative and quantitative analysis to determine project impacts, (ii) determination of tangible measures to prevent, minimize, mitigate or compensate for these adverse impacts, (iii) public consultation and disclosure as part of the EA process, and (iv) an Environmental Management Plan (EMP) to address set of mitigation, monitoring and institutional measures to be taken during design, implementation, operation of maintenance phases of the project.

**World Bank Operational Policy 4.04 – Natural Habitats** (World Bank 2004) requires the conservation of natural habitats and specifically prohibits the support of projects that involve significant conversion or degradation of critical natural habitats, as defined by the policy. The policy further requires the EA to identify impacts on biodiversity and species and to determine endemism, endangered species and to determine project impacts on these species and to propose acceptable mitigation and monitoring measures.

**World Bank Operational Policy 4.10 – Indigenous Peoples** (World Bank 2005) requires the Governments of Tonga and Fiji to engage in a process of free, prior and informed consultations with Indigenous peoples, as described by the policy in situations where Indigenous People are present in, or have collective attachment to, the project area and for the preparation of an Indigenous Peoples Plan (IPP) and/or Indigenous Peoples Planning Framework (IPPF). Indigenous Peoples are defined as a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:

a) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others,

b) collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories.

c) customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture, and

d) an indigenous language, often different from the official language of the country or region.

**World Bank Operational Policy 4.11 – Physical and Cultural Resources** (World Bank 2007b) seeks to avoid the disturbance and or destruction of physical and cultural resources as defined by the policy by the projects activities. Physical and cultural resources include; places of worship, buried artefacts, cemeteries and archaeological assets, etc. The policy further requires (i) EA to undertake an exhaustive desk review and/or site investigation to pre-identify and locate physical and cultural resources in the project influence area, (ii) EA/EMP to propose management measures and (iii) to include chance find clauses in civil works contracts during construction and maintenance stages.

**World Bank Operational Policy 4.12 – Involuntary Resettlement** (World Bank 2007c) addresses direct economic and social impacts from the projects activities that will cause (a) involuntary taking of land resulting in (i) relocation or loss of shelter, (ii) loss of assets or access to assets or (iii) loss of income sources or livelihoods, and (b) involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the

livelihoods of the displaced persons. The policy requires siting of project infrastructure to be so chosen so as to avoid these impacts altogether or to minimize them to the extent possible. Where these cannot be avoided, the policy requires the preparation of either or both of these instruments (i) resettlement policy Framework, (ii) Resettlement Action Plan, and for meaningful consultations with potentially affected people. The policy prohibits Community donations of lands for location-specific infrastructure.

**Asian Development Bank Safeguard Policy Statement** (ADB 2009) covers three key safeguard areas:

- Environment – ADB uses a classification system that focuses on a project's most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impact.
- Involuntary Resettlement – ADB screens all projects to determine whether or not they involve involuntary resettlement. For a project involving involuntary resettlement, a resettlement plan will be prepared that is commensurate with the extent and degree of the impacts. The degree of impacts shall be determined by (i) the scope of physical and economic displacement, and (ii) the vulnerability of the affected persons.
- Indigenous Peoples – ADB screens all projects to determine whether or not they have potential impacts on Indigenous Peoples. For projects with impacts on Indigenous Peoples, an Indigenous Peoples plan will be prepared. The plan's level of detail and comprehensiveness will be commensurate with the degree of impacts. The degree of impacts is determined by evaluating (i) the magnitude of the impact on Indigenous Peoples' customary rights of use and access to land and natural resources; socio-economic status; cultural and communal integrity; health, education, livelihood systems, and social security status; or indigenous knowledge; and (ii) the vulnerability of the affected Indigenous Peoples.

## 2.5 Administration

### Tonga's administrative framework

Five key agencies have jurisdictions over matters potentially affecting the proposed development in Tonga:

1. The Ministry for Environment and Climate Change (MECC) administers the Environmental Impact Assessment Act 2003. It therefore evaluates compliance of Environmental Assessments with the Act and implementation of environmental management plans by developers. MECC also manages Tonga's participation in international conventions on biodiversity and the environment and has oversight of the National Biodiversity Strategy Action Plan.
2. The Tonga Port Authority has authority, under the Ports Authority Act 1998 and Harbours Act CAP 137, over the port of Nuku'alofa and its approaches, including all shipping operations and shore and sea-based installations.
3. The Ministry of Lands Survey and Natural Resources is vested with authority over all government land, including the esplanade and road reserves over which the cable must cross between the foreshore and cable station. The Ministry also has authority over the administrative aspects of UNCLOS.
4. Offshore, Tonga's international maritime conventions are administered by the Ministry of Transport's Department of Marine and Ports, most of them under the

auspices of the Marine Pollution Prevention Act 2002.

5. The Ministry of Agriculture and Food, Forestry and Fisheries (MAFFF), manages fisheries in Tonga under the Fisheries Act 2002. MAFFF-Fisheries also operate an oyster aquaculture facility in Nuku'alofa harbour near the proposed route of the cable.

### Fiji's administrative framework

Six key agencies have jurisdictions over matters potentially affecting the proposed development in Fiji:

1. The Fiji Department of Environment (FDoE) administers the Environment Management Act 2005, compliance of Environmental Assessments with the Act and implementation of environmental management plans by developers. FDoE also manages Fiji's participation in international conventions on biodiversity and the environment.
2. The Department of Lands and Survey is vested with authority to grant lease over State Land including soil under Fijis waters should such a lease be deemed necessary in order to lay the cable. Further, the Fiji Ministry of Foreign Affairs would have to be consulted for consent and guidance in laying the cable on Fiji's Continental Shelf. The context of this discussion is broadly defined by the provisions of the UNCLOS 1982 Part VI Article 79.
3. The Fiji Ports Corporation Ltd has authority, under the Sea Ports management Act 2005 and the Marine Act 1986, over the port of Suva and its approaches, including all shipping operations and shore and sea-based installations.
4. FinTel administers the Fiji station of the Southern Cross cable. A landing party agreement exists between TCL and FinTel with the latter agreeing to share their cable landing point terrestrial ducting and cable station and facilitate securing the requisite approvals with Fiji authorities.
5. The Ministry of Fisheries and Forests manages fisheries in Fiji and administers the Fisheries Regulations 2004. No significant effect on fisheries has been discovered by this assessment.
6. Two Customary Fishery groups (Vanua Suva and Vanua Burebasaga) have use-rights over the coastal approaches of the cable to the Suva cable station.

## 2.6 Summary of policy, legal and administrative frameworks

For clarity, the policy, legal and administrative environment within which this proposal is to be undertaken is summarised as table 2.1.

**Table 2.1** Summary of the general requirements of laws, agreements and policies and the agencies responsible

| Requirement | Law/Agreement/Policy | Agency Responsible |
|---|---|---|
| Assess the environmental implications of the development and identify mitigation measures. | •Tonga Environmental Impact Assessment Act 2003<br>• Fiji Environment Management Act 2005<br>• WB OP4.01 Environment Assessment<br>• ADB Safeguard Policy Statement | • Ministry of Environment and Climate Change, Tonga<br>• Department of Environment, Fiji<br>• World Bank<br>• Asian Development Bank |
| Undertake maritime operations with all precautions to prevent marine pollution | • Tonga Marine Pollution Act 2002<br>• SPREP Convention<br>• London Convention 1972/96<br>• MARPOL 1973/78<br>• CLC 1992<br>• HNS Convention 1996<br>• OPRC Convention 1990 | • Ministry of Transport, Tonga<br>• Ministry of Transport, Fiji |

| Requirement | Law/Agreement/Policy | Agency Responsible |
|---|---|---|
| | • FUND 1992<br>• INTERVENTION 1969/73<br>• FUND 1992<br>• UNCLOS | |
| Undertake maritime operations with all precautions to ensure safe navigation and the preservation of lives at sea | • Tonga Harbours Act, CAP137<br>• Tonga Ports Authority Act 1998<br>• Fiji Sea Ports Management Act 2005<br>• Fiji Marine Act 1986<br>• Fiji Health and Safety at Work Act 1996<br>• Convention on the IMO 1948-<br>• SOLAS 1974<br>• COLREG 1972<br>• International Convention on Load Lines | • Tonga Port Authority<br>• Ministry of Transport, Tonga<br>• Fiji Ports Corporation<br>• Fiji Islands Maritime Safety Authority |
| Secure approval for the detailed cable route from the respective national authorities | • Tonga Land Act, CAP 132<br>• Tonga Parks and Reserves Act, CAP 89<br>• Tonga Continental Shelf Act, CAP 63<br>• Fiji Crown Lands Act, CAP 132<br>• Fiji Continental Shelf Act, CAP 149<br>• UNCLOS | • Tonga Ministry of Lands, Survey and Natural Resources<br>• Fiji Ministry of Lands and Survey |
| Deliver project objectives without impacting on the sustainable utilisation of marine fisheries | • Tonga Fisheries Management Act 2002<br>• Fiji Fisheries Regulations 2004<br>• Fiji Marine Spaces Act CAP 158A | • Tonga Ministry of Agriculture and Food , Forestry and Fisheries<br>• Fiji Ministry of Fisheries and Forests |
| Deliver project objectives without impacting on biological diversity and natural habitats | • UNCLOS<br>• Convention on Biological Diversity<br>• Nouméa Convention<br>• WB OP4.04 Natural Habitats<br>• ADB Safeguard Policy Statement | • Ministry of Environment and Climate Change, Tonga<br>• Department of Environment, Fiji<br>• World Bank<br>• Asian Development Bank |
| Deliver project objectives without impacting on marine mammals, in particular, cetaceans | • UNCLOS<br>• Convention on the Conservation of Migratory Species of Wild Animals | • Ministry of Environment and Climate Change, Tonga<br>• Department of Environment, Fiji |
| Deliver project objectives without disturbing or destroying land resources or physical cultural resources | • Nouméa Convention<br>• WB OP4.11 Physical Cultural Resources | • Ministry of Environment and Climate Change, Tonga<br>• Department of Environment, Fiji<br>• Tonga Ministry of Lands, Survey and Natural Resources<br>• World Bank<br>• Nautilus Minerals<br>• KORDI Minerals |
| Deliver project objectives without affecting the activities and opportunities of indigenous peoples | • WB OP4.11 Indigenous Peoples<br>• ADB Safeguard Policy Statement | • World Bank<br>• Asian Development Bank<br>• Vanua Suva<br>• Vanua Burebasaga |
| Deliver project objectives avoiding involuntary taking of land or involuntary restrictions on access | • WB OP4.12 Involuntary Resettlement<br>• ADB Safeguard Policy Statement | • World Bank<br>• Asian Development Bank |
| Conclude construction by verifying compliance with Environmental Management Plan and notifying the appropriate authorities. | • Tonga Environmental assessment Act 2003<br>• Fiji Environment management Act 2005<br>• WB OP4.01 Environment Assessment<br>• ADB Safeguard Policy Statement<br>• UNCLOS | • Ministry of Environment and Climate Change, Tonga<br>• Department of Environment, Fiji<br>• World Bank<br>• Asian Development Bank<br>• Ministry of Transport, Tonga |

# 3 Description of the Fiji-Tonga Cable System

This section outlines the proposed development with the purpose of providing context to the sections that follow. The phases of the development are described. These phases align with similar breakdowns in discussions on impacts and management later in the report. Some technical detail on submarine fibre-optic cables and cable-laying is included to engender comprehension of the nature and magnitude of the proposed operation. The section concludes with a brief discussion of qualifying criteria for an acceptable route and considers an alternative landing site proposed early in the design phase.

## 3.1 Existing operations

In a recent Pacific ICT Ministerial Forum, organised by the International Telecommunication Union (ITU), the Forum heard that international connectivity to broadband communications services is the biggest stumbling block to development in Tonga (ITU 2009). Satellite has been the main bandwidth provider to most Pacific island countries since the 1970s and Tonga, like most other island nations, still endures low-capacity and high-cost communications. Papua New Guinea and Fiji are the only countries that have international submarine cable access at the moment.

Tonga has two main telecommunications providers; Tonga Telecommunications Company (TCC) and Digicel. International telecommunications is satellite-based with both companies servicing the public using IntelSat. TCC owns the international gateway with Digicel buying satellite bandwidth for its own services. Tonga is facing challenges with international connectivity as the demand for bandwidth, driven primarily by the Internet, steadily grows.

TCC presently operates a national telecommunications network that services the entire country of Tonga. This network provides landline, internet and cellular services. TCC also manages the satellite earth station through which all upstream transmissions must go. To enable higher bandwidth services into the Kingdom, TCC has incorporated a wholly-owned subsidiary, Tonga Cable Limited (TCL), to undertake the installation of a submarine fibre-optic cable connecting to the Southern Cross Cable in Suva, Fiji. The system will be Tonga's first submarine cable.

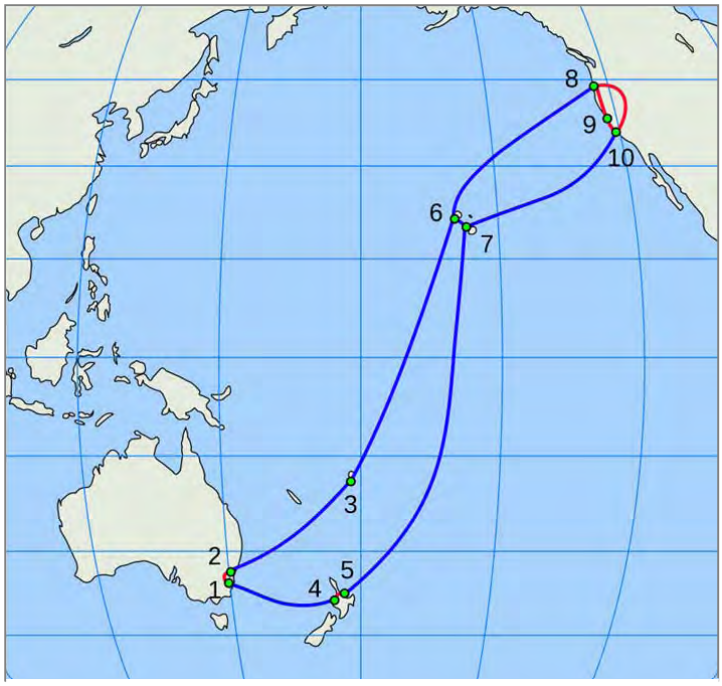



**Figure 3.1.** The Southern Cross Cable network. Suva is the cable station labelled '3' on the map.

The Southern Cross Cable[1] is a trans-Pacific loop of telecommunications cables linking the USA with New Zealand and Australia via Fiji and Hawaii. Construction began in 1998, with its first traffic occurring in 2000 and network completion in 2001 (Figure 3.1). Initially, each cable had a bandwidth capacity of 240 Gb/s but this was doubled in early 2008 and then upgraded further to 960 Gb/s in late 2008 and 1.2TB/s in 2010. A planned upgrade in 2010-2013 will take capacity to over 3.8 Tb/s.

## 3.2 Proposed development

The proposed development entails the installation of a fibre-optic cable from Suva in the Republic of Fiji, to a new landing station in Nuku'alofa in the Kingdom of Tonga (Figure 3.2). The base system will be a repeatered cable with a design life of 25 years and design capacity of a minimum of 320 Gb/s per fibre pair, with an initial lit capacity of 20 Gb/s.

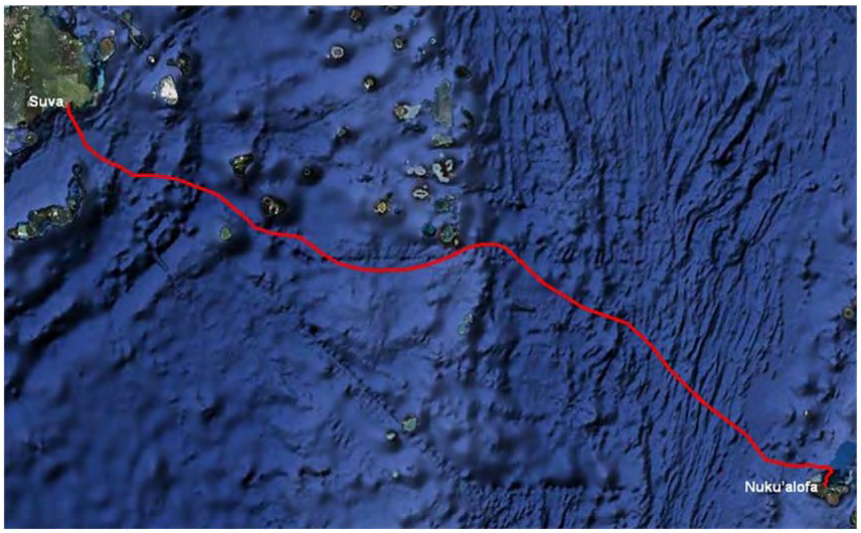



**Figure 3.2.** Fiji–Tonga cable initial design route.

The Suva cable station will be the Vatuwaqa station, in Laucala Bay, operated by FinTel where the Southern Cross cable currently terminates. Tonga Cable Ltd has negotiated a landing service agreement with the current Southern Cross operators, FinTel, for this connection. The interconnection at the Suva cable station will be established parallel to and independent from the Fijian connection, ensuring a measure of independence and security for Tonga's connection to the outside world. The cable landing station building has been constructed to the most stringent local earthquake zoning standards. As well as providing the requisite space for the interconnection, the service agreement includes provision of DC and AC power, un-interruptible power supplies, lighting, fire protection and security.

The cable's path from the Suva terminal will be close to, and parallel to, the Southern Cross cable, thus minimising disturbance of new ground and consequent spread of environmental impacts.

The cable stations in Fiji and Tonga will be linked by an estimated 826 km of submarine cable of four different types as depicted in the line diagram and cable cross-section diagram below (Figures 3.3 & 3.4).

[1] http://en.wikipedia.org/wiki/Southern_Cross_Cable and www.southerncrosscables.com/


**Figure 3.3** Line diagram of the Fiji-Tonga Cable (beginning at Suva (on left) and ending in Nuku'alofa (on right). Numbers above each section denote length in km. Codes below each section denote cable type: DA = Double Armour, SA = Single Armour, LWA = Light Weight Armour, SPA = Special Purpose (minimal) Armour.

To maintain signal strength, repeaters will be installed at intervals of 80-100 km along the length of the cable. The repeaters can be powered from either end of the system but Suva will be the primary electric power provider with Tonga as the backup.

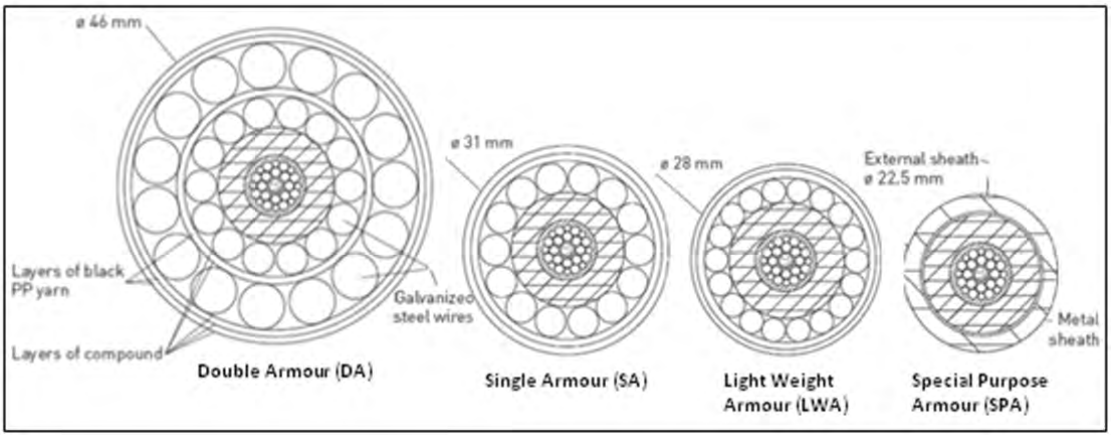



**Figure 3.4** Indicative cross-sections (approximately full size) through the cable types listed in the line drawing.

The cable traverses a geologically, seismically, and volcanically active area of irregular relief including deep depressions and high ridges, seamounts and hydrothermal fields. Seismic and volcanic activity is common and sub-sea slope failures and turbidity flows have been recorded.

The cable will approach Tonga from the west and arrive in Nuku'alofa through the lagoon along the western margin of the main shipping channel (Figures 3.5 and 4.7). Tonga Cable Ltd has opened discussions with the Ports Authority of Tonga to extend an existing 'no anchoring' zone to cover the route of the cable through the lagoon. The final leg of the route ascends from the harbour bottom through a small boat channel onto a wide tidal reef platform fronting the beachfront. The cable would likely then be buried in a trench cut in the reef platform (an option preferred by most stakeholders consulted) or, if not buried, further armoured and affixed to the surface. Its entry onto land and onward to the cable station will be through a buried conduit (Figure 3.7).

The planned new Tonga cable station will be at Sopu, on the western margin of Nuku'alofa and less than 100 m from the cable landing (Figure 3.7). The Tonga cable station will mimic, on a smaller scale, the Suva station. The station, being on a low-lying coastal site, will be elevated 1.5 m above ground level with non-essential services on the lower floor and all key equipment installed on the upper floor. A separate elevated structure will house two backup generators.

## 3.3 The design phase

Before construction begins, the development undergoes a four-step Design Phase comprising: an initial route selection and project scope, an environmental assessment (this study), a route survey, and the detailed design.

The initial route selection and project scope is complete and is summarised in Section 3.2 above. This has been a desktop study based on available information sufficient to scope and specify the proposed development with enough accuracy for costing and calling for tenders for components of the construction phase that follows. It also provides the basis for the second design component, the environmental assessment, which examines the project's interaction with the environment, considers potential impacts and determines mitigation measures necessary to eliminate or minimise negative affects on the natural or social environment. This report is the product of the environmental assessment.

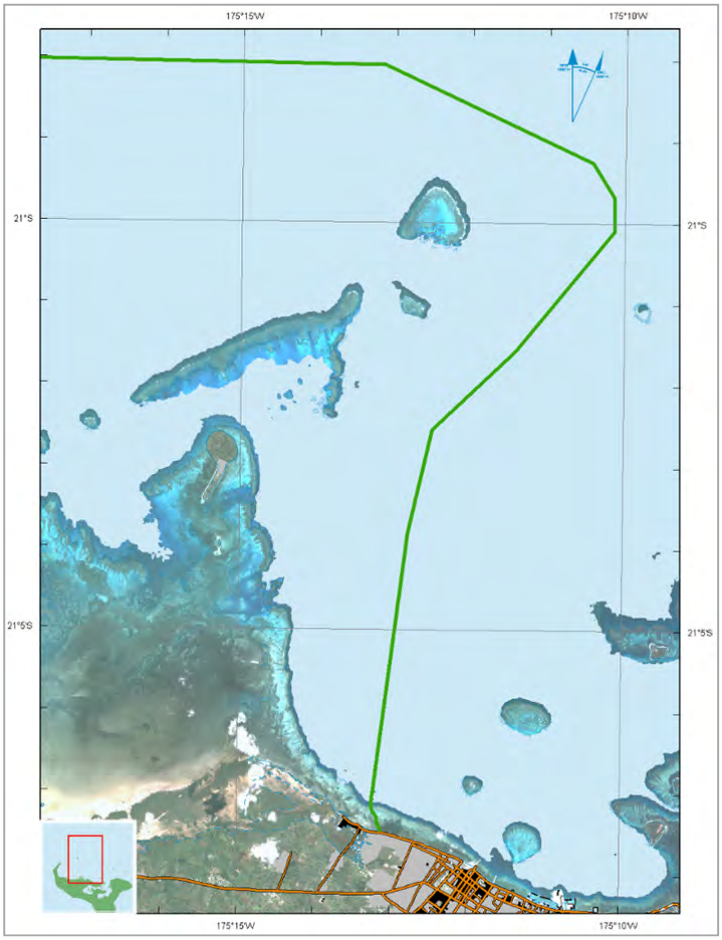



**Figure 3.5.** The proposed route the cable will take through the lagoon to the landing site.

There follow the final two design stages – route survey and detailed design - as follows:

### Route Survey

Having determined the cable landing sites, a full review of pertinent available information is conducted in order to define the most efficient and secure route for the cable. This preliminary review, commonly referred to as a desktop study, is generally conducted by marine geologists with cable-engineering experience who assemble all available hydrographic and geologic information about the intended route. They commission reports, if appropriate, to consider fishing and other maritime activities and practices and permitting required and considers the location and history of existing infrastructure and other obstructions. With this information, a comprehensive desktop study will provide an optimal route design that can be scheduled for a detailed 'marine route survey'. The desktop study will generally determine the detailed design of the cable landing – how it enters the littoral

zone from the deep sea, crosses any reef systems and lands on the beach and finally links to the cable terminal.

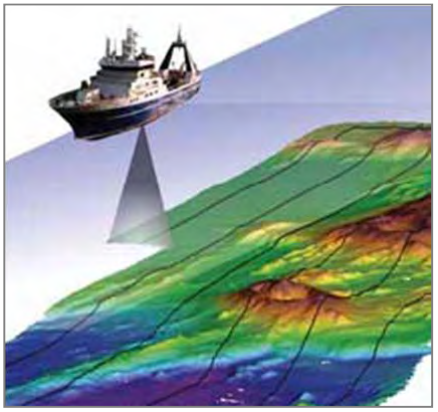


**Figure 3.6.** Marine route survey using multi-beam bathymetric mapping controlled by satellite navigation.

Based on the desktop study, the marine route survey is conducted along the optimised route to fully characterize that route and avoid hazards and/or environmentally significant zones that may not have been identified. Surveys include water depth and seabed topography, sediment type and thickness, marine faunal/floral communities, and potential natural or human-made hazards. Where appropriate, measurements of currents, tides and waves may be needed to evaluate the stability of the seabed, movement of sediment and ocean conditions that may affect cable-laying and maintenance operations. A marine route survey commonly covers a swath of seabed from 1 to 10 km wide with repeat passes where necessary. In many places where local shipping and fishing conditions make the cable more vulnerable to damage, this depth reflects the limit for burying cables for protection. The width of the survey corridor can be adjusted largely in response to the expected complexity of the seabed, and the depth to which these complete surveys are conducted will be based on local hazards, particularly bottom trawl fishing if present and shipping activities, which may require the cable to be buried (Carter et al. 2009). Water depth has traditionally been measured by echo-sounding, which has now developed into seabed mapping or multi-beam systems (Figure 3.6).

The data acquired during such surveys are constantly monitored so that if an unexpected hazard, cable obstruction, or benthic community is identified, the route can be adjusted to avoid any hazardous or ecologically sensitive areas. Ultimately, the desktop and marine route surveys will precisely define a viable cable route and identify the natural and human activities that could conflict with the cable. This information guides the cable design and manufacture so that its degree of armouring is matched to the specific conditions of the route (Carter et al. 2009).

### Detailed design

The information collected in the route survey provides input to a review and detailed design of the submerged infrastructure – the cable and repeaters. This will consolidate decisions on the cable route and cable types and quantities, revising or confirming those in Figure 3.3, and clarify the nature of its deployment on the seafloor – surface laying or trenching and burial, supplementary protection, etc.

The cable landings on each coast will also be finalised. This includes the method and depth of burial as it emerges from the sea, any additional armouring, conduit design, whether to terminate the sea cable at a manhole junction or connect directly to the landing station.

## 3.4 The construction phase

Once the Design phase is complete, the Construction Phase entails three components:

- Cable Station construction
- Cable Laying (including post-laying survey if required)
- Notification and Commissioning

### Cable station construction

The Suva end of the cable will terminate at an existing landing station – the Southern Cross Fiji terminal. No new construction is required at this site apart from the service agreement and provision of requisite space for the interconnection, shared provision of power, UPS, fire protection and security, etc.

Establishment of the Tonga cable station will entail: demolition of existing structures, design and construction of the new station, landscaping and security, all permits, consents and approvals, the cable duct from the landing site (70 m away), the complete fit-out of the inside, commissioning and handover – all as described in the a cable station specification document (TCL 2010).

### Cable laying

It is intended that the cable-laying will begin from the Fiji end. The lay begins with the end of the cable being floated ashore and drawn through the trenching and/or ducting to its landward junction point where it is secured. Then, when secure and in position, the floats on the cable are cut, one-by-one, working seaward, allowing the cable to sink to the seabed; the seaward lay of the cable can then commence. Initially, the cable is payed out slowly, with the vessel moving 'slow ahead' until the cable reaches the seabed. This is the touch-down point. The ship can then increase its laying speed up to a practical maximum of about 6–8 knots, periodically slowing down to allow repeaters to pass through the cable-handling machinery that controls cable tension and pay-out speed. Once a steady-state is achieved, the cable pay-out speed should be approximately the ship's speed plus 2–3%, assuming the seabed topography is fairly constant.

**Figure 3.7.** The site of the Nuku'alofa cable landing station. The three buildings will be demolished to make way for the new cable terminal building. The dotted orange line shows the only section of overland cable.

Laying operations undergo constant and accurate monitoring. The ship's position and speed over the ground are measured by differential GPS, and the water depth by precision echo-sounders and seabed mapping systems (from the marine route survey), whereas cable

pay-out speed and length are recorded by a rotometer. Onboard, the cable engineer scrutinizes laying progress with constant reference to the engineered route plan, making adjustments if necessary (Carter 2009).

The EA team has been informed that the cable will likely be buried in the shallow water approaches to the landing site and will likely be surface-laid along the deep water route and this intent is supported by stakeholders. In sections where the cable is not buried it will lie directly on the seabed. The environmental assessment has been based on this intent, though the comparative impacts of burying versus surface-laying the cable are unlikely to differ greatly. Elsewhere in the world, cables are commonly buried across the continental shelf, typically 0–130 m deep, and even down to depths of 1000–1500 m where there is risk of damage from bottom-trawling. Where burying is undertaken, the most effective method is by sea plough. As a cable approaches the seabed, it is fed through the plough, which inserts the cable into a narrow furrow. Burial disturbs the seabed along the path of the cable. When towing a sea plough, the ship carefully controls its operations so that cable slack is kept to a practical minimum as it enters the plough. The aim is to lay the cable with near-zero slack, but with enough looseness to fall into the furrow. In areas where the cable crosses another cable or a pipeline, the plough must be either recovered or 'flown' over the crossed section and then re-deployed on the opposite side. These skipped sections may be buried later, either by divers or by a remotely operated vehicle (Carter 2009).

#### Notification and commissioning

The final, exact, location of the cable is notified to the appropriate country and maritime authorities and published in a Notice to Mariners. Electronic and paper navigational and other nautical charts are updated by hydrographic agencies so that mariners are aware of the cable.

Finally, the completed system is commissioned as a point-of-contact service for local wholesale and retail providers (currently the two incumbent companies, TCC and Digicel, but with provision for additional providers in the future).

### 3.5 The operation phase

The design life of the cable, the repeaters – and the system as a whole – is 25 years. In the normal course of events, recovery of the cable should only be necessary in the event of damage from some external source (most commonly fishing trawls and lines, ships anchors, and, infrequently, natural events). Recovery generally entails:

- location of the cable and, if a repair is required, identification of the faulted section
- retrieval of the cable with specially designed grapnels deployed from the repair vessel
- lifting to the surface for removal or repair.

Once repaired, the cable is returned to the seabed.

## 3.6 Alternatives considered

The paucity of data in the poorly-surveyed expanse of ocean that lies between Fiji and Tonga means no alternative route has yet been considered by the project design team and there is no basis on which the EA Team can suggest such an alternative. Instead, the EA Team has listed below a number of criteria against which the current proposed route, any deviation from that route, or any new route should be tested before acceptance. Any shortfall when measured against these criteria may be cause for additional environmental consideration.

The unknowns inherent in laying a submarine cable across a tract of sea where none has been laid before and about which little information is known, implies a certain generality in the early design and a commensurate reliance on the marine route survey to furnish the final detail. We therefore expect there will be sometimes subtle, and sometimes significant, deviations from the initial route in response to the rules (mitigation measures) derived from the Environmental Assessment and the principles of engineering and cable-laying design. Provided any such deviation is clearly in response to the recommendations of the Environmental Assessment and to engineering principles, it should be regarded as valid and not requiring further environmental assessment unless it raises new or unresolved issues.

### Acceptance criteria for any oceanic route

A viable and acceptable cable route is one that maximises cable integrity and minimises risk of cable damage while avoiding or minimising negative impacts on the environment. An acceptable and viable alternative oceanic route would satisfy all the criteria below. It would:

- maximise its path over soft sediments (to minimise habitat disturbance)
- avoid habitat and fishing conflicts around seamount with a 2 km clearance from base
- avoid habitat, mining and environment conflicts around hydrothermal vents with a 2-km clearance
- avoid coral reef habitats by placement on the sandy seafloor
- minimise potential conflict with coastal shipping and inshore fisheries
- follow seabed terrain with gentle, even, relief (<6° slope) to minimise sharp-edge abrasion, cable movement and suspended sections
- avoid unstable ground or areas potentially prone to deposition from instability up-slope
- minimise overall length (to minimise resource consumption)
- minimise requirements for protective armour (to minimise resource consumption).

### Description of the alternatives considered

Other than in the deep ocean (and considering that the Suva end is an immovable, established fact), the proponents have had little freedom to consider alternatives and, in fact, only one was put to the EA Team, as described below.

Early in the design phase, consideration was given to landing the cable on the western side of Tongatapu and then running it overland to the cable station in Nuku'alofa (Figure 3.8).

The Kanokupolu area on the northwest of Tongatapu is a narrow finger of land of gentle relief that rises to around 15 m above sea level. On its eastern side (facing Nuku'alofa), it falls gently to an extensive area of mudflats that backs a fringing reef that forms the western

rim of the harbour. On the north-western (sea coast) side, the land stops abruptly at a low sea cliff of between 2 and 5 metres high standing above a narrow tidal fringing reef of hard coral that gives way directly to the sea. It is an active coastline subject to heavy wave break and strong currents through the breaks in the reef. Coastal erosion has affected land along the seafront during cyclones.

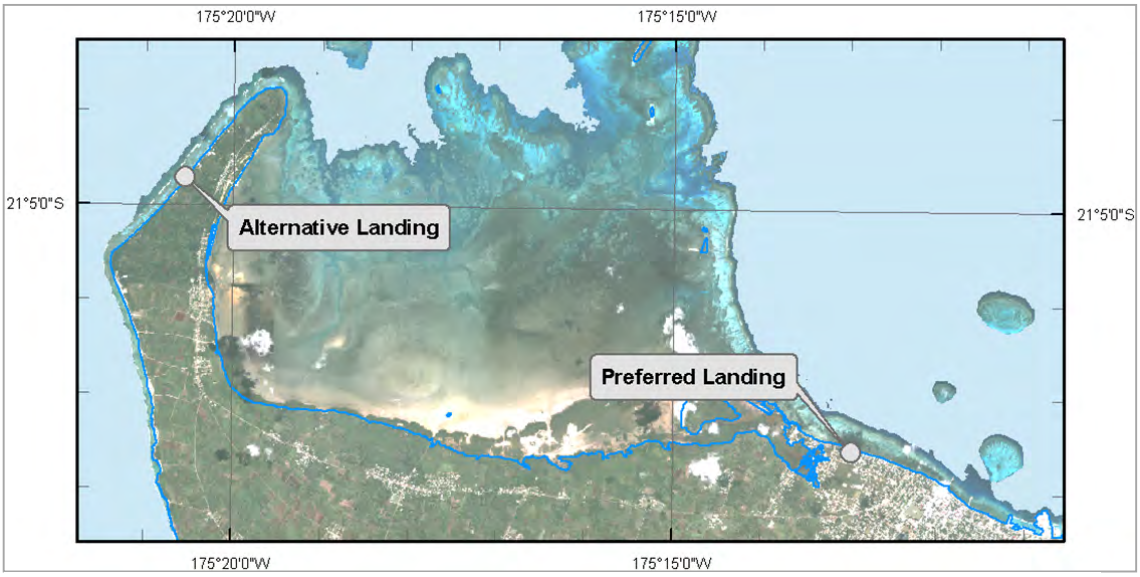



**Figure 3.8.** The alternative landing point considered (and rejected) early in the design phase.

### Assessment of alternative

The western landing site presents advantages in its more direct route to mainland Tongatapu, which avoids the harbour passage and consequent (albeit low-level) conflict with harbour and fishing activities and the measures necessary to avoid impacting coral reef habitats.

Its disadvantages are in the greater vulnerability of the cable (at the landing and the onward overland route) and the heavier impact on the terrestrial environment in routing the cable overland to the cable station. The greater vulnerability of the cable stems from its landing on an exposed volatile hard-rock coast subject to high-energy wave action and exposure to cyclonic storms. This would make greater demands on design and construction to protect the cable and thereby maintain communications security. Once landed on the north-west coast, there remains about 20 km of terrestrial cabling to reach the western edge of Nuku'alofa. Along this route the cable could be laid in a trench or suspended on poles. The former would be more secure from casual interference but would require clear, frequent, and well-maintained signage to mitigate unintentional damage from construction, roading, and services excavations. Suspension on poles would not find favour with other utilities agencies because of the high additional wind-loading on an already under-capitalised network, and would probably introduce an unacceptable reduction in telecommunications security. Whether by trenching or by suspension on poles, this overland route will have an impact on 20 km of already poorly maintained roads and 10 villages before reaching the city, with additional environmental, social and operational considerations to be factored into the development.

Largely for these reasons this alternative was rejected by the project proponents at a very early stage.

# 4 Baseline Conditions

This section is a factual description of baseline conditions prevailing in and around the proposed development's area of influence. While some implications may be drawn, no deductions are made in this section. These baseline conditions are the reference point from which potential impacts are assessed in Section 5 and around which management procedures are recommended in Section 6.

## 4.1 Location and setting (influence area)

The most conspicuous setting for this project is the more than 800 km of intervening ocean between the cable terminals in Fiji and Tonga. This ocean extent descends to depths of more than 3000 m and is an area characterised by high geologic, seismic, and volcanic activity with irregular relief including deep depressions and high ridges, seamounts and hydrothermal vent fields. By avoiding seamounts, it is probable that the cable will only rise from below 1000 m depth as it nears the landing sites at each end and as it crosses the Lau ridge roughly halfway along its crossing.

To assess the possible impacts of the proposed development, a geographical constraint or area of likely influence was determined to delimit the geographic scope of this study (Figures 4.1 and 4.2).

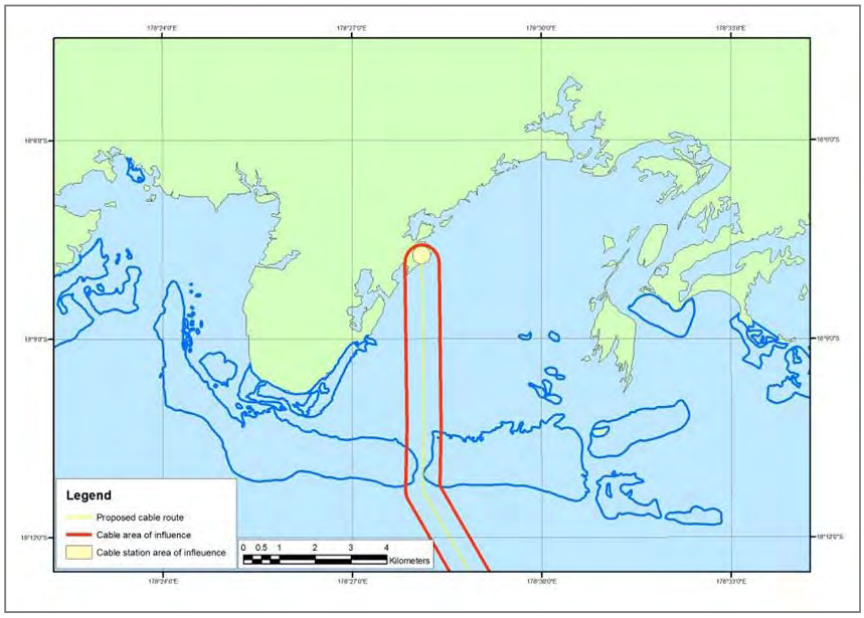



**Figure 4.1.** Area of influence of this study – Suva end.

In respect to the coastal zone, initial scoping determined that any impacts in the shallow seas were likely to be confined to the immediate vicinity of the cable, a matter of less than a few tens of metres. Factoring in the high spatial precision of the cable laying, it is unlikely that the cable would come to rest more than 100 m away from its intended position. Using precautionary logic, the area of influence was resolved to be no more than 500 m either side of the initial design route – a 1-km corridor. With increasing bathymetric depth there is a possible broadening of the area of influence as a consequence of the lowered precision of cable placement. This is matched by a corresponding drop-off in the spatial specificity of the information available with the more general information for the deep sea portions of the cable route being applicable over a wider swath or area.

For the cable stations, an area of likely influence of 250-m radius from the central point of the station sites was assumed. Based on the proposed development plans, initial scoping by the EA Team determined that any likely impacts from the construction of the cable station at the Tonga end, and the connection of the cable at the existing Fiji cable station would likely have only localised impact.

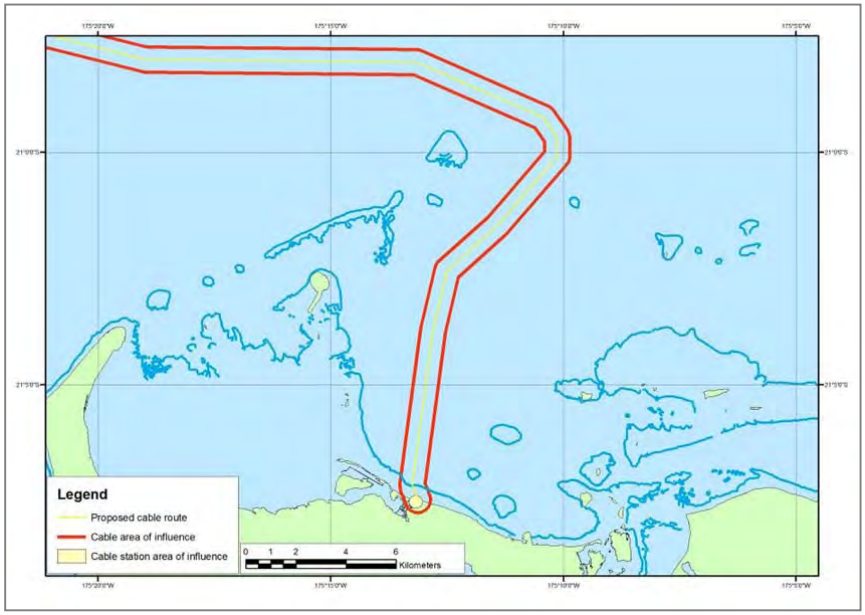



**Figure 4.2.** Area of influence of this study – Nuku'alofa end.

The setting at the Suva end of the route is peri-urban. The most relevant feature is the existing FinTel property, which comprises an extensive open space of reclaimed land extending from the sea to (and surrounding) the Southern Cross cable station. Outside this is a mixture of wasteland, recreational space dedicated to a golf-course, with residential buildings a few hundred metres to the southwest. The approach to the landing site is across an extensive mudflat (left-hand image, Figure 4.3).

**Figure 4.3.** Location and Setting at the two cable landings and cable stations (Suva on the left and Nuku'alofa on the right).

At the Nuku'alofa end, the approach to the landing site is through the entrance to the harbour between, but not over, extensive coral reefs and coral heads, to ascend finally onto a reef platform for the last 500 m to the landing site. Less than 70 m distant from the landing is the site of the proposed new cable station. This site, presently occupied by three residential buildings, sits on the edge of a primarily urban setting, but one backed by wasteland and semi-reclaimed tidal marshes (right-hand image, Figure 4.3).

## 4.2 The physical environment

### Climate

Both Tonga and Fiji lie within the equatorial belt and have a tropical maritime climate. Both countries lie in the trade wind zone of the South Pacific with a tropical climate characterised by a prevailing pattern of south-easterly winds, warm temperatures throughout the year, a distinct wet and dry season and relatively high rainfall intensities.

The landing station in Fiji is located on the wetter side of the main island of Viti Levu. The climate in Suva has a distinct seasonality, with a hotter, wetter, rainy season from November to April and a cooler, drier season from May to October. The seasons are linked to the onset and falloff of the South East trade winds. March is, on average, the wettest month with 368 mm of rain over an average of 21 rain days (days with precipitation >0.25 mm). The maximum monthly average high temperature (30°C) and maximum highest recorded temperature of 37°C was also recorded in March.

Nukualofa's climate has a similar seasonality, though not nearly as marked as that of Suva. On average, the warmest month is February with an average temperature of 29°C, while the coolest is on average July (25°C). Like Suva, the wettest month on average is March with an average 218 mm of rain.

### Topography, bathymetry and substrate

The along-cable route bathymetry for Suva harbour shows an unremarkable and gradual slope across Laucala Bay (Figure 4.4). Under its proposed route, the first approximately 300 m from the shoreline will be over a tidal mudflat. There is then a gradual slope starting at around 1km from shore and running to around 4.5 km where the seabed reaches a depth of 35 m. This is around the mouth of

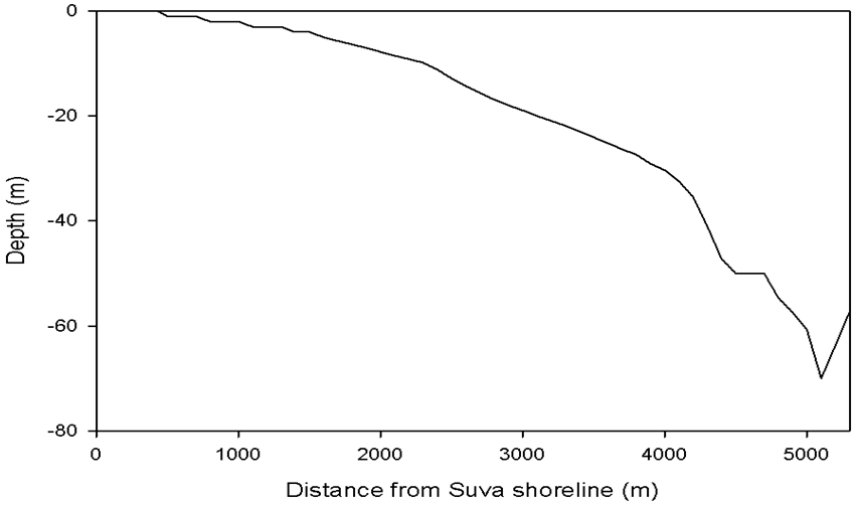



**Figure 4.4.** Suva harbour along cable route depth profile based on extrapolation from depth contours shown on as-laid cable route plan for Southern Cross cable segment G1, chart SG1-002.

Nukubuco passage through which the cable is intended to pass. The depth then drops more sharply to around 60 m in mid-passage. At present the initial cable route then climbs up the western-most face of the reef passage whereas, in reality, it is likely to be routed to continue descending throughout the reef passage.

The whole path from landing station to reef passage within Suva lagoon crosses soft sediments (Figure 4.5). Grain sizes of these sediments vary from an area of coarser sand ($\varphi^2$ = 2–2.5, grain size = 200–250 µm) around the mouth of the Nukubuco passage to areas of finer sediments and silt (φ = 3–3.5, grain size = 75–125 µm) closer to shore.

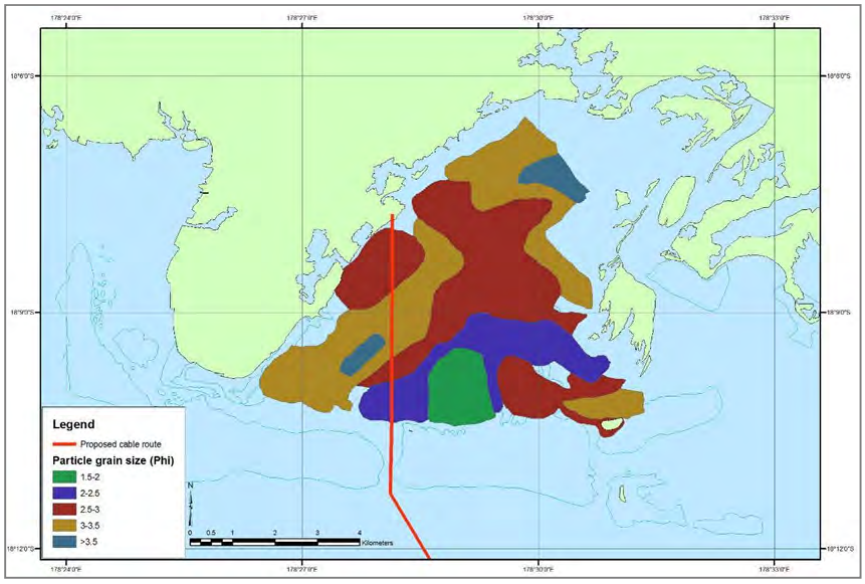



**Figure 4.5.** Particle size in Laucala Bay (after Kyaw 1982).

The area between Tonga and Fiji has a complex bathymetry, known to be tectonically, seismically, and volcanically active. Figure 4.6 presents (left to right) a cross-section of the cable's oceanic passage from Fiji in the west to Tonga in the east.

After emerging from the Nukubuco reef passage, the route descends progressively for 150 km to its deepest point of 3500 m depth just to the south of Moala Island in Lau. From there the seabed rises over the next 250 km to cross the comparatively shallow (about 600 m) Lau arc-front about midway between Fiji and Tonga. For much of the remainder of the route the cable descends to fluctuate between 2000 and 3000 m as it crosses the Eastern Lau Spreading Center (ELSC), an area of complex, angular, topography characterized by seamounts, hydrothermal areas, volcanoes, deep depressions and high ridges.

[2] φ is a way of referring to particle size in terms of the mesh of the sieve that retained a particular fraction

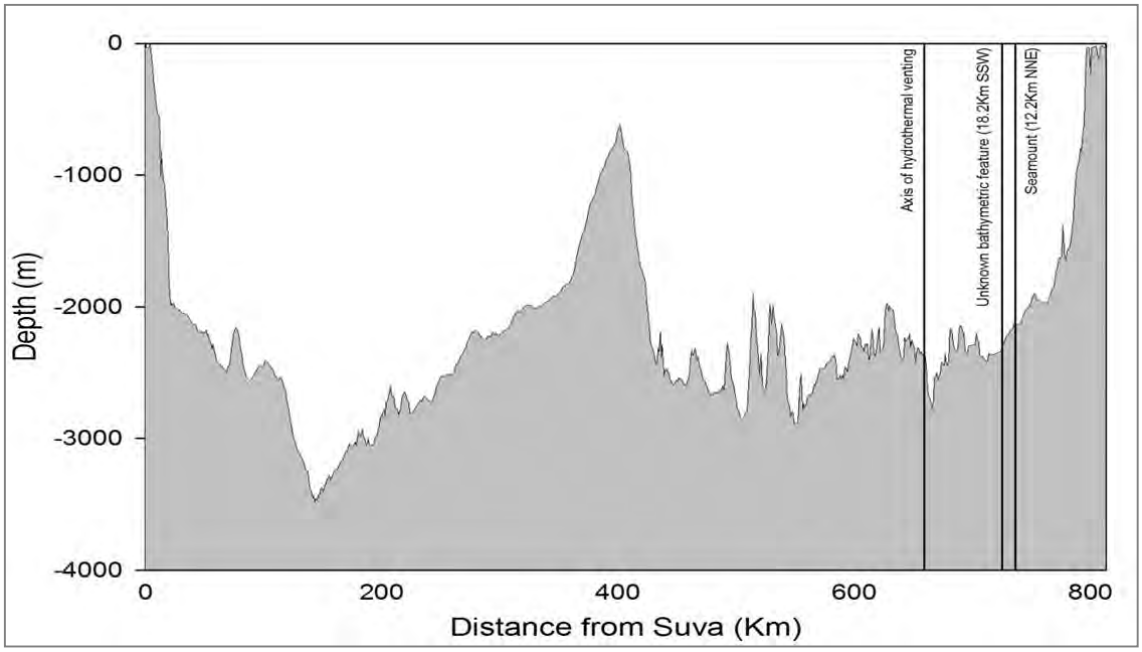



**Figure 4.6.** Fiji (left hand side) to Tonga (right hand side) along-cable route profile. Identified by vertical lines are three areas of interest: the spreading axis that has associated with it hydrothermal venting and the closest points along the cable route of the two closest bathymetric features together with the perpendicular distance from the proposed cable route (see Section 4.3 for details).

This seabed topography (Figure 4.6) owes its existence to the presence of the boundary between the Pacific plate to the east and the Australian plate to the west forming an Oceanic Spreading Ridge (Bird 2003) over which the cable passes on a perpendicular heading.In the area of the cable route the spread is about 75 mm per annum with the rate increasing to the north and decreasing to the south.

Approaching Nuku'alofa Harbour, the depth of the seabed rises rapidly from a depth of about 2200 m within 100 km of Nuku'alofa to about 500 m approaching the harbour entrance (Figure 4.7). 17 km from landing, the cable is still at 400 m depth but within the space of a few kilometers this shallows to 64 m, reducing to 33 m with 13 km to run. At this point the cable joins the main shipping channel.

Figures 4.7 and 4.8 show the depth shelving as the channel crosses an area of coral outcrops 6–8 km out. These coral heads rise from the seabed at about 16–18 m up to a depth of about 10 m. The indicative cable

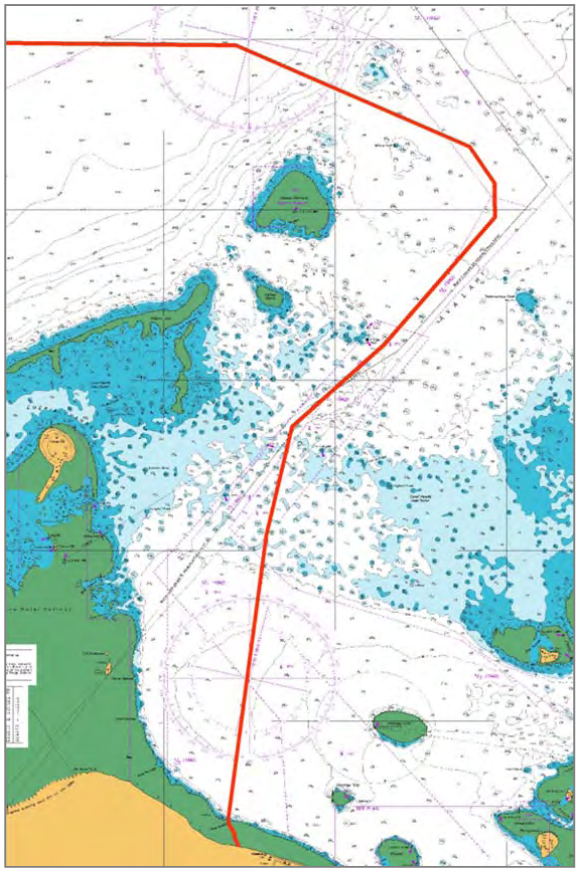


**Figure 4.7.** The intended cable route superimposed on a section of navigational chart NZ8275 showing its position in relation to the shipping channel and submarine features.

route passes directly over several of these coral heads but the final route will follow a path between the outcrops so that the cable remains on the flat sandy seabed. The depth within Nuku'alofa harbour is about 20–30 meters. The final approach to land sees the cable rise up the margin of the harbour bed to enter a small boat passage and onto a 500-m wide tidal reef flat that it crosses diagonally before landing adjacent to the cable station site.

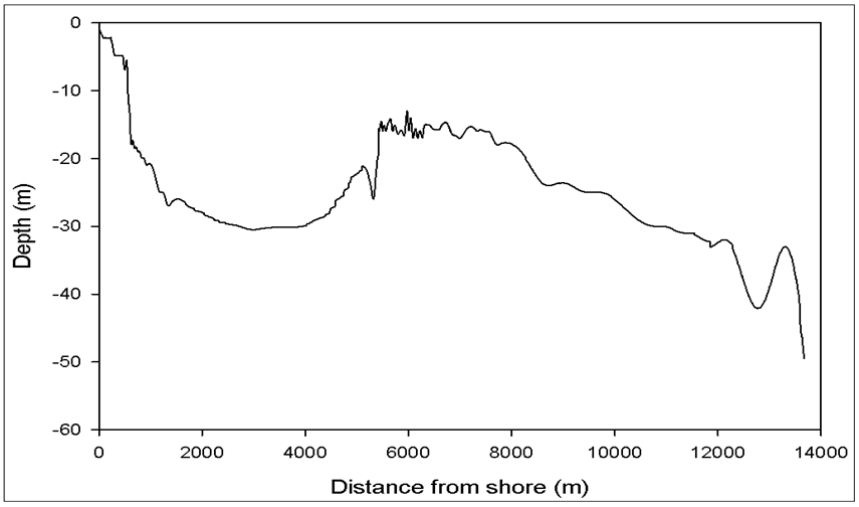



**Figure 4.8.** Nuku'alofa harbour along cable route depth profile based on extrapolation from depth soundings shown on Admiralty Chart Nukua'alofa Harbour sheet NZ8275.

Previous work assessing marine aggregate extraction potential (Lovell 2005) shows that for the 12-km approach to Nuku'alofa (and aside from the coral heads which the provisional route crosses at present) the substrate is composed of sand of mixed particle size.

### Marine hydrology

Circulation models have been developed for both Tongatapu lagoon (SPC 2009) and Laucala Bay (Fichez et al. 2006).

The mean annual wind direction across Tongatapu is 130° – a direction from which the wind blows for more than 70% of the year. This wind drives waves of 2.3 m average height onto the eastern most barrier of the lagoon. In turn, this wave action pumps water over the reef top, flooding the lagoon on an incoming tide. The westward flow of water into the lagoon decreases with distance into the harbour.

On all but the largest spring tides, regardless of whether the tide is ebbing or flooding, water moves east to west over the whole length of the proposed cable route inside the lagoon. Close inshore, water moves across the shallow reef platform to the south of Atata Island and out Egeria Passage. Further from shore, water exits the lagoon through Hakaumama'o reef. During large amplitude spring flood tides water enters Egeria Passage, floods across the reef platform south of Atata, and enters the lagoon.

Maximum surface current velocities modelled inside the lagoon are low – less than 0.07 m/second and this velocity will decline further the deeper the water as a result of the friction effect of the substrate. This low flow rate produces a relatively long residency time inside the lagoon.

Water entering Suva Lagoon and Laucala Bay is also forced by prevailing south-east winds. The main break in the reef at the mouth of the Rewa River provides the point of greatest

ingress. Current velocities through this reef passage exceed 0.2 m/second during high amplitude flooding tides, with higher velocities being forced by shallow silt deposits at the river mouth. Once into Laucala Bay the water velocity reduces considerably. At the proposed landing site of the cable, there is a very slight southward flow of water of less than 0.01 m/second during flooding spring tides and in the wet season when high seasonal rainfall is producing a heavy freshwater flow into Laucala Bay from the Rewa River.

### Terrestrial physical environment

The land at the Suva landing station is reclaimed land. The fill, of unknown origin, overlies former saline mudflats that previously supported mangrove communities. The site is characterized by poor soil structure, a perennially high water table and poor internal drainage. The site is transected by a drainage ditch which seems effective in removing surface water in normal weather. The shoreline is coarse coral rock and gravel overlying a solid coral platform that grades into an extensive tidal mudflat.

The land in the vicinity of the proposed Nuku'alofa landing site and cable station is low-lying and of gentle relief. The shoreline is fronted by a large tidal reef platform extending 500 m seaward. Along the shoreline there is a continuous seawall of coral boulders that rise about 2 m above high water level. Ground level behind is less than 1 m below the crest of the seawall and elevations fall further from Vuna Road southward, becoming tidal in places within a few hundred metres to the west and south.

The proposed cable station is on land approximately 1 m above high water level with limited seaward protection afforded by: the 40 m of land between it and the seawall, the seawall itself, and the reef platform.

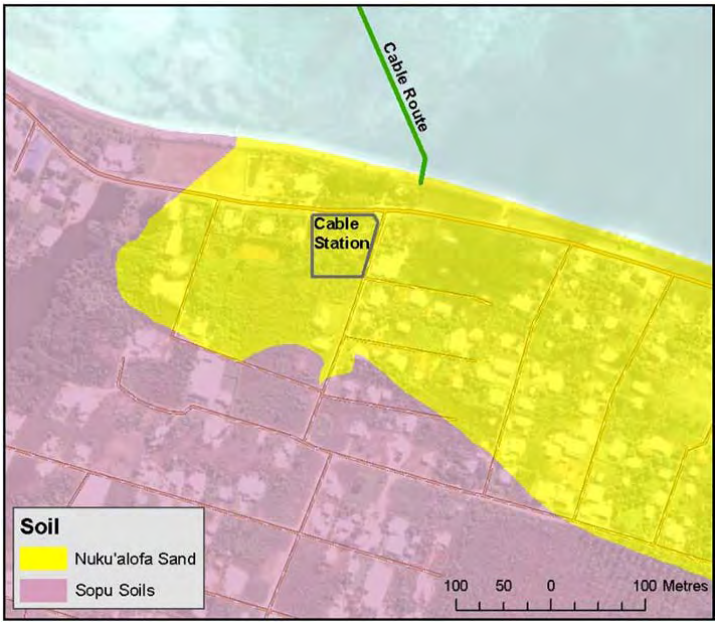



**Figure 4.9.** Soil Series in the vicinity of the Nulu'alofa cable landing and proposed cable station.

The site of the proposed cable station is on a narrow finger of Nuku'alofa soils formed from accumulation of beach sands along the northern coast of Tongatapu (Figure 4.9). These soils overlie coral limestone and have low organic matter, poor water retention and drain rapidly to a water table that may in places be less than a metre below surface. Bordering the Nuku'alofa soils to the west and south are extensive areas of Sopu sand and Sopu peaty sandy loam. Sopu soils are found in low-lying wet areas of bays and tidal marshes. They have formed from sediments and their properties are dominated by excessive (commonly saline) water and consequently severe limitations to plant growth.

## 4.3 Habitats, flora and fauna

### Protected areas

There are seven marine protected areas (MPAs) on the north shore of Tongatapu (Figure 4.10). None of these protected areas are crossed by the proposed cable route and none are closer than 4 km from the proposed route. Among the MPAs, six were gazetted under the Parks and Reserves Act 1976. While these sites have been in existence for a relatively long period of time by Pacific standards, little public consultation was carried out prior to their designation and today they are not enforced and comprise little more than 'paper parks'.

By contrast, and as a result of a paradigm shift in management both in the region and in Tonga, the sixth site ('Atata Island) is a community-based, community-designated, Special Management Area. Such areas are formed under the Fisheries Management Act 2002, which gives the right to any coastal community to apply to the Department of Fisheries (now MAFFF-Fisheries) to establish a Special Management Area. Experience from the region suggests such an approach to management has a higher likelihood of long-term sustainability.

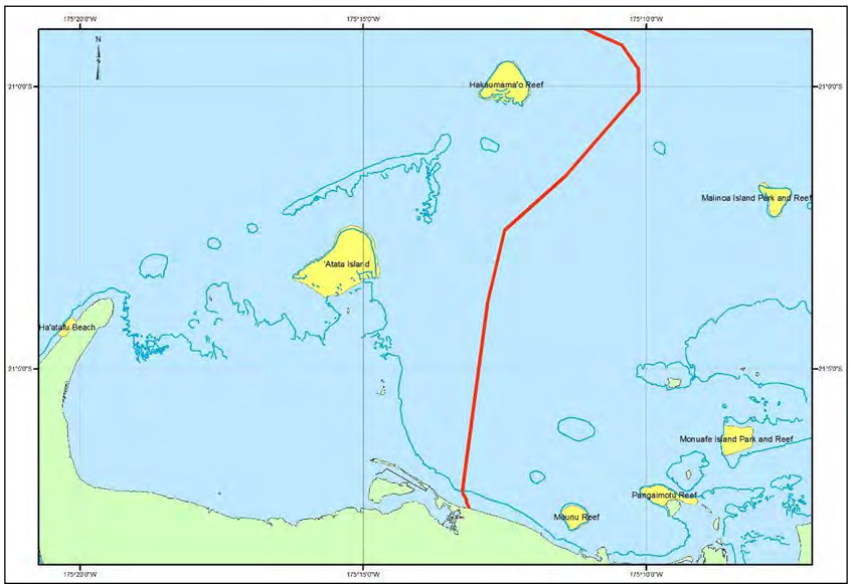



**Figure 4.10.** Marine Protected Areas in the vicinity of the cable at the Tonga end.

There are three protected areas with a marine component in the vicinity of the Suva route of the cable (Figure 4.11). Two of these sites (Vuo Island and Drauniboto and Labiko Islands) were established in 1960 as a Forest Park and Amenity Area by the Forestry Department. These sites, while

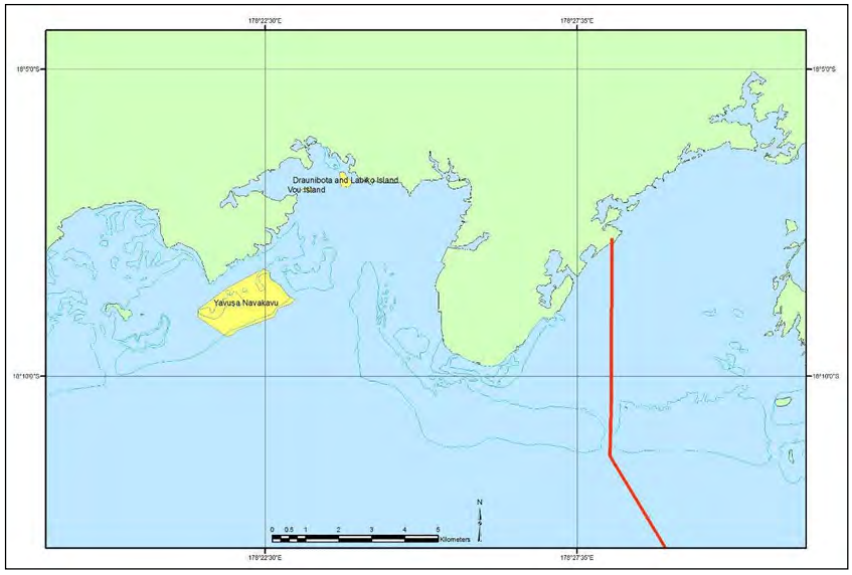



**Figure 4.11.** Marine Protected Areas in the vicinity of the cable at the Fiji end.

still existing, do not have actively enforced management rules. The third site (Yavusa Navakavu) is a community-based, marine managed area and is one of the most actively enforced and managed sites in Fiji. All three Fiji MPAs are over 10 km at their closest point from the proposed cable route.

There are no terrestrial protected areas within a 1-km radius of the landing stations in either Tonga or Fiji.

There are no proposed or established protected areas documented along the oceanic portions of the cable route.

### Critical natural habitats[3]

#### *Coastal*

Seagrasses (Figure 4.12) are a functional group of flowering plants and are unique in being the only group of flowering plants that have entered the marine environment. There are about 60 species in the seagrass group. Seagrass beds form complex physical structures and are a highly productive ecosystem. This enables them to support a considerable biomass and diversity of associated species, with thousands of associated marine plants and animal species (Green & Short 2003).

Seagrasses are subject to many threats, both anthropogenic and natural. Runoff of nutrients and sediment from human activities on land has a major impact in the coastal regions where seagrasses thrive. These indirect human impacts, while difficult to measure, are probably the greatest threat to seagrasses worldwide. Both nutrient- and sediment-loading affect water clarity. The relatively high light requirement of seagrasses makes them vulnerable to decreases in light penetration of coastal waters. Direct harm to seagrass beds also

**Figure 4.12: Seagrass community on the Nuku'alofa reef platform.**

[3] Critical Natural Habitats are defined in Annex A of World Bank Operational Policy OP4.04 (World Bank 2004)

occurs from boating, land reclamation and other construction in the coastal zone, dredge-and-fill activities, and destructive fisheries practices.

Coral reefs are underwater structures formed by the deposition of limestone by small reef-building coral polyps. These polyps form extensive colonial associations and, through sheer number, are able to build immense structures. Coral reefs are thought to be the most diverse marine ecosystem. While occupying less than 1% of the area of the world's oceans, they provide shelter and food for 25% of marine biodiversity (Mulhall 2007). In addition to acting as a repository of biodiversity, coral reefs also provide extensive ecosystem services such as coastal protection and food security. These services, across all coral reefs of the world, have an estimated economic value of US$30 billion per annum.

Coral reefs are, however, under increasing threat – an estimated 10% of reefs are already 'dead' and globally 60% are under threat (Tun 2004). The agents of this demise are diverse, and range from direct impact from humans, such as coastal reclamation, to indirect human impacts such as overfishing upsetting the balance of the ecosystem, global climate change, and natural impacts such as tropical storms.

The reef formations around Tongatapu are the result of the Island being on a tilting slab of tectonic crust. The south coast of the island is uplifting while the north coast is submerging. It is this submerging process that has given rise to the great number of islets, reefs, and intertidal areas along the coastline.

Along the northern shore of Tongatapu Island there is an intertidal fringing reef. The width of this reef ranges from less than 10 m to about 1 km at its widest point. Further west, this fringing reef extends onto a flat platform offshore of Ha'atafu, which dries at low tide. The northern most extent of this platform is bounded by 'Atata Island.

Egeria passage separates 'Atata Island from the barrier reef on which Hakaumama'o reef lies. There is a break in the barrier reef for a distance of about 20 km, which forms the main passage into Nuku'alofa Harbour. The barrier reef begins again around Tau Island and then connects back to Tongatapu around Pangaimotu Island.

There were 192 species of scleractinian corals and 229 species of reef associated fish found on the reefs around Tongatapu, primarily in the marine protected areas around Nuku'alofa (MPJC 1997).

The fringing reef over which the proposed cable route will pass is 500 m wide from wave break to shoreline (with the proposed cable route travelling 600 m diagonally across this). There is a clear zonation between the outer slope, across the reef crest and into the lagoon area. The majority of live hard coral is found in the outer reef slope, which ends at c. 8 m on the sandy harbour floor. Live hard coral cover is up to 60% in places. The outer slope is bisected by a sandy-floored opening approximately 4 m wide at its narrowest point. Under present proposals, the cable will be taken through this opening, a small boat passage. On either side of the opening and inshore of the outer slope is the surf-exposed reef crest. As is common on many Pacific Island fringing reefs, this reef crest is tidal and owes its existence to calcified red algae that are actively secreting limestone. The whole area inside the reef crest is soft sediment and supports a seagrass bed dominated by *Halodule uninervis* (Figure 4.12). In places the seagrass cover is up to 100%, while in other areas the substrate is harder and seagrass cover is replaced by brown macro algae (Figure 4.13). Closer to shore there is a marked and obvious increase in the cover of epiphytic algae on the blades of the seagrass, often an indication of degraded water quality stimulating algal growth.

The 1998 World Resources Institute report 'Reefs at Risk' (Spalding et al. 1998) found only two broad reef areas within the Polynesia mana (a coral reef status report node that includes Cook Islands, French Polynesia, Niue, Kiribati, Tonga, Tokelau and Wallis and Futuna) that were under high threat and were considered already to be in a highly degraded condition. One site included the reefs inside Nukualofa harbour, which have been significantly modified over a long period. The Tongan Tourism Development Plan, commissioned by the Asian Development in 1993, stated that the reefs along the immediate seashore have been significantly altered by coastal reclamation, sand mining, sea wall construction, dumping of refuse and waste water, and over-fishing and over-harvesting of resources (Nicholas Clark & Associates 1993). This project will not do anything to further degrade this condition.

The inshore patch reefs and the offshore barrier reef around Nuku'alofa have also undergone quite severe degradation. Fisheries have undergone remarkable decline and the ecosystem itself has been negatively impacted. Recent proliferation of brown macroalgae at 'Atata Island is a likely sign of impact, with the agents of change being either increased nutrient levels in lagoon waters or a decrease in herbivorous fish populations or a combination of both. These threats, while not documented throughout the rest of the lagoon, are likely ubiquitous.

Aside from the shallow areas of reef, very little is known of the ecology of the deeper areas inside Nuku'alofa harbour. Aggregate surveys showed that the bottom of the harbour is soft. The closest sampling points to the proposed route of the cable were found to have sediments described as gravely-sand with 10% gravel ($\phi$ of –6 to –1), 17% coarse sand ($\phi$ of –1 to 0), 30% coarse sand ($\phi$ of 0 to +1), and 31% medium sand ($\phi$ of +1 to +2). Coral rubble and shell detritus dominated the sediments in these samples.

With the seabed in this area composed of soft sediment and lying within the photic zone, it is likely to support seagrass beds. However, no inventory on the extent of this habitat has been undertaken.

Diffuse patch reefs project through these soft sediment areas. The patch reefs closest to the proposed cable route have proliferations of soft corals and large table corals though much of the hard substrate remains uncolonised (Lovell 2005).

Suva Peninsula is bound by a barrier reef inside which water depths are up to 50 m and beyond this depths quickly slope off to hundreds of metres. Some of the reef is exposed at high tide. The main stretch of the Suva harbour reef is 10 km long and varies from between 0.5 km to 2 km in width. There are three main passages through the reef: The largest (Levu passage) lies to the west of Suva peninsular and provides shipping access to Suva Harbour; the other two passages (Nukubuco and Nukulau passages) to the east of the peninsular are narrower. Further to the east of Nukulau Passage, the influence of the Rewa River dictates that the reef formation becomes patchy and fragmented for a distance of about 10 km.

Ecologically the reefs are comprised of a sedimentary back reef supporting patchy coral heads and dense macroalgae on hard substrates in a sand matrix (Pohler & Collen 2006). The reef crest, which is often exposed, is dominated by red calcified algae. Outside and past the wave break the outer reef slope often supports a diverse coral community, though the health of this community is being diminished by anthropogenic and natural threats.

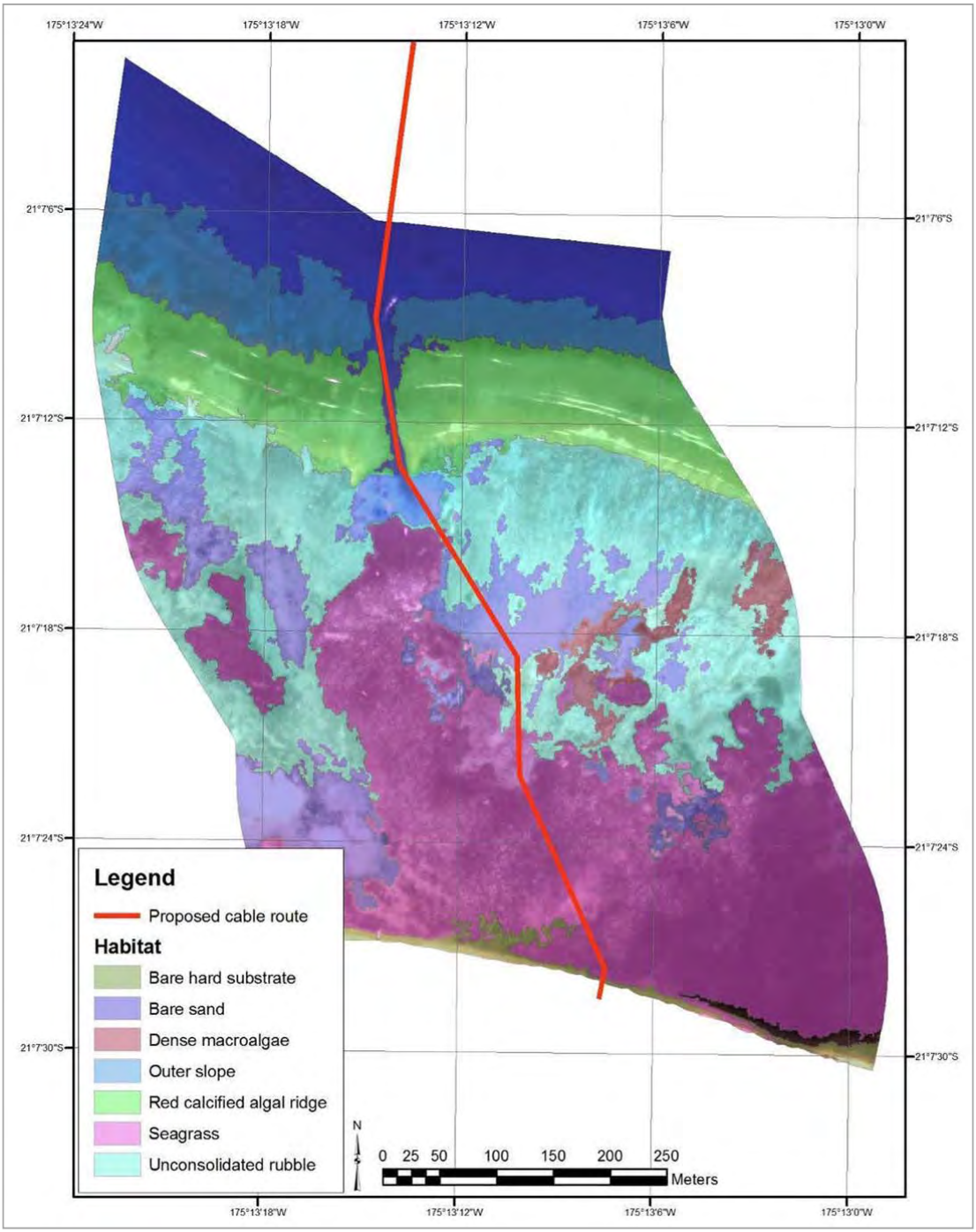



**Figure 4.13.** Habitat map of the Nuku'alofa reef platform in the vicinity of the proposed cable route.

Much of the coastline on the east side of Suva Peninsula comprises a heavily sedimented and alluvium covered Suva marl platform (Pohler and Collen, 2006) with the Rewa River bringing heavy sediment loads and freshwater lenses particularly during the wet season.

Being situated close to Fiji's main urban centre exposes the Suva reef to a range of direct threats. Fishing pressure on the inner sides of the reef is extremely high. Pollution and elevated nutrients, perhaps combined with a lack of herbivorous fish populations resulting from high fishing pressure, have led to the proliferation of brown macroalgae and the decline

of live coral cover. In addition, the Suva reef has been exposed to repeated and sustained outbreaks of Crown of Thorns seastars that have acted to further reduce the diversity of the reefs (Vuki et al. 2000).

Gleaning of shellfish and netting of fish along the shoreline of the peninsula has reduced the stocks of target species.

The soft sediments lining the shore support some dispersed and diffuse seagrass beds. However, like the reef communities further offshore, these seagrass beds are also being heavily influenced by runoff and nutrient input (Seeto 1992). In addition, extensive land reclamation has occurred along the whole peninsula, and the proportion of the seagrass beds that remain today are a fraction of those that once existed.

### *Oceanic*

Little is known about the natural habitats along much of the oceanic portion of the cable route. Broad-scale habitat mapping conducted for the project 'A Global Map of Human Impact on Marine Ecosystems' indicates that the majority of the cable route over the oceanic environment passes over soft, benthic sediments.

Within the proposed cable route there are, however, two habitat types whose extent and location are at least in part mapped and whose importance is known. These habitats are hydrothermal vents and seamounts.

#### *Hydrothermal vents*

Much work has been done along the Eastern Lau Spreading Centre to locate, identify and study hydrothermal vents (Figure 4.14). These vents occur when geothermally heated water issues from cracks in the earth's crust. Typically, water issuing from these vents can exceed 300° Celsius and is prevented from boiling only by the immense overlying hydrostatic pressure. In addition, the water is extremely acidic and corrosive and is capable of leaching out minerals from the surrounding rock.

Individual vent structures are small, measuring only a few tens of metres across, and stand a similar height off the surrounding sea floor. Individual vents exist within vent fields. These fields, which measure in the order of a few kilometres across, are sites where hydrothermal activity is closest to the surface and within which vents form when heated water reaches the surface.

Methods to detect the presence of vents have evolved over time. Some vents may be visible on detailed bathymetric maps. More typically, however, researchers make use of oceanographic probes called CTDs that measure conductivity, temperature and density. These probes are towed behind a research vessel in a tow-yo pattern where they alternately ascend and descend in the water column to sample in two-dimensional space. If a vent is emitting heated water into the surrounding environment, this water, being less dense, will rise and spread to form a diffuse plume that is slightly warmer than its surroundings. By detecting temperature anomalies, the probe is therefore able to detect if it has passed through a vent plume. This method gives only a rough guide to the location of any plume. If a more detailed location is needed, a Remotely Operated Vehicle (ROV) needs to be deployed to visually inspect the seabed in the area of interest. Using an ROV is, however, extremely expensive.

A total of 33 vents occurring along the ELSC have been catalogued by the Interridge [4] project from a number of different references. These plumes range in distance from 12 km to 78 km from the proposed cable route. Some of these plumes were identified as being active, while the status of others was unconfirmed.

Further expeditions under the Ridge 2000 programme[5] confirmed and named an additional 7 active vent sites along the ELSC, ranging from 14 km to 170 km from the proposed route of the cable.[6] The depths at which these vents were found increased progressively from south to north along the ELSC with minimum depths of 1700 m and maximum depths of 2700 m.

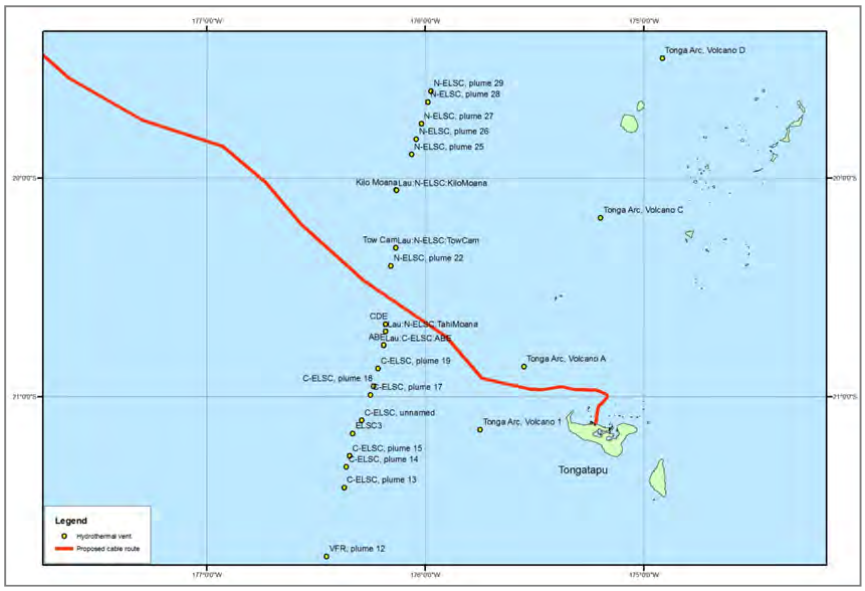



**Figure 4.14.** Hydrothermal vents in the vicinity of the proposed cable route.

Temperatures of the vent plumes along the ELSC are only available for some vents, and range from 309° Celsius (Abe plume 20 ELSC) to 365° Celsius (Hine Hina plume 7, VFR).

In addition to the confirmed vent sites from the Ridge 2000 project, work over a broader scale under the same project using chemical signals of vent presence suggests that the proposed route of the cable actually passes within 1 km of an area of plume activity (derived from Figure 3.2 of Martinez (2006)).

Vents are also individually ephemeral and it is fair to assume they could occur at any site along the ELSC at any point in time to replace sites that become dormant or are destroyed by volcanic activity.

Deep sea communities around hydrothermal vents consist of densely populated organisms occurring within a few hundred square metres of the vent. The communities rely on microorganisms that reduce chemicals to provide energy to sustain a variety of associated, mainly invertebrate, organisms. In the western Pacific hydrothermal vents are dominated by

[4] http://www.interridge.org/

[5] http://www.ridge2000.org/science/iss/lau/index.php

[6] http://www.marine-geo.org/tools/search/search.php?funding=Ridge2000:Funded&output_sort_full=date&geo_type=geo_site&site=Lau&start_date_y=2001&start_date_m=01&start_date_d=01

bathymodiolid mussels, “hairy” gastropod, vesicomyid clams, and shrimps (Llodra & Billet 2006).

Sampling around vents of the Lau basin have found faunal associations clustered around active vent areas to be dominated by two species of snails (*Ifremeria nautilei* and *Alviniconcha hessleri*) and one or two species of mytilids (Bivalvia) belonging to genus *Bathymodiolus* (Desbruyères et al. 1993). The same study also found that around the outer rim of hydrothermal vents pedunculate sessile barnacles dominate.

Other surveys around hydrothermal vents in the Lau and North Fiji basin have resulted in the discovery of three new species of bivalves in the genus *Bathymodiolus* (Cosel & Metivier 1994). A sessile barnacle *Neobrachylepas relica* was found to be unique to hydrothermal vents in the Lau basin and is also the first record of the sub-order Brachylepadomorpha to be found since the discovery of fossilised remains from the Miocene age (Yamaquchi & Newman 1995). The Lau basin hydrothermal vents also have species of the other three remaining orders of the sessile barnacles. This makes the Lau basin vents the most diverse cirriped fauna of any known hydrothermal vent community.

Densely populated areas of the Lau basin are not just confined to hot hydrothermal vents but also around the cold seep areas which occur where cold fluid, high in methane, is released from the sea floor. In such areas vestimentiferans (tubeworms) and pogonophorans (beard worms) are the dominant organisms surrounding the area.

Areas away from active spreading zones, such as the abyssal plains and ridges, also support a diverse fauna but are less densely populated and are composed mostly of nematodes, foraminifera, polychete worms, small peracarid crustaceans, mollusks, nemerteans, sipunculans, echiurans ,and enterropneusts worms (Llodra & Billet 2006).

Benthic organisms of the Lau basin have no current national economic importance and are not harvested commercially. The technology to access deep parts of the ocean floor for large-scale collection or any potential commercial use is still not developed. The same limitations prevent complete and thorough understanding of the deep sea area.

Despite recent studies and sampling of the Lau basin many more species still remain undiscovered.

### *Seamounts and associated bathymetric features*

Seamounts and associated bathymetric features (Figure 4.15) act as important aggregation sites for pelagic and benthic fish and invertebrates. Recent studies have shown that the pelagic biodiversity around seamounts was far greater than in areas of open ocean, and even of coastal reef areas. On average, 15% of benthic species found associated with seamounts in the Pacific are endemic either to that specific seamount or to a cluster of seamounts (Alder & Wood 2004).

The main cause of this increased diversity is up-welling currents and oceanographic phenomena that drive primary productivity and creates additional ecosystem niches that support more species

Unlike hydrothermal vents, the location of seamounts is much more completely mapped. They are far larger features with many rising in excess of 1 km from the surrounding seabed and being many kilometres in cross section.

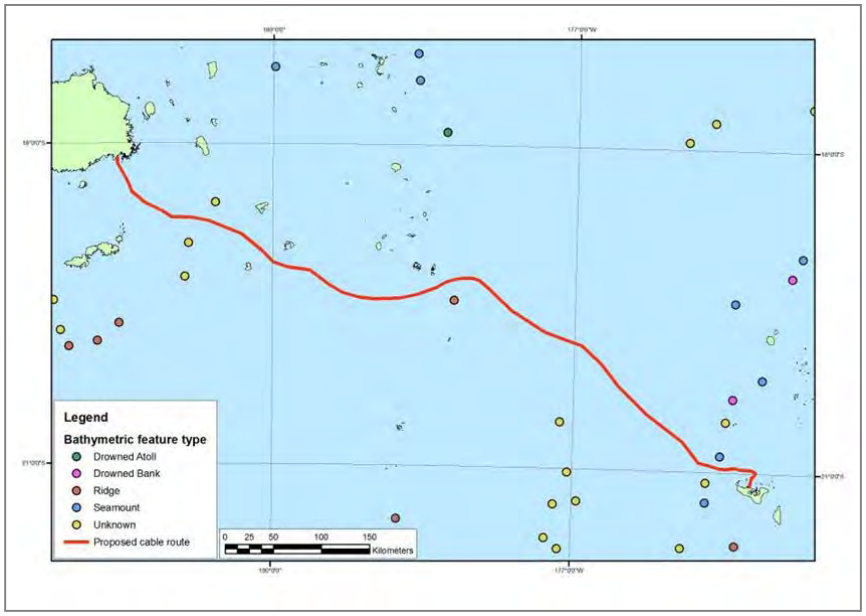



**Figure 4.15.** Bathymetric features in the vicinity of the proposed cable route.

A recent compilation and validation of existing datasets on seamounts and associated bathymetric features was undertaken by the Secretariat of the Pacific Community (Allain et al. 2008)., which used a 12-class standardized terminology to classify, label and name undersea bathymetric features. Within the EEZs of Fiji and Tonga this review confirmed the presence of 112 and 73 underwater features respectively (Table 4.1)

**Table 4.1** Underwater features within the exclusive economic zones of Fiji and Tonga

| Feature-type : Depth : Description | Fiji | Tonga | Total |
|---|---|---|---|
| Deep Bank: Deep: Large elevated area of the seafloor which is relatively deep | 1 | 1 | 2 |
| Guyot: Deep: Flat-topped submarine mountain | | 1 | 1 |
| Hill: Deep: Elevation rising generally less than 500 m | | | 0 |
| Knoll: Deep: Elevation rising generally more than 500 m and less than 1000 m and of limited extent across the summit | | | 0 |
| Plateau: Deep: Flat-topped feature of considerable extent, dropping off abruptly on one or more sides | | | 0 |
| Ridge: Deep: Long narrow elevation with steep sides | 13 | 1 | 14 |
| Seamount: Deep: Underwater mountain rising more than 1000 m from the ocean floor and having a peaked or flat-topped summit below the surface of the sea | 5 | 12 | 17 |
| Drowned Atoll: Shallow: Entirely submerged and shallow elevation rising from the seafloor, clearly showing a drowned rim (40 m depth max.) surrounding lagoon features | 4 | 1 | 5 |
| Drowned Bank: Shallow: Large and shallow (summit at 40 m depth max.) elevation rising from the seafloor, but entirely submerged | 1 | 6 | 7 |
| Unknown: No information is available on the feature but it is identified by an elevation on the bathymetric maps | 88 | 51 | 139 |
| TOTAL | 112 | 73 | 185 |

There are seven features identified within 50 km of the proposed cable routing (Table 4.2 and Figure 4.15). Of these, two are seamounts and both are found within Tonga's EEZ.

**Table 4.2** Underwater features within 50km of the proposed cable route

| Feature type | Name | Distance from proposed cable (km) | Summit depth (m) | EEZ | Longitude | Latitude | Allain *et al* ref |
|---|---|---|---|---|---|---|---|
| Seamount | - | 12.2 | 13 | Tonga | 184.47 | –20.85 | 8619 |
| Unknown | - | 18.2 | 501 | Tonga | 184.33 | –21.1 | 6929 |
| Ridge | Lau | 20.4 | 271 | Fiji | 181.8 | –19.45 | 6791 |
| Unknown | - | 21.0 | 1654 | Fiji | 179.43 | –18.55 | 6701 |
| Unknown | - | 26.1 | 1718 | Fiji | 179.17 | –18.933 | 6749 |
| Seamount | - | 38.0 | 500 | Tonga | 184.33 | –21.283 | 6968 |
| Unknown | - | 47.6 | 665 | Tonga | 184.52 | –20.533 | 6883 |

## Species of interest

### *IUCN Red List*

The IUCN Red List of Threatened Species[7] provides a global assessment of the status of threatened species. An analysis report prepared in 2009, based on Pacific Island species, listed on the 2008 Red List (Pippard 2009) identified some clear gaps at the regional scale in information used to produce the Global assessment. In response, the IUCN Oceania Regional Office are beginning a multi-year programme to produce a regional Red List collating information known about species population status from within the region.

Accepting these limitations of the present list, analysis carried out for a previous environmental assessment in an area close to the Fiji end of the proposed cable route provided the following analysis.

There are 308 marine species of concern (critically endangered, endangered or vulnerable on the IUCN Red List categories) on the present Red List. Of these, 35% were not known to occur in a similar habitat and/or ecological niche to that found at the site and therefore were considered unlikely to occur in the vicinity. Of these species of concern 24% have been documented as found within the geographic locale of the cable route. Corals comprised the majority of these species (85%). Additionally, the analysis examined if species of concern were found elsewhere within a protected area. In the case of the corals over 80% of the species assessed are documented as being found within existing protected areas in Fiji, and it is thought the remaining 20% are likely to be found within other protected areas.

Two species were listed as being critically endangered, both of them sea turtles (Leatherback and Hawksbill). Neither of the species has been found within the locale of the proposed cable route however. Only the green turtle (*Chelonia mydas*), which is listed as endangered, is known to occur within the locale of the cable route. The green turtle is associated with the seagrass beds on which it feeds. Given the condition and highly modified nature of the shorelines, however, it is extremely unlikely that this species would come ashore in the vicinity of the proposed cable route in order to breed.

[7] IUCN 2010. IUCN Red List of Threatened Species. Version 2010.2. www.iucnredlist.org. [accessed 2 July 2010]

The only comparable species lists for the area of interest around the shallow water areas in Tonga deal with coral species (MPJC 1997). However, it is considered extremely likely that coral species on the Red List are also found elsewhere in Tonga and that colonies found in other locations are likely to be healthier and better protected than those in the Nuku'alofa harbour area.

Within the oceanic portion of the cable route, there are 37 species listed on the Red List. Of these, there are 22 species of cetaceans, which are discussed in the next section. Of the remainder, 19 are sharks, of which three are considered Vulnerable. Three species of tuna (Albacore, Yellowfin and Bigeye) have been assessed but only Bigeye is considered Vulnerable. The three Tuna species are known to occur along the route and appear in catch landings of the Tuna fishing fleet operating in the area. Of the shark species, six are recorded in the catch logs as by-catch species of fishing boats that are known to operate along the cable route; specific locations of these species are unknown.

### *Cetaceans*

The EEZs of both Fiji and Tonga have resident and transient or migratory populations of cetaceans (whales and dolphins). While confirmed records for Fiji and Tonga differ, the proximity of their EEZs makes it likely that species found in one EEZ are also found in the other (Table 4.3). In total there are 16 species with confirmed presence in Tonga and 18 species in Fiji (WDCS 2009).

There is a paucity of information on the population status of most of these species.

Perhaps the best known and studied species of interest in the two EEZs is the Humpback whale (*Megaptera novaeangliae*). The tropical waters of Tonga are the mating and calving grounds for the whales which migrate to the area annually from Antarctic waters. Adult cows and their calves migrate from the south to Tonga in June and remain in Tongan waters until November (Dawbin 1966, Orams 2001). During this migration period Humpbacks are known to pass across the passage between the Lau group in Fiji and the Tonga group

Comparisons of historical Humpback sighting data and whaling records (Dawbin 1956, 1959, 1964) with recent sighting survey data from New Zealand, Fiji and Norfolk Island demonstrate a lack of (or at the very least a slow) recovery of populations at these sites (Childerhouse and Gibbs 2006, Gibbs *et al.* 2006, Paton *et al.* 2006, Oosterman and Whicker 2008) following the cessation of whaling activities in the late 1950s- 1960s . These surveys returned to the same look-out sites used by Dawbin and replicated his earlier surveys as closely as possible. Results from these re-surveys include sighting rates in Fiji over the period 1956-58 were between 0.15-0.58 whales per hour and were significantly higher than equivalent sighting rates of between 0.01-0.03 observed in 2002-03 (Paton *et al.* 2006).

Of all cetacean species known from the EEZs of Fiji and Tonga, four are considered globally threatened by the IUCN Red List[8] (the Sei, Blue and Fin whales are considered Endangered (En) and the Sperm whale are considered Vulnerable (Vu)).

[8] IUCN 2010. IUCN Red List of Threatened Species. Version 2010.2. www.iucnredlist.org [accessed 23 July 2010]

Humpbacks, globally, were assessed as of least concern, but the status of the Oceania sub population of Humpbacks and its apparent lack of recovery since whaling ceased, led to the reassessment of this population in 2008 as Endangered.

For the remaining cetaceans there is either not enough information to make concrete assessments (marked as data deficient (Dd)) or they have been assessed as being of least concern (Lc).

The Global status of cetaceans under the Convention on Migratory Species lists threatened species in Appendix I of the Convention, and species of Least Concern or Data deficient are listed in Appendix II.

**Table 4.3** Cetacean species and their status in the waters of Fiji and Tonga (WDCS 2009)

| Species | Common name | Status | Country | IUCN category |
|---|---|---|---|---|
| Balaenoptera acutorostrata subsp. | Dwarf minke whale | Confirmed | Tonga | Lc |
| Balaenoptera bonaerensis | Antarctic minke whale | Confirmed | Tonga | Dd |
| Balaenoptera borealis | Sei whale | Confirmed | Tonga | En |
| Balaenoptera edeni | Bryde's whale | Confirmed | Fiji | Dd |
| Balaenoptera musculus | Blue whale | Unconfirmed | Fiji | En |
| Balaenoptera physalus | Fin whale | Confirmed | Fiji | En |
| Balaenoptera sp. | Minke whale | Confirmed | Fiji | - |
| Balaenoptera sp. | "Bryde's-like" whale | Confirmed | Fiji | - |
| Delphinus delphis | Common dolphin | Confirmed | Fiji and Tonga | Lc |
| Feresa attenuata | Pygmy killer whale | Confirmed | Tonga | Dd |
| Globicephala macrorhynchus | Short-finned pilot whale | Confirmed | Fiji and Tonga | Dd |
| Grampus griseus | Risso's dolphin | Confirmed | Tonga | Lc |
| Kogia breviceps | Pygmy sperm whale | Unconfirmed | Fiji | Dd |
| Lagenodelphis hosei | Fraser's dolphin | Unconfirmed | Fiji | Lc |
| Megaptera novaeangliae | Humpback whale | Confirmed | Fiji and Tonga | En |
| Mesoplodon densirostris | Blainville's beaked whale | Confirmed | Fiji | Dd |
| Orcinus orca | Orca | Unconfirmed | Fiji | Dd |
| Orcinus orca | Orca | Confirmed | Tonga | Dd |
| Peponocephala electra | Melon-headed whale | Confirmed | Tonga | Lc |
| Physeter macrocephalus | Sperm whale | Confirmed | Fiji and Tonga | Vu |
| Pseudorca crassidens | False killer whale | Confirmed | Fiji and Tonga | Dd |
| Stenella attenuate | Pantropical spotted dolphin | Confirmed | Fiji and Tonga | Lc |
| Stenella longirostris | Spinner dolphin | Confirmed | Fiji and Tonga | Dd |
| Steno bredanensis | Rough-toothed dolphin | Unconfirmed | Fiji and Tonga | Lc |
| Tursiops sp. | Bottlenose dolphin | Confirmed | Fiji and Tonga | Lc |

### Terrestrial habitats

The land on which the existing Suva landing station infrastructure is constructed is managed grassland of low quality comprising grasses, sedges and rushes. The soil matrix is mobilized by mud crabs constructing burrows.

The intertidal mudflats within Suva lagoon cover approximately 1000 hectares. They are important habitats for, and attract large numbers of, migrant shorebirds. All but one of the shorebirds visiting Fiji are migrants that breed in the Arctic region of Siberia or Alaska before dispersing in the northern winter to feeding grounds in the central and southern Pacific.

A long-term census programme found that on average 500 shorebirds use the intertidal mudflats around Suva point (Watling 2006). While this site is 2 km to the south of the intertidal flats that the proposed cable route crosses and is far more extensive, it provides some indication, in the absence of quantitative studies, of the likely use of the mudflats. The results on the census from 1998 to 2005 found that, despite major increases in human population, pollution and industry within the Suva area, there has been no reduction in the population of birds using the area. The same study commented that the reclamation of land on which the present cable station is located removed a large area of the mudflat previously found at this site.

The study also noted that many of the shorebirds are disturbed on a frequent basis by people and domestic animals entering the mudflats at low tide for recreation and collecting fisheries products. Indeed, periods during which the population census was conducted were timed to avoid times of peak disturbance during which seabird counts were depleted. It is clear therefore that, if disturbances are brief, shorebirds quickly return and these disturbances have little impact on the use of the area by shorebirds.

There are three small islands on the top of the Suva reef. One of these to the west of Nukubuco Passage is entirely bare of vegetation, presumably as a result of continuing erosion. The other two islands lie to the east of the Nukulau Passage. The larger of these, Nukulau Island, was previously a prison but is presently not inhabited. The second, Makuluva Island is approximately 3 hectares in size. Makuluva is of particular ecological interest as it supports vegetation communities that have evolved to deal with limited freshwater supply and a physically dynamic shape of the island (Thaman, 2005). The island is also listed in the Fiji National Biodiversity Strategic Action plan as being of conservation significance.

Even more than at the Fiji end, the proposed Tonga landing and cable station sites are in a constructed landscape. The environment is urban-residential, interspersed with public spaces supporting roads and an esplanade reserve. Vegetation in the immediate vicinity of the landing site and cable station is a mix of planted and managed grasses, shrubs and trees and adventive species occupying the margins. Animals include domestic dogs, cats and pigs, urban/peri-urban birds, herpetofauna and invertebrates.

## 4.4 People and communities

Nationwide, ethnic Fijians comprised 57% of the population in the 2007 census.[9] In Tonga, ethnic Tongans comprised 92% of the population in the 2006 census. While some of these people live a rural semi-subsistence lifestyle (77% rural, 23% urban in Tonga; 56% rural,

[9] Fiji Islands Bureau of Statistics 2007 Census of Population and Housing. http://www.statsfiji.gov.fj/Census2007/census07_index2.htm [accessed 5 August 2010]

44% urban in Fiji) there are no indigenous peoples, according to the narrow definition of the World Bank Operational Policy on Indigenous Peoples, within the area of influence of the proposed development.

## Oceanic users and uses

### *Commercial Fisheries*

There are two main types of oceanic fishing methods employed in Fiji and Tonga's EEZ – long lining and the deep water bottom fishery.

Long lining uses a horizontal main line which may extend many kilometres (Beverley et al. undated). Attached to this main line are a series of baited hooks that hang down from the main line and may number in the thousands. The fishing gear is buoyed at the surface and floats. Typically, the line has one or more radio beacons on it and the gear is 'shot', left for up to 24 hours and then retrieved. Long-line fisheries target pelagic fish species such as tuna and billfish.

Deep water fisheries employ a weighted mainline normally about 200 m long, which has a number of baited hooks attached to it. The gear is shot into the water and left to soak for a number of hours before then being retrieved, typically using hydraulic winches (Preston et al. 1999).

With limited land-based resources and a significant area of ocean under Tonga's jurisdiction, fishing has the potential to be an important export industry for the kingdom. Fisheries production in Tonga grew by 3.4% in the period 1994–2004 (Pacific Islands Trade and Investment Commission 2008).

Commercial offshore fisheries in Tonga include two important fish categories, tuna and deep water snapper, both of which dominate fish exports from the country. Two species of deep water snapper are exported: the longtail red snapper *Etelis coruscans* spp. and the pink snapper *Pristopomoides filamentosus* spp., both of which are highly valuable and exported to Hawaii and Japan by air freight (Project Global 2009). The maximum depth to which deep water snapper bottom fishing is conducted in Tongan waters is 1000 m (Siua Finau, Tonga deep water fishery, pers. comm.). The deep water snapper fishery in Tonga was established in1980 and now involves some 16 fishing vessels, ranging in length from 9 to 13 m.

Tonga's tuna industry is responsible for most of the fishery exports by air. The tuna fishing fleet is mainly compromised of long liners with a small number of US purse seining vessels operating in the EEZ of Tonga. Local long line vessels range from 20 to 30m in length and are based in Tongatapu.

There are 12 licensed long liners operating in Tonga that target mainly Albacore and Yellowfin tuna. In terms of the quantity, there was a decline in tuna production from 2000 tonnes in 2001 to 500 tonnes in 2004, after which production has started to increase again to above 500 tonnes (Project Global 2009).

Fishing is an extremely important aspect of Fiji's economy as a large number of people are involved in the fisheries sector and is also the third largest natural resource sector contributing 1.9% of Fiji's GDP (FAO 2009). Unlike in Tonga, there is no deep sea bottom fishing in Fiji; the majority of the offshore fisheries are carried out with long-line gear by

about 100 operational vessels targeting mainly Albacore, Bigeye and Yellowfin tuna. Offshore fishing in Fiji is export-oriented with major markets for tuna being Japan and the USA.

Fijian long-line vessels are between 20 and 35 m in length and spend between 5 to 15 days fishing; foreign long liners spend longer.

Offshore fisheries productions from Fijian long liners in recent years have ranged from 12 000 to 22 000 tonnes, of which 80% is tuna.

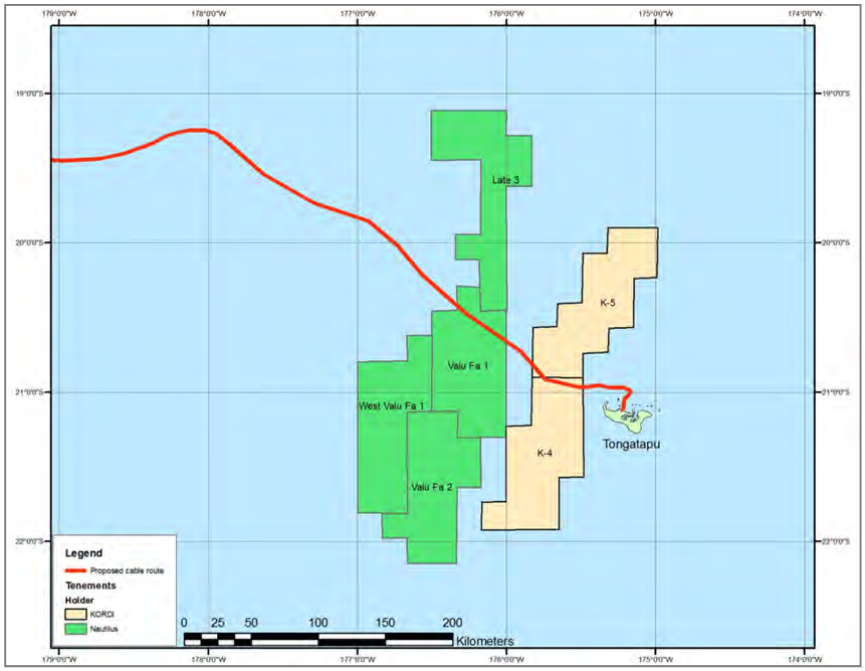



**Figure 4.16.** Subsea prospecting areas licenced to Nautilus Minerals (green) and KORDI Minerals (brown).

A recent review paper examining the geographic proximity of long-line sets to seamounts and the catch per hook has shown that fishing effort is concentrated within 50 km of seamounts (Morato et al. 2010). The same pattern is true in the deep water snapper fishery. The bathymetry at these sites allows upwelling of deep cold water currents, which stimulates primary productivity. This increased productivity in turn provides prey for the pelagic tuna-like species and the predatory snapper species that congregate around the seamounts.

The destructive practice of bottom trawling was outlawed in the EEZ of all members of the South Pacific Regional Fisheries Management Organisation including Fiji and Tonga in May 2007.

### *Deep sea mining*

Seafloor massive sulphide deposits (SMS) form where hydrothermal vents expel superheated water carrying metals from deep in the earth. This superheated water, on mixing with cold deep oceanic water, deposits metal-rich minerals. These metal-rich nodes are currently under investigation by two mining companies, Nautilus Minerals and KORDI Minerals (Figure 4.16).

Nautilus Minerals Tonga was incorporated in 2007 following the granting of 16 prospecting licences by the Government of Tonga. The proposed cable route passes through the Valu Fa 1 prospecting licence areas (Figure 4.16). In 2008, Nautilus Minerals Tonga conducted the first

deepwater commercial seafloor mineral resources exploration program in Tongan waters. Results from this exploration program in Tonga's EEZ were announced in February 2009. The work identified six new SMS systems (named Tahi Moana 1 through to Tahi Moana 6), which were mapped by Nautilus itself during the MV Nor Sky program in mid December 2008. A further six previously known SMS systems were also characterised during this work program. Four new systems were discovered by Teck Resources under an exploration agreement with Nautilus.

KORDI Minerals Ltd holds prospecting licences over additional areas through which the proposed cable route will pass (KORDI staff 2010, pers. comm., Figure 4.16).

The Department of Mineral Resources (MRD) in Fiji is in the final stages of negotiation with a number of parties interested in expanding the exploration of deep sea minerals into Fiji's EEZ. It is expected that any tenements issued in Fiji will also be within the area of the cable route and adjacent to the tenements in Tonga. At this stage, however, the exact location of tenements and the content of the agreement to be decided is entirely unknown.

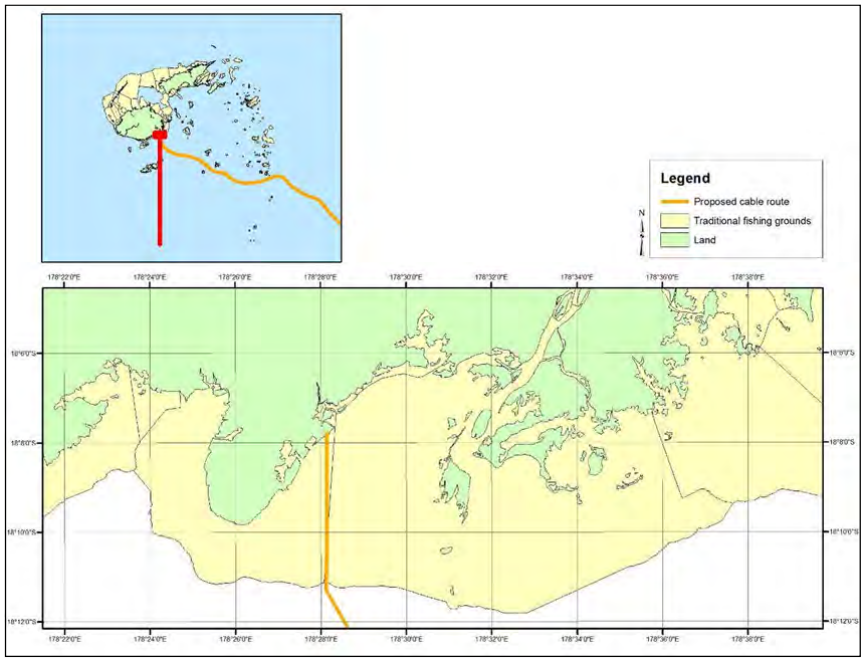



**Figure 4.17.** Customary Fishing Ground areas at the Fiji end.

## Coastal users and uses

### *Marine tenure*

There is no customary marine tenure system in Tonga and the state has ownership and control over what activities are permitted by whom and where. In contrast, in Fiji, while the state owns the marine resources from the high water mark to the edge of the EEZ (as described in the Marine Spaces Act), the law also recognises the customary marine tenure system established through Fiji's history.

This system divides the inshore area into 410 customary fishing grounds. The tenure of these fishing grounds is well recorded and established and is held by the Native Lands and Fisheries Commission. The customary fishing grounds range in size from 1 to 5000 square kilometres. Regardless of which passage the cable takes through the Suva reef, it will cross two customary fishing grounds (Figure 4.17). The rights over the fishing ground to the west

are owned by the Vanua Suva, while the rights to the ground to the east are owned by the Vanua Burebasaga.

Vanua is a traditional term in Fijian society that relates people to the land and marine resources on which they have traditionally depended. Membership to a Vanua is by birth. Individual members of a Vanua are likely to be aggregated geographically though it is common for individuals to live outside their Vanua. Each Vanua is headed by a Paramount Chief who in turn is likely to have advisors and spokespersons. Membership of ethnic Fijians to their respective Vanua is recorded in the Vola ni Kawa Bula which is sometimes called the Native Lands Register. The membership of Vanua Burebasaga and Vanua Suva is likely to total several thousand people. Decisions are, however, made collectively by the Paramount Chief following consultation with advisors and members of the Vanua.

A 1995 study found that 91% of individuals from rural coastal villages on the main islands of Fiji are likely to engage in fishing at some point in a given year. This figure is likely to be considerably less in the peri-urban Vanua Burebasaga and Vanua Suva where income is more likely to be earned in town, this study does indicate that Fijians make good use of their traditional fishing grounds.

### *Commercial fishing and ports*

The proposed route of the cable passes close to the main ports of both Tonga (Nuku'alofa port) and Fiji (Suva – Kings Wharf).

Suva wharf is accessed through the main reef entrance to the west of Suva Peninsula. The port is owned and operated by Fiji Ports Corporation Ltd. The current wharf at Suva Harbour was upgraded in 2005/6 and now has mobile cranes with a lifting capacity of 100 tonnes upright and an extended load reach of 32 tonnes. The deepest draft in the port is between 11 and 11.5 m.

In 2008 ninety-six different commercial vessels called into Suva port, and in total there were 398 vessel movements.[10] The average frequency of vessels arriving at Suva port was one vessel

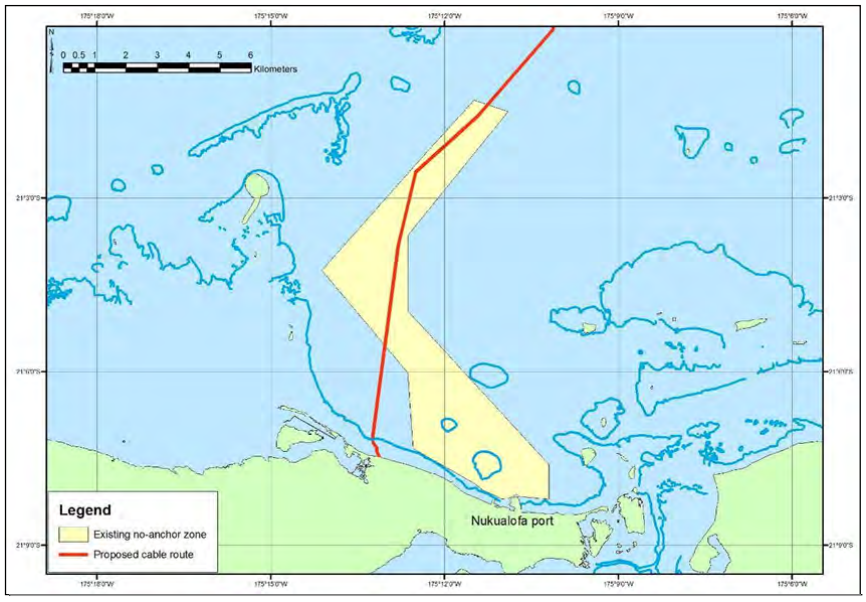



**Figure 4.18.** The cable route in relation to the existing no-anchor zone in Nuku'alofa Harbour.

[10] Data provided by Secretariat of the Pacific Community Regional Maritime Programme shipping database, July 2010

every 1.1 days during this 1-year period. The most common previous or next port of call for these vessels were Lautoka in the west of Fiji (78 instances), Noumea, New Caledonia (59), Auckland, New Zealand (59), and Nuku'alofa, Tonga (47).

In the same year, only seven different commercial vessels called into Nuku'alofa port and in total there were 45 vessel movements.[11] The average frequency of vessels arriving into Nuku'alofa port was one vessel every 8.6 days during this 1-year period. The most common previous or next port of call for these vessels were Suva, Fiji (23 instances), Vuda in the west of Fiji (13), and Apia, Samoa (8). Two vessels, *Majala* and *Florence*, sail monthly between Tonga and Fiji,

The proposed cable route runs within the entrance channel to Nuku'alofa port.[12] At present, a no-anchoring zone covers the proposed cable route from 3.5 to 10.7 km out from the landing site (Figure 4.18).

The last 3.5 km of cable passes through an area of good holding ground that is used regularly as an anchorage by vessels awaiting berths in port and, depending on prevailing wind direction, by vessels caught in harbour during cyclones ('Esau Tupou, Tonga Port Authority pilot, pers. comm.).

To date there have been no activities to dredge the shipping channel for navigational purposes, though during meetings with the Tonga Ports Authority, this future possibility was not ruled out. The depth of the main channel to Nuku'alofa is at present limited by the presence of coral heads that stand clear of the sandy bottom and not by the depth of the bottom itself. Should deepening of the channel be needed, it is therefore considered unlikely that dredging of sand would take place; mechanical removal of coral heads would instead be the most expedient process.

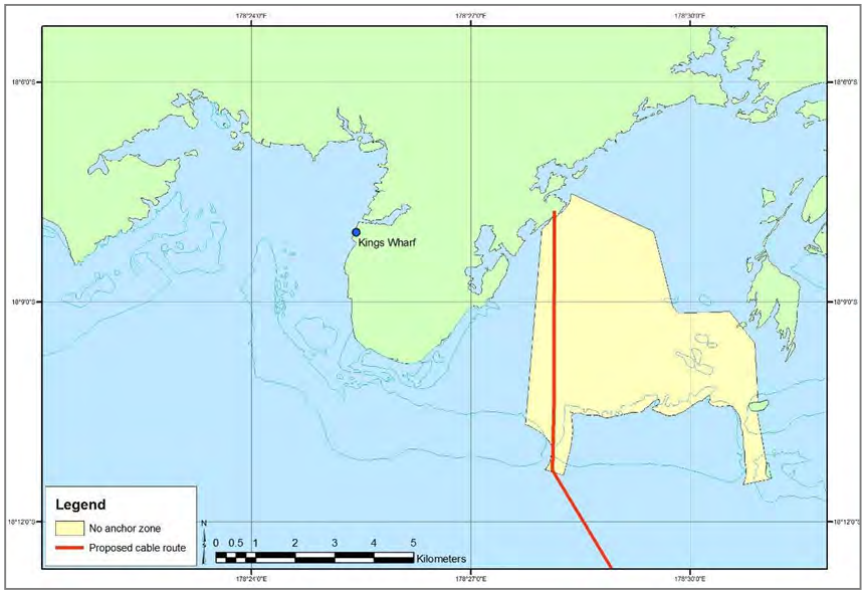



**Figure 4.19.** The cable route in relation to the existing no-anchor zone in Laucala Bay, Suva.

In Suva the proposed cable route runs to the east of Suva peninsula away from the entrance to the port. From the

[11] Data provided by Secretariat of the Pacific Community Regional Maritime Programme shipping database, July 2010

[12] Navigational chart NZ8275- Approaches to Nuku'alofa Harbour

entrance through the Suva reef to the landing site the entire length of cable on the proposed route is within a designated and marked no-anchor zone established for the Southern Cross and previous cables (Figure 4.19).[13]

### *Gravel and aggregate extraction*

Offshore aggregate dredging started in Tongatapu in October 2003 by Tonga Ports Authority (TPA), followed in July 2004 by dredging operations by Vete Holding Corporation Limited (VHCL) (Web & Tawake 2004). Today, only the Tonga Ports Authority are actively engaged in dredging activities and are targeting aggregate resources above 6m depth mostly around the north side of Atata Island (Iketau Kaufusi, operations manager, Tonga Port Authority, 2010, pers. comm.). Dredging is primarily for the provision of aggregates for use in the construction industry and for use in human burials.

Aggregate extraction does not occur within the vicinity of the Suva landing site or proposed cable route.

### *Fishing*

Inshore fisheries have been a major source of protein and income for a large proportion of the populations of both Tonga and Fiji. The reef is the dominant environment for inshore fisheries since there are very few fish aggregating devices aimed at bringing pelagic fish species within reach of the inshore fleet and very few fishers target pelagic species inshore. In both countries, fishery activities can be divided into commercial/artisanal/semi-commercial and the subsistence fishery. In commercial/artisanal fishery the catch is sold either directly to market or through an intermediary to market (commercial) or is sold informally at, for example, the roadside (semi-commercial/artisanal). In subsistence fishery the catch is made by a family or village member and

**Figure 4.20.** Local families collecting *Holoturia atra* (sea cucumber) on the Nuku'alofa reef platform.

[13] Admiralty chart number 1674; Eastern Approaches to Suva Harbour

is subsequently eaten at home, or, at the very least, remains within the village unit and is not sold for commercial gain.

The line between commercial/artisanal and subsistence fishery, while theoretically clear, is often greyed by commercial pressure from modern society, leading to fishers selling excess catch beyond the subsistence needs of the family home unit.

Common food fish species in both Tonga and Fiji include the Emperor (Lethrinidae), surgeofish (Acanthuridae), snapper (Lutjanidae) and grouper (Serranidae) – all species closely associated with the reef ecosystem. Invertebrates were traditionally an important source of protein and more recently have become important sources of income.

Targeted invertebrates include the edible sea urchins, giant clams (Tridacnidae), crabs, lobster, molluscs and, most recently for commercial exploitation, sea cucumbers (Holothuridae).

There is strong evidence in fish stock assessments (Teh et al. 2010) that fisheries are declining with a consequent impact on the function and health of the ecosystem itself (Jennings & Polunin 1997). While the majority of such evidence emanates from studies in Fiji, a similar pattern is also being observed in Tonga (Siola'a Malimali, Principal Fisheries Officer, Tonga, pers. comm.).

A Survey of fishing activity between 16:30 and 17:30, 29 July 2010 adjacent to the Sopu landing site recorded 15 fishers utilizing the back reef at low tide (Figure 4.20). The dominant fishing method employed at the sites was gleaning at low tide, though hand lining is also used at high tides to catch fin fish, some of which are used for home consumption and some of which are informally sold. An interview with a group of fishers revealed they were targeting *Holoturia atra*, sea cucumber. The group of 10 fishers had collected five 20 litre buckets of sea cucumber in the preceding 4 hours. The same group of fishers target the same area of reef four times a week during the sea cucumber season, which runs from July to September. For this group, this fishery was their main source of household income during harvest season.

When asked for their perceptions on the likely impact of a trench being dug across the back reef in order to bury the cable, they had little objection, saying that they would simply move to an adjacent area for the duration of the work.

### *Game fishing*

There are currently two licensed commercial sports fishing boats operating from Nuku'alofa; and twelve private recreational sports fishing boats, six of which are attached to Nuku'alofa fishing club and six of which are independently owned and operated (Roger Miller, representative of Tonga sports fishing operators, 2010, pers. comm.).

The predominant gear type and fishing method used is trolling for tuna and tuna-like species, with some bottom fishing using weighted hook. Game fishing effort is generally concentrated within 10 miles of the coast, though some offshore seamounts out to 30 miles may also be targeted.

There is very little information on the economic value of the game fishery and there is no obligation at present on the operators to report. Best estimates based on information provided

by game fishing operators indicate the value of the fishery nationwide is between 2 and 4 million pa'anga.

### *Aquaculture*

In Tonga, the Fisheries Division of MAFFF with support of ACIAR has established an oyster hatchery at their facility in Sopu.[14] Larval oysters (*Plateria penuin*) are grown out in controlled environment tanks at this facility until they become spat, at which point they are transferred to ropes offshore from the fisheries facility. These grow-out ropes are anchored to the sand outside the reef platform and run parallel to shore. The eastern-most end of that line finishes about 100 m from the small boat passage through which the cable is proposed pass.

Being filter-feeding organisms, the oysters are vulnerable to the effects of siltation.

There are no other aquaculture facilities or projects within the vicinity of the proposed cable route, nor are there any in the vicinity of the landing sites at either the Tonga or Fiji-end.

## Terrestrial users and uses

The land on which the existing landing station in Suva is built is non-native land, and was reclaimed from a mangrove area at the mouth of the Samabula River. The land is owned by Fiji International Telecommunications Company (FinTel). The site backs onto a residential development some 400 m away to the southwest and a golf course to the northwest.

The land on which the proposed new Tonga cable station will be built is owned by the Government of Tonga. At present three residential buildings, also owned by the Government, occupy the site. Cabinet decision number 583, 2 July 2010, has approved the merging of these three lots into one lease and the granting of this lease to Tonga Cable Limited for the purpose of construction of the cable station. From the landing site to the cable station, the cable would cross a public esplanade reserve and Vuna Road – a total distance of less than 100 m.

In the vicinity of the proposed Tonga cable station, predominant land uses are residential, public (including the esplanade reserve and road), and commercial. The residential properties range from up-market leased properties to more basic government housing. The commercial property is Nukumaanu Lodge, an up-market accommodation facility.

## Cultural heritage

There are no known sites of cultural heritage within the area of influence of the proposed development.

## Conflicting infrastructure (present or planned)

The only conflicting existing infrastructure is the three residential buildings on the site of the proposed cable station at the Tonga end. These three, government-owned, buildings are not in

[14] http://aciar.gov.au/project/FIS/2006/172

a high state of maintenance and have for some time been leased on a monthly basis pending disposal either as is or for development.

Planned infrastructure developments are more difficult to describe; there are no published infrastructure developments under way that are likely to conflict with the proposal.

Consultations with the Ports Authority of Tonga did, however, reveal a concept dating back almost 30 years for a 2000-tonne slipway with ship maintenance and repair facilities on the reef platform very near the proposed cable landing site. This concept arose from a maritime infrastructure study conducted in 1992 by Kinhill Riedle and Byrne (citation unknown) with funding from the Asian Development Bank and the Government of Tonga. The Ports Authority recovered a location map, outline plan and costing for this >TOP1M concept but there was no corroborating evidence that this concept had gained any traction in the ensuing years and no knowledge of this in either of the Ministries of Transport or Public Enterprises. The prevailing opinion at CEO level of these ministries was that, in the prevailing and foreseeable economic conditions, the slipway concept would remain on the drawing board and that any re-emergence of this concept could readily be resolved as an operational issue between ministries and government agencies concerned.

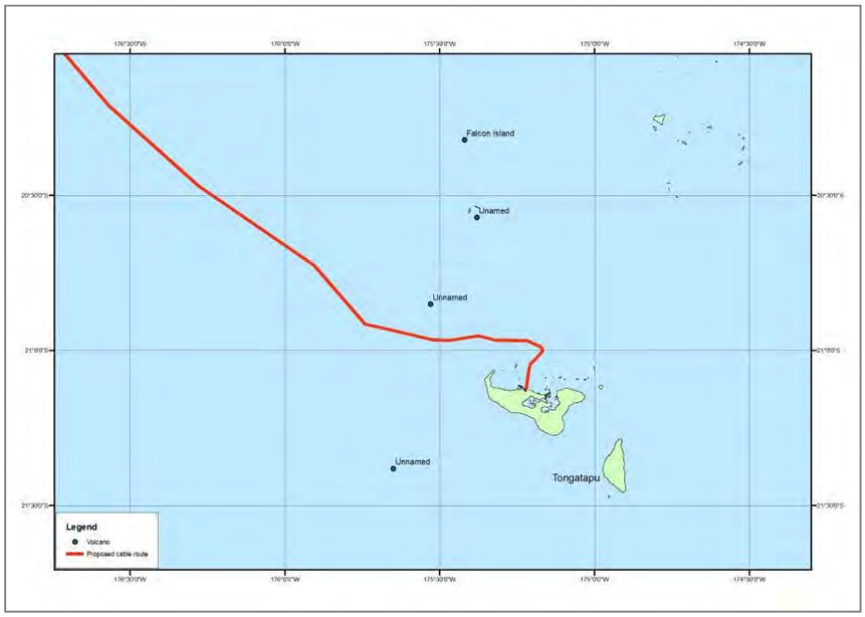



**Figure 4.21.** Volcanoes in the vicinity of the proposed cable route.

In addition, during the environmental assessment, the EA team became aware of a plan for Makuluva Island, which lies on the eastern boundary of Nukulau Passage through Suva reef, to be developed as an aquaculture training centre and algae farm. No additional details were available at this time, though, given the cable will pass in deep water through this passage, there is no concern over interaction between the proposed project and the possible use of Makuluva Island.

## 4.5 Environmental hazards

### Volcanicity

There are three volcanoes within 50 km of the proposed route of the cable (Figure 4.21) (at 12 km, 42 km and 48 km) (data from Global Volcanism Program[15] accessed via GeoMapApp[16]). In addition, another six lie along the active Tonga arc front, which the cable will cross within 50 km of Nukualofa harbor.

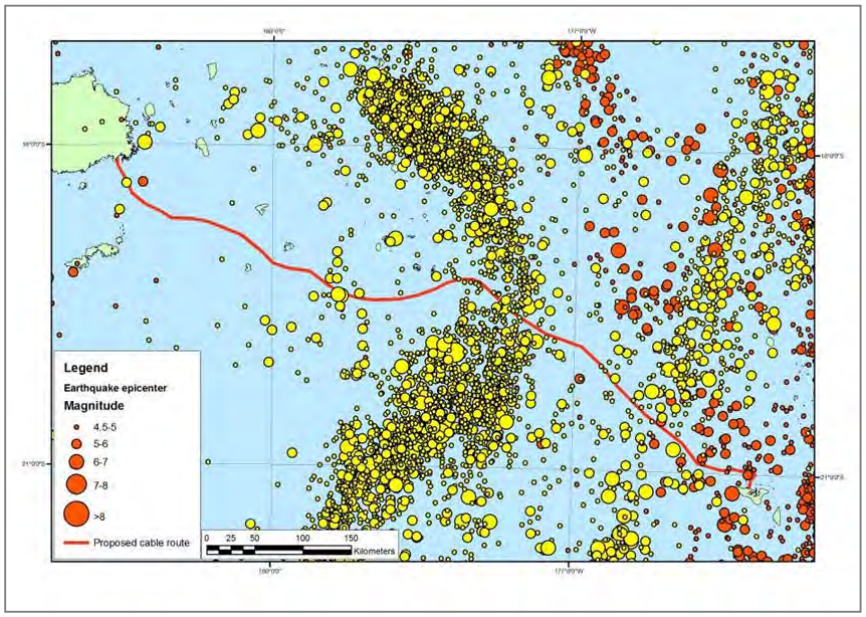



**Figure 4.22:** Earthquake epicentres and magnitudes - yellow symbols represent deep earthquakes (>100 km below surface), red symbols represent shallow earthquakes (<100 km below surface).

### Seismicity

There have been a total of 10 203 magnitude 4.5 or greater earthquakes within 500 km of the proposed route of the cable between 1973 and 2009 (data provided by National Earthquake Information Center,[17] accessed via GeoMapApp[18]) (Figure 4.22 and Table 4.4).

**Table 4.4** Earthquake numbers of magnitude 4.5 or greater occurring within 500km of the proposed cable route

| Distance from cable (km) | Magnitude | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | 4.5 – 5 | 5.5 - 6 | 6 – 6.5 | 6.5 – 7 | 7 – 7.5 | 7.5 – 8 | 8 – 8.5 | |
| <1 | 5 | - | - | - | - | - | - | 5 |
| 1–5 | 26 | 6 | - | 3 | - | - | - | 35 |
| 5–10 | 26 | 4 | 1 | - | - | - | - | 31 |
| 10–20 | 77 | 18 | 5 | 5 | - | - | - | 105 |
| 20–50 | 273 | 55 | 27 | 3 | 1 | - | - | 359 |
| 50-200 | 3198 | 988 | 280 | 65 | 16 | 4 | 3 | 4554 |
| 200–500 | 3506 | 1206 | 293 | 80 | 19 | 6 | 4 | 5114 |
| Total | 7111 | 2277 | 606 | 156 | 36 | 10 | 7 | 10203 |

[15] http://www.volcano.si.edu/

[16] http://new.geomapapp.org/gma_html/about.html

[17] http://earthquake.usgs.gov/

[18] http://new.geomapapp.org/gma_html/about.html

Of these, 5 minor quakes (magnitude 4.5–5) occurred within 1 km of the cable. Larger earthquakes (magnitude >7.0) have occurred within 50 km of the proposed cable, and very large quakes in excess of magnitude 8 have occurred within 200 km of the cable.

### Cyclones

Both Fiji and Tonga lie in the area occasionally traversed by tropical cyclones. The official South West Pacific cyclone season runs from November to April.

Nadi weather office was designated the sixth Regional Specialized Meteorological Centre in 1995. It is responsible for issuing forecasts and warnings for tropical cyclones between the equator and the 25th parallel south and between the 160th parallel east and the 120th parallel west. This area of responsibility covers both Fiji and Tonga.

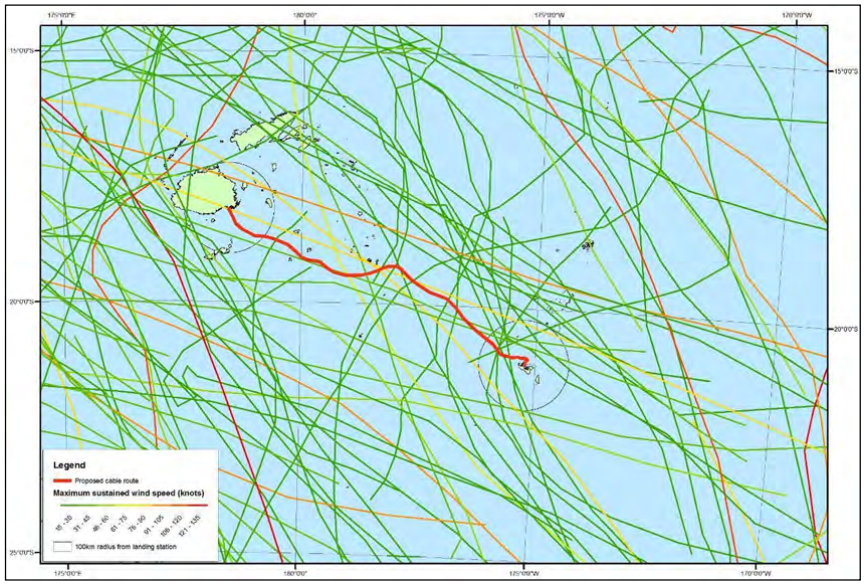



**Figure 4.23.** Cyclone tracks and intensities over 30 year period (1979-2009) over the project area (maximum sustained wind speed based on 1-minute average as calculated by the Joint Typhoon Warning Centre).

The general track of cyclones over the project area most commonly sees development occurring to the north-west in the inter-tropical convergence zone around the 15th parallel south with the cyclones then moving in a south-easterly direction over the project area (Figure 4.23).

**Table 4.5** Cyclones over the past 30 years whose paths have passed within specified distances of the proposed cable route

| Distance from cable (km) | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2 | | 1 | 2 | 8 | 3 | 3 | 3 | | 20 |
| 50 | | 1 | 2 | 9 | 3 | 4 | 3 | | 22 |
| 100 | | 1 | 4 | 13 | 5 | 4 | 5 | | 32 |
| 200 | | 2 | 6 | 16 | 8 | 10 | 6 | | 48 |
| 400 | 1 | 2 | 10 | 22 | 11 | 15 | 7 | 1 | 69 |

All cyclone track data plotted from raw tracks available at the Joint Typhoon Warning Centre website[19].

Within the past 30 years, 20 cyclones have passed within 2 km of the proposed cable route, eight of these occurred in the month of January (Table 4.5).

Ten cyclones in the past 30 years have passed within a 100-km radius of the proposed cable station site in Nuku'alofa, and seven have passed within the same distance of the existing cable station in Suva. Of the ten in Tonga, six had sustained wind speeds below 30 knots, two had speeds of 30–45 knots and, two had speeds between 75 and 90 knots at the time of passing. Cyclones passing within the 100-km radius of the Suva terminal tended to be of greater intensity – two had speeds of less than 30 knots, one was 30–45 knots, one was 60–75 knots, two were 75–90 knots, and one had maximum sustained wind speeds over 90 knots. This pattern of declining intensity is explained by Tonga being further south than Fiji; the intensity of the storms wanes with declining sea surface temperature. Peak cyclone intensities are reached between 17° and 22° south.

**Table 4.6** Return Intervals for surge heights for Suva

| Return interval (years) | Surge height (m) |
|---|---|
| 2 | 1.38 |
| 5 | 1.67 |
| 10 | 1.91 |
| 25 | 2.36 |
| 50 | 2.75 |

Storm surges, associated with cyclones, may have the greatest impact on the proposed development. These surges are caused by the effects of approaching low pressure areas associated with the tropical cyclone and the wind of the cyclone system causing water to pile up against coastlines. Previous work by Carter (1990) on the vulnerability of Suva Peninsula to storm surges associated with cyclones calculated return intervals for a number of surge heights for Suva Harbour. These storm surge models are based on astronomical spring tides to develop a worst case scenario and also account for seasonal and inter-annual sea level variations. The nearest location modelled to the Suva-based landing site is at Vatuwaqa – approximately 2 km to the south of the landing site location. Heights in Table 4.6 are quoted in relation to Mean Sea Level.

No such analysis and modelling have been undertaken for Nuku'alofa harbour but the most severe inundation during a tropical cyclone in recent memory occurred during Cyclone Isaac in March 1982 when storm surges breached the seawall and entered the township of Nuku'alofa. Details of the storm surge and resulting inundation are provided by Oliver and Reddy (1982). On Tongatapu, the passage of the cyclone coincided with a high spring tide, which was about 1.39 m above Chart Datum (1990). The worst affected areas (in terms of inundation) were at Sopu and in localised areas to the west around Kolovai, and to the east at Manuka. The water level observed across Vuna Road at Queen Salote wharf was about 0.5–0.75 m above the level of the road. All houses fronting the road were moved off their

[19] The Joint Typhoon Warning Center Tropical Cyclone Best-Tracks, 1945–2000: http://www.usno.navy.mil/NOOC/nmfc-ph/RSS/jtwc/best_tracks/shindex.html [accessed July 2010]

foundations a distance of about 10 m. Based on observed debris lines, the storm tide level reached approximately 3.05 m above Chart Datum resulting in a storm surge magnitude of about 1.66 m. At Manuka village on the northeast coast of Tongatapu, the storm surge was estimated at 1.5 m. In Sopu, the worst affected area, water inundation was up to 1.5 m but more generally about 1 m in low-lying properties behind Vuna Road (about 0.4–0.5 m inside houses with a floor level similar to that of Vuna Road). Inundation reached 1 km inland at Sopu but in other affected areas was considerably less about 300 m inland. Further information on inundation and erosion during Cyclone Isaac is provided by Woodroffe (1983, 1984).

### Tsunami

Tsunami are caused by vertical displacement of seabed fault lines during earthquakes, or by other processes such as volcanic eruption, volcanic collapse or submarine landslide. Tsunami-generating earthquakes tend to be shallow and of relatively-large magnitude (i.e. greater than Richter Magnitude 7). Hence the occurrence of a large, shallow earthquake located beneath the ocean will more often than not produce a tsunami, providing there is some vertical offset of the sea floor. The source of an earthquake-generated tsunami may be anywhere around the Pacific 'ring of fire'. Figure 4.24 shows the earthquake sources of tsunami that would theoretically have affected Tonga during the 20$^{th}$ century (ITDB/PAC 2004).

Large earthquakes within the Pacific 'ring of fire' are a potential distal source of tsunami (Figure 4.24). The tsunami caused by the Peru earthquake of June 2001, registered a 15-cm peak-to-trough oscillation at the SEAFRAME tide gauge located at Nuku'alofa about 15 hours after the earthquake occurred. With distal-source tsunami there will be hours of warning of the arrival of the tsunami.

Large earthquakes within the seismically active zone on which Tonga is located are a potential near-field cause of tsunami (Figure 4.24). The Magnitude 8 earthquake centred 160 km NE of Nuku'alofa on 3 May 2006 registered a 40-cm peak-to-trough oscillation at the SEAFRAME tide gauge located at Nuku'alofa. The Magnitude 8 earthquake (now believed to be two Magnitude 8 earthquakes, just minutes apart (Beavan et al. 2010) 150 km S of Samoa on 29 September 2009 generated a 6-m-high tsunami on Niuatoputapu that destroyed 60% of homes with the loss of nine lives and registered as a 25-cm peak-to-trough oscillation at the SEAFRAME tide gauge located at Nuku'alofa. Tsunami generated close to Tonga will have a warning period measured in minutes rather than hours.

The active tectonic zone on which Tonga is located is also prone to earthquake-triggered submarine landslides into the Tonga Trench. Such submarine landslides may cause local tsunami.

### *The tsunami hazard*

In the deep ocean, a tsunami is barely noticeable and will only cause a shallow ripple on the sea surface as it passes. However, when a tsunami approaches shallower waters near the coast, the waves slow and become compressed, causing them to grow in height. Under the best case scenario, the tsunami comes onshore like a quickly rising tide and only causes gentle flooding in low-lying coastal areas. Under the worst case scenario, however, walls of water rush ashore causing large-scale destruction and flooding, with damage exacerbated by the volume and weight of debris it carries with it. Before the hazard finally passes, this cycle may repeat itself several times as a succession of waves. This was most evident in the recent 2009 tsunami that devastated Niuatoputapu and Samoa.

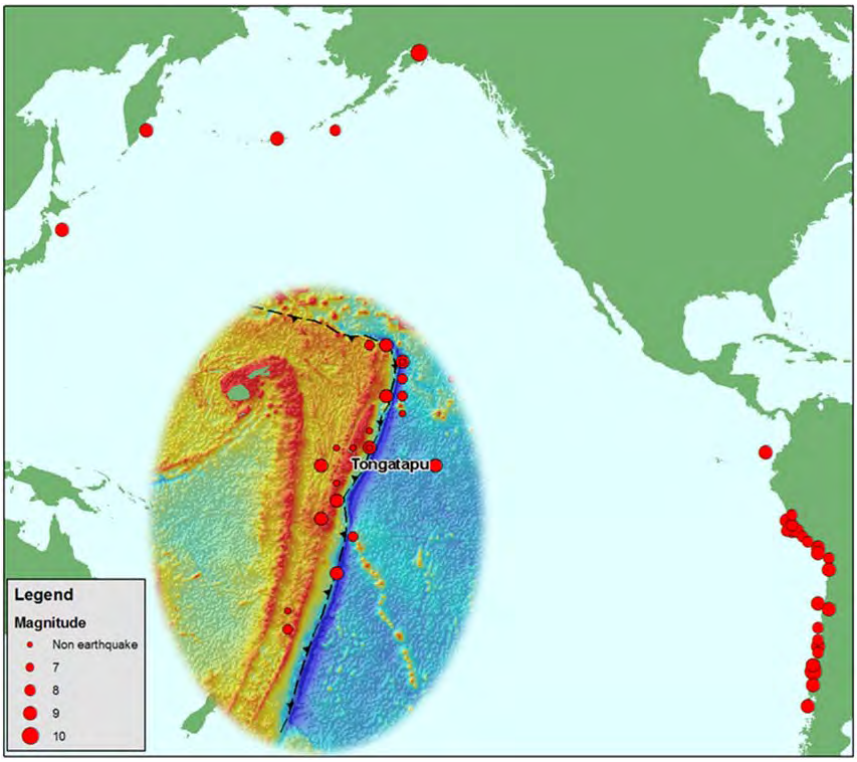



**Figure 4.24.** Pan-pacific earthquake origins (main map) and near-field earthquake origins (inset map) that will have produced more or less noticeable tsunami in Tonga in the 20th century.

Tsunami typically cause the most severe damage and casualties near their source (i.e. earthquake) where the waves are highest. Nearby coastal populations, often disoriented from the violent earthquake shaking, may have very little time to react before a tsunami arrives. Tsunami generated by more distant earthquakes will make landfall several hours after an earthquake. Warnings can be given several hours before tsunami strike, provided adequate monitoring and warning systems are in place, thus allowing time for possible evacuation.

Given that much of the Tongan land mass is low lying and most of the population live by the coast, Tonga is generally vulnerable to tsunami, and Nuku'alofa, with its concentration of people and infrastructure spread along an exposed, low-lying coast, is a site at particular risk.

### Climate change and sea level rise

The best guidance currently available on future projections of climate change for the Pacific comes from global climate models. The IPCC Data Distribution Centre (http://ipcc-ddc.cru.uea.ac.uk/) has archived data from a number of simulation experiments. Analysis of these experiments indicates that the Pacific is likely to warm at a slightly slower rate than the global average, but at a rate that is still substantial, and likely to have significant impacts.

IPCC Working Group 2 scenarios, project an area-averaged warming in annual temperature of 1.6°±0.2°C between now and the 2050s for the region encompassing the Pacific small island states, and a 2.5±0.6°C between now and the 2080s. The scenarios indicate little change between the wet and dry seasons. No specific downscaling work has been done for Tonga.

Confidence in rainfall changes is lower because of the strong rainfall gradients that currently exist around the Inter-tropical and South Pacific convergence zones, and the difficulty of simulating these with low-resolution models. However, the coupled models suggest increased precipitation along the equatorial belt from the dateline eastwards, and a likelihood of decreases in the southwest Pacific.

In the Pacific generally, more intense (heavier) rainfall events are thought very likely to occur during the 21st century over many areas, with model results for the 2050s and 2080s projecting fewer rain days than at present but an increase in the daily intensity of precipitation. Although there have been no specific studies for Tonga, predictions by Whetton et al. (1996) suggest this trend may not be felt in Tonga; their scenarios point to a general decline in heavy rainfall events. These predictions are in general agreement with the majority of models that suggest mean-annual rainfall is likely to decrease gradually and the frequency of dry periods increase in Tonga, but considerably more work is required to clarify this.

The sea level trend to date is +9.5 mm/year but the magnitude of the trend continues to vary widely from month to month as the data set grows. Accounting for the precise levelling results and inverted barometric pressure effect, the trend is +8.6 mm/year. A nearby gauge, with longer records but less precision and datum control, shows a trend of +6.3 mm/year (Australia Bureau of Meteorology 2009).

# 5 Environmental Assessment

This section draws on the information in the foregoing sections, together with that obtained during stakeholder consultations to consider each potential impact on, or from, the development and the risk that they present. The net significance of each potential impact is discussed and summarised in impacts tables at the end of the section.

*The EA Team has found no impacts that cannot be eliminated or reduced to low or negligible levels with appropriate mitigation.*

All impacts assessed below can most usefully be considered to be direct or indirect impacts. There are no significant cumulative impacts associated with this development.

## 5.1 Introduction

The installation of an offshore submarine communications cable together with its supporting terrestrial infrastructure is a significant undertaking, both economically and socially. Relative to other developments of a similar magnitude, this development has a very low profile and in many respects is quite benign in nature. Nonetheless, its considerable linear extent encompasses a considerable range of environments and raises the possibility of impacts in a number of environmental domains as discussed in the sections below.

Among the potential environmental impacts considered in the passages below are:

- Physical Environment
    - Greenhouse gas emissions affect on climate.
    - Alteration of topography, bathymetry and substrates
    - Modification of marine hydrology
- Habitats, Flora, Fauna
    - Incursions on existing or proposed marine protected areas
    - Affects upon critical natural habitats in the coastal, oceanic and terrestrial environments, with particular reference to:
        - Coral reefs and seagrass beds
        - Hydrothermal vents
        - Seamounts and associated bathymetric features
    - Species of interest, especially cetaceans
- People and Communities
    - Impacts on semi-subsistence lifestyles of local people
    - Disruption to oceanic users and uses with particular reference to:
        - Commercial fisheries, and
        - Deep sea mining
    - Disruption to coastal users and uses, with particular reference to:
        - Incursions on customary use-rights and tenure
        - Commercial shipping operations and aggregate/dredging operations
        - Subsistence food gathering and fishing
        - Game fishing, and
        - Aquaculture
    - Disruption to terrestrial users and uses through the acquisition of land, trenching and construction

## 5.2 The physical environment

### Climate

*Aside from the potential of cyclones, which are discussed in detail in a later section, the climate at the landing station sites and cable route poses no impact to the proposed development.*

The proposal will result in the emission of greenhouse gases through burning of fossil fuels by cable laying vessels and construction machinery during the construction phase, and the provision of electricity needed to power the telecommunications equipment during the operational phase However, on a national scale in both Fiji and Tonga, the quantities of GHGs released will be insignificant and represents, in part, a substitution from one telecommunications-based energy use (satellite) to another (fibre optic cable).

### Topography, bathymetry and substrate

*The proposed development will have no impact on the seabed topography, bathymetry or substrate.*

There are considerations as to how topography and bathymetry are likely to affect the proposed development, and these are discussed in detail in subsequent sections.

### Marine hydrology

*The proposed development will have no impact on the hydrology of the affected area.*

Water movement in and around the development site is such that we do not expect impacts associated with the disturbance of sediments to be spread beyond the area of influence.

The wave regime within Nuku'alofa Harbour and Laucala Bay (Suva), together with the particle size of the substrate, means it is likely that the cable will become alternately buried and uncovered by shifting banks of sand.

## 5.3 Habitats, flora and fauna

### Protected areas

*The proposed development will have no significant impact on any existing protected area.*

The cable passes no closer than 4 km on the Tonga end and no closer than 10 km at the Suva end to existing marine protected areas. There are no terrestrial protected areas at either end and no proposed or known oceanic protected areas along the cable route.

## Critical Natural Habitats

### *Coastal*

*The proposed development will likely have a localised short-term impact on seagrass habitats at the Nuku'alofa end.*

The cable passes between living reef structures before ascending onto a back reef platform, thereby avoiding impact to coral communities. The cable will, however, pass through an area of seagrass that will be disturbed when a trench is dug in order to bury the cable. The width and depth of this trench are, however, limited (40cm x 50cm) and with the same soft sediment material being returned to the trench, there would be no barrier to re-growth of the seagrass that is disturbed. While the rate of recovery of physically damaged areas of seagrass beds depends on the species present, small areas of many species have been shown to recover within months to a year (Paul et al. 2006). The mechanism for this recovery is the rhizome structure of the seagrasses, which provides a mat of vegetation throughout the substrate and which, assuming the substrate is not significantly altered, allows rapid recolonisation of cleared areas.

The sediments disturbed during the trenching process will increase turbidity in the water column, which in turn will reduce the amount of photosynthetically active radiation reaching the blades of seagrasses in the immediate area. While no studies have been made of the species of seagrass found at the site, the most comparable species in terms of the morphology has been shown to be able to survive 3–4 months with 0% of the surface irradiance reaching the seagrass blades (Longstaff & Dennison 1999). Given that trenching activities will affect a small area over a short period of time and be carried out at low tide when the beds are exposed, it is likely disturbed sediments will have negligible impact on the seagrasses in the surrounding area.

Finally, the area of seagrass that would be disturbed represents only a fraction of the area of seagrass within the immediate vicinity of the proposed route, much less that found in the wider environs of Tongatapu.

*The proposed development will have no significant impact on critical coastal habitats at the Suva end.*

In Suva, the cable will lie on soft bottom-sediment and will avoid coral reef areas by entering through a reef passage. Some seagrass beds may be disturbed by the laying of the cable; though these are already degraded in nature and represent only a small fraction of the seagrass communities within Suva vicinity much less those found around Fiji and the region.

### *Oceanic*

#### *Hydrothermal vents*

*It is likely that the proposed development would have localised impact on hydrothermal vent communities* ***only if the cable is laid upon active vent sites****.*

The vent communities are known to be fragile in nature and exist in an environment remote from physical disturbance. However, the communities are highly ephemeral in nature and

depend on the short lifespan of the vents themselves. In addition, and as discussed in the environmental hazards section, the hostile environment that an active vent presents to a cable dictates that the detailed route survey would avoid locations of active vent fields. If this avoidance is achieved the impact on vent communities will be non-existent.

*Seamounts and associated bathymetric features*

*It is likely that the proposed development would have localised impact on seamount benthic communities **should the cable be laid upon such communities**.*

Seamount sites are known to be biodiversity hotspots in the open ocean. As discussed in the oceanic users section, seamounts and associated bathymetric features, and the ecological communities they support, attract a great deal of fishing effort. The topography of such sites would additionally make cable routing difficult and therefore the recommendation is made that seamounts and associated bathymetric features be avoided by the cable route. Should such avoidance be achieved, then impacts on seamount and associated bathymetric features will be negligible.

**Species of interest – IUCN red list**

*The proposed development will likely have no significant impact on any populations of IUCN Red Listed species of concern.*

The only species known to occur in the vicinity of the proposed cable route are either a) coral communities, which will be avoided, and occur ubiquitously in adjacent sites or b) turtles, of which only one is known to occur in the vicinity and is likely transient and does not use the area for critical life history stages such as breeding. A notable exception discussed below is the cetaceans.

**Species of interest – cetaceans**

*The proposed development will likely have no significant long-term impact on any populations of cetaceans. However, there is the potential for specific phases of the project to have a short-term impact on the behaviour and welfare of individuals*.

These potential impacting agents are discussed below.

Cetaceans use sound as a means of communication with each other, to locate prey and to navigate. The sound they emit is one of the many forms of natural noise that can be detected in the ocean. In addition to this natural noise there is an increasing intensity and continuity of human-produced sound emanating from shipping, underwater construction, acoustic exploration, and active sonar systems. Such sound is commonly referred to as noise pollution. Both natural and anthropogenic sound can travel many hundreds or even thousands of kilometres underwater.

In order for cetaceans to hear effectively, they have a highly sophisticated auditory system and a similarly developed vocalisation system to emit sound. Both systems have the ability to detect and produce sounds spanning a very wide range of frequencies. These systems are, however, prone to disruption and damage by non-natural sound for which they have not evolved.

The response of cetaceans to noise falls into three categories: behavioural, acoustic and physiological. Behavioural responses include individuals actively avoiding sound sources, modifying feeding behaviour, and even modifying surfacing behaviour. Acoustic responses include changes to the frequency, intensity and duration of vocalisation by individuals subject to external sound sources. Finally, and most severe, are physiological responses which include, at the lesser end of the spectrum, a change in heart rate through to physical damage of auditory systems in individuals exposed to high intensity sound (Nowacek 2007).

These responses typically deal with individuals. There is also the potential for population-level responses through, for example, altered mating behaviour affecting population fecundity. Given, however, that much of the data on cetacean population size is uncertain at best, finding changes to such metrics much less proving causative pathways to noise pollution is at present not possible.

The level of likely response by both individual cetacean and possibly by population is highly dependent on a number of factors. Primarily, the intensity and frequency of the sound source are of critical importance. In general, as the intensity increases the potential for negative response by cetaceans increase. The sensitivity of cetaceans also changes. During mating and migration for example, the rate of vocalisation is far greater than during periods of 'rest'. Consequently, these life history stages are more susceptible to noise pollution impacts.

Within the proposed development there are likely two sources of sound pollution, one specific to the design phase and one that will come during both the design and the construction phase.

During the marine route survey of the design phase, active sonar will be used to find the depth of water in which the cable will be laid in addition to the nature (topography and perhaps substrate) of the seabed. For this, two types of sonar will be used: a) multibeam sonar for bathymetry and b) side-scan sonar for bottom typing.

Both these sonar types are at the lower end of the intensity scale, though they are generally considered high acoustic density sources and medium frequency generators.

The level of sound pressure ranges from about 200 dB re 1µPa to 240 dB re 1µPa. The frequency ranges from about 50 to 500 kHz. The nature of propagation varies depending on the nature of the survey, although it can generally be expected to conform to a conical pattern with a greater swath being covered in deeper water.

To survey deeper water it is necessary to use lower frequency to compensate for the attenuating properties of seawater. However, the lower the frequency of source used, the lower the resolution of images collected. Therefore, it is likely that for most operations the maximum detectable frequency will be used.

There is a significant difference in the effects of seismic and multibeam/side-scan surveys on cetaceans. Higher frequency emissions utilised in normal multibeam operations tend to be dissipated to safe levels over a relatively short distance despite having similar sound levels to seismic surveys. By contrast the lower frequency (and higher intensity) emissions of seismic surveys, including airgun arrays, travel over a far greater distance and esonify a greater area at greater intensity (Dept of Environment, Heritage and Local Government, Government of Ireland 2007).

*Given this difference in intensity between seismic (air gun) survey and more conventional sonar bathymetric survey, this environmental assessment is valid only for multibeam and sidescan sonar. In the unlikely event that seismic surveys are required during the route survey, this would require additional assessment, mitigation and management actions.*

Work done for the Antarctic Treaty Consultative meeting on acoustic effects on cetaceans in the Southern Ocean found the following level of responses and associated likelihoods of occurrence for multibeam sonar (Scientific Committee on Antarctic Research 2006) and, given the similar acoustic properties of side-scan, a similar response is likely for the use of side-scan sonar.

Individuals show no response or only a temporary (minutes) behaviour change. No change to environment or populations. *Expected in almost all instances*

Individuals show short-term (hours) behaviour change. Temporary displacement of a small proportion of a population; small proportion of habitat affected; no impact on ecosystem function. *Could occur in some cases*

Longer term (days) simultaneous displacement of a higher proportion of a population; disruption to behaviour; interference with feeding. *May occur in exceptional circumstances.*

The main concern is with the Humpback whale populations that migrate through the proposed cable route area of interest. The migration period through the study area of interest is June–October each year. During this period displacement of a proportion of the population and disruption to behaviour could result in modified migration behaviour.

Given this concern, best practice should be followed when sonar is used during the route survey. This best practice is described in Appendix 4 of this report. If this best practice is followed, most of the concerns can be mitigated and the impact would be rendered insignificant.

The inshore waters of Tonga at the end of the migration are used by Humpbacks for mating and calving (South Pacific Whale Research Consortium 2002). Both these life history stages involve extensive use of sound and are therefore especially susceptible to noise pollution. However, these life-history stages take place within water less than 200 m deep. The only survey areas of the cable route less than 200 m deep are inside both Nuku'alofa and Suva harbour, neither of which is used by Humpbacks for mating and calving. Therefore, this does not present an impact of concern.

The second source of noise pollution during both the route survey design and cable laying construction phase is the activity of survey and cable-laying vessels. Vessels have acoustic footprints generated by engines and transmitted through the hulls as well as by moving propulsion systems in water (Whale and Dolphin Conservation Society 2009). Given, however, that the vessels involved in the route survey and laying stages are likely to be in the region for only relatively short periods of time and given that the proposed cable route area is traversed regularly by other vessels, the proposed development does not constitute a significant additional ship-noise burden.

The second potential impact is entanglement or physical contact by cetaceans with the cable when it is being laid. Given that the cable laying process will take place over a very short

period of time, however, this is considered extremely unlikely and is therefore considered an insignificant impact.

The final potential impact comes after the cable has been laid during the operational phase. Between 1877 and 1955 there were 16 records of cetaceans becoming entangled in unsupported sections of submarine cables. The most at risk group of cetaceans are the deep diving toothed species such as sperm whales (Heezen 1953), whose feeding behaviour involves swimming along the seabed with the lower jaw skimming the sediment.

However, a more recent exhaustive study of cable fault databases containing records of 5740 cable faults, between 1959 and 2006, failed to find a single record of cetacean entanglement in cables (Wood & Carter 2008). The review attributes this change in the frequency of entanglement, to change in the design of cables (coaxial to fibre optics), marine surveying resolution and availability, and cable laying techniques. In particular, the following five reasons are stated: 1) development of torque-balanced cables that were less prone to self-coiling; 2) laying armoured cables under slight tension to minimize suspensions and loops, and laying low-torque, non-armoured cables with minimum slack to follow the seabed topography; 3) avoidance of rough topography where suspensions may develop; 4) burial of cables below the seabed on the continental shelf and upper slope to protect against shipping and fishing activities; and 5) use of fault repair procedures that reduce cable slack.

*This review concludes that entanglement by cetaceans is extremely unlikely to occur so this represents a non-significant impact.*

### Terrestrial habitats, flora and fauna

*The proposed development will have no significant impact on terrestrial habitats and flora and only a minor and short lived impact on fauna (shorebirds) at the Suva end.*

In Tonga, the esplanade reserve and road reserve will be returned to their original state and landscaping of the cable station will replace the vegetation removed during construction. There are no species of concern within the area of influence of the development at the Tonga site.

In Suva the mudflats across which the cable will pass (and into which it will be trenched) are important feeding grounds for migratory shorebirds. However, the development will be localised to only a small area of available mudflat within Laucala Bay, will likely occur during only one low tide cycle and will represent no loss of habitat. Given these factors and that at present shorebirds are disturbed regularly by fishers and recreational users without apparent long-term behavioural change, it is likely there will be only a minor, localised and short-lived impact on shorebirds.

While the cable will pass through the reef passage adjacent to either the un-named sand cay or Nukulau and Makuluva islets on Suva reef, the passage of the cable laying boat through these passages will not be any different to the passage of any other vessel, and once the cable is laid there will be no impact on any of these islets.

## 5.4 People and communities

### Indigenous peoples

*The proposed development will have no negative impact on the semi-subsistence activities of Fijians and Tongans. The populations within the project footprint are not indigenous peoples as defined in the narrow sense of the World Bank Operational Policy on Indigenous Peoples.*

### Oceanic users and uses

#### *Commercial fisheries*

*The proposed development will have no significant impact on offshore commercial fisheries.*

Long lining, which is practised in the area of the proposed cable route, will have to avoid the survey vessel during the detailed route survey and during the cable laying process to prevent entanglement with the cable while it is being payed out from the vessel. However, the duration of these activities, together with the geographic footprint that these will occupy, is such that this avoidance is likely to be only a very minor inconvenience. The second type of fishery employed in the EEZs of Tonga and Fiji, the deep bottom fishery, is undertaken around seamounts and associated bathymetric features. There is possibility of gear used in this fishery becoming entangled in the cable. However, with route design to avoid seamounts and associated bathymetric features and to prevent suspended segments of cable, this risk can be reduced to a negligible level.

With bottom trawling being outlawed by all members of the South Pacific Regional Fisheries Management Organisation, deep trawl fishing does not pose a risk to the cable nor does the cable prevent other forms of trawl fishing.

#### *Deep sea mining*

*There are at present no active mining operations; however, the cable traverses prospecting areas licensed to two companies. Should these operations proceed to active mining, the proposed development could have a localised impact on the mining operation unless mitigation through consultation is applied.*

There are three levels of reality that provide context to this potential impact:

1. The likelihood of direct conflict between the cable and mining interests is small. The deposits of interest to mining are few and are very small when measured on an oceanic scale so without any conscious mitigation, these two activities are unlikely to come into conflict.

2. UNCLOS Part VI (Article 79) and Part VII (Article 112), recognises a right of the State (and TCL is, and will be in the foreseeable future, majority owned by the Government of Tonga) to lay submarine cables on the bed of the high and continental shelf. Under international law, Tongan licensing law and the powers available to the Government of Tonga, there is nothing to prevent passage of the cable through the exploration tenements.

3. The licences held by KORDI and Nautilus Minerals are exploration licences that confer exclusive rights to prospect for minerals in the tenements outlined in Figure 4.16, not a land/seabed right.

Nonetheless this impact can be mitigated to leave no residual impact if the cable route and areas of active mining activity can be geographically separated by a suitable buffer. This would require consultation during the route design survey between the project proponent and the potential mine operators.

### Coastal users and uses

#### *Marine tenure*

*The proposed development will have no significant impact on customary use rights owners of either customary fishing ground at the Suva end and, with no formal customary tenure in Tonga end, there will be no legal use rights encroached upon. During the laying of the cable, however, the ability of fishermen to access the area may be temporarily curtailed for operational reasons. The temporal and spatial extent of this curtailment is considered insignificant.*

The EA Team observed people using the reef platforms in both Laucala Bay and Nuku'alofa Harbour on each occasion they visited but their numbers were few (6-15) and those spoken to indicated that they saw no impact and would willingly move aside during cable laying.

There remains a potential for the customary use rights owners in Fiji to request compensation for allowing the cable to be laid through their fishing grounds. This has been attempted in the past, without success and the issues of customary tenure and use-rights in this respect are unclear. On the 10th November 2009 Cabinet approved a review of the Fishing Ground (Qoliqoli) Compensation Policy[20]. At the time of writing, the review is incomplete and it would be inappropriate to speculate on the outcome. Equally, it would be inappropriate to suggest a process for negotiating an easement of the cable through the customary fishing areas when this is likely to be one of the outcomes of the government review.

Previous cable laying activities including the Southern Cross cable have not invoked compensation claims. In the opinion of the EA Team, given the lack of impact on the integrity and productivity of the fishing ground, it is considered unlikely that impact on the fishery from the proposal development would constitute fair grounds for compensation.

#### *Commercial shipping and ports*

*The proposed development will have no significant impact on the access to, or operations of, Suva port and the shipping activities it supports.*

[20] http://www.fiji.gov.fj/index.php?option=com_content&view=article&id=718:101109-cabinet-approves-review-of-qoliqoli-compensation-policy&catid=49:cabinet-releases&Itemid=166

The entrance to the port, being on the other side of Suva Peninsula, will not be obstructed by either the survey stage or cable laying stage of the proposed development. With the majority of shipping leaving and entering Suva port coming from, or going to, the west, and the cable route running in an east-south-east direction, there is clearance between the two uses.

*The proposed development is likely to have a short-term impact on the access to, and egress from, Nuku'alofa harbour by deep-draft commercial vessels. But, with the average frequency of vessels calling at the port being one vessel every 8.6 days, it is likely that avoidance of scheduled vessel movements can remove this impact.*

Shipping managers indicated that even in the event of a conflict, there were alternative channels available to all but deep-draft vessels.

It is desirable that there be a southward extension to the existing no-anchor zone in Nuku'alofa Harbour so that the whole length of cable along the proposed route would be afforded protection. This is considered an operational matter and will need further discussion between the project proponents and the Tonga Port Authority.

Should no suitable compromise be reached in these discussions, there is a potential to re-route the cable in a south-east direction, to remain within the existing no-anchor zone, and then bear west and run parallel with the reef slope before turning south to enter the boat passage as per the original proposed route. If this deviation to the route was made, the route would remain over sand, would avoid any critical natural habitats and not affect any people or communities and, as such, environmental assessments made in this report would remain valid.

In the area of the Nuku'alofa shipping channel, where depth is restricted by the presence of coral heads, if the cable is laid on the sandy bottom between outcrops, it should not be an impediment to future deepening of the main shipping channel. However, operational guidelines would need to be in place, and considerable care taken, to ensure the removal of these coral heads does not impact on the cable itself.

### *Gravel and aggregate extraction*

*Present areas of aggregate extraction by dredging are outside the cable route so the development will have no impact on this activity and this activity will have no impact on the proposed development.*

Should future aggregate extraction activities be considered along the cable route, this operational matter will need consultation and agreement between the project proponent and the dredging company. At present the likelihood of this activity seems remote, but is not defined and therefore cannot be considered further.

### *Inshore fishing*

*The proposed development is likely to have only a minimal impact on inshore fishing activities on the back reef in Sopu and the inshore areas within Nuku'alofa Harbour.*

Trenching activities across the back reef will be confined both geographically and temporally. The EA Team observed up to 15 people using the reef platform in Nuku'alofa Harbour on each occasion they visited and those spoken to indicated that they saw no impact and would willingly move aside during the short period of disturbance.

Similarly, in the Nuku'alofa Harbour, first, fisheries activities should not be occurring in the no-anchor, no-fishing zone in which the cable will be laid and, second, those activities that are occurring will be disrupted by no more than a day or two as the cable is being positioned. Once the cable is laid it will represent no risk to the fishery.

*In Suva gleaning activities on the shoreline, and fishing activities within Laucala Bay, are likely to be disrupted by a similar short-term, restricted area nature to that of Nuku'alofa. Consequently there will be only minimal impact at the Suva end.*

The EA Team observed only about half a dozen people using the Suva reef platform on the occasion of their visit.

It is thought highly unlikely that an anchor used by a small vessel engaged in inshore subsistence/artisanal fishery would damage an armoured cable which in itself is likely over time to become buried.

#### *Game fishing*

*There will be no significant impact on the game fishery.*

The shallow water fishing methods employed by this fishery and the presence of the no-anchor, no-fishing zone covering shallow water areas mitigate the risk of fishing gear becoming entangled in the cable once laid.

The offshore game fishing is concentrated around seamounts which will be avoided by the cable route as discussed in the seamount environmental assessment section. By having no significant environmental impact, the cable will not act to influence game fish populations.

#### *Aquaculture*

*There is the potential for trenching activities and the sediment disturbed during this activity to impact adversely on the oyster aquaculture grow-out lines close to the small boat passage in Nuku'alofa Harbour.*

The EA Team assesses this impact to be unlikely because the end of the line begins about 100m, and then runs away from, the mouth of the small boat passage which is the likely conduit for silt entering the harbour. So, in the worst case of an impact on the grow-out lines, it will likely only affect the end closest to the small boat passage by depressing growth rates for a period.

Following best practice for trenching in the near shore including the provision of silt screens will substantially reduce the potential magnitude of this impact.

### Terrestrial users and uses

*There will be no significant impact on land tenure at either end of the proposed cable route.*

There will be no significant impact on terrestrial users and uses at the Fiji end because the development makes use of existing infrastructure. Being some hundreds of metres distant from any residential areas, and with activities to bring the cable to the present cable station taking place during working hours, any noise or dust generated are likely to go unnoticed.

The prevailing onshore south-easterly wind would blow any dust created during cable trenching onto the adjacent golf course and away from any residential areas.

There will be a small, localised impact on terrestrial users and uses at the Tonga end resulting from the acquisition of land, the demolition of existing buildings and subsequent construction of the landing station, and the trenching of the cable to reach the cable station.

As the residential properties that will be demolished and replaced are intended to be sold by the Government in the near future with the displacement of the present tenants, the proposed development represents no additional displacement.

Access to the back reef by trenching machinery will be easily afforded by a nearby existing boat ramp over the seawall.

Access to the cable station site by construction machinery will be provided by Vuna Road. Whilst this may cause some additional traffic flow, the duration will be short.

Noise and dust during construction will be no greater than that generated by the construction of residential properties – two of which were undertaken in the immediate vicinity in recent years. Furthermore, construction work will be confined to daytime hours only.

There is no indication that upgrading of services including electricity and water to the cable station will be needed so there are therefore no associated impacts.

Some traffic disruption will occur when the road is being dug for the trenching of the cable. The proposed development site is nearing the edge of the built-up area of Sopu so road traffic is light during work hours. Any residual impact can be mitigated by digging only one half of the road at a time and allowing controlled flow of traffic over the remaining path.

Once constructed, the cable station should have a positive residual aesthetic and visual effect. As the present residential properties have limited aesthetic value, it is likely that a modern, landscaped, and neutrally painted cable station will not detract from and indeed will likely enhance aesthetic value. The intended twenty-four hour on-site security will also benefit the immediate neighbourhood.

On a monthly basis there will be a small impact associated with the routine maintenance running of the backup generators at the station. This running will, however, be limited to one hour per month and it is intended that the generator design is, in part, selected on the basis of its low sound output. If the generator is required during periods of power outage from the national grid, it will not be alone as many of the residential properties in the immediate area also have their own backup generators.

### Cultural heritage

*The proposed development will have no impact on cultural heritage.*

The lack of identified specific sites of cultural heritage and the lack of significant and irreparable environmental impact suggest the proposed development will have no impact on cultural heritage.

### Conflicting Infrastructure (present or planned)

*There will be no significant impact of the proposed development of existing or planned infrastructure with proper mitigation and the following of construction standard procedures.*

As discussed, the residential properties on the site of the cable station are to be sold anyway. Water supply infrastructure to the site will need to be avoided during construction and cable trenching activities.

### Compensation

TCL in consultation with the contractor and affected stakeholders, will provide compensation in compliance with the CPF for the temporary or permanent loss, restriction or disturbance of these resources and/or infrastructure in both Fiji and/or Tonga, except in the case of negligence or breach of contract caused by any act and/or omission of the contractor, its sub-contractors, representatives, agents or employees, in which case the contractor will be solely responsible for all the costs.

## 5.5 Relevance of World Bank and Asian Development Bank safeguard policies

Having determined the significance of the impacts, the relevance of the World Bank and Asian Development Bank safeguard policies can be reviewed, as follows:

- **World Bank Operational Policy 4.01 – Environmental Assessment** (World Bank 2007a) has already been triggered by the issue of the contract for this study.
- **World Bank Operational Policy 4.04 – Natural Habitats** (World Bank 2004) is relevant because there are potential impacts on critical natural habitats. However, these can be mitigated to negligible levels through the avoidance measures proposed in the environment plan. There will be no conversion or degradation of critical natural habitats by this project.
- **World Bank Operational Policy 4.10 – Indigenous Peoples** (World Bank 2005) need not be triggered because there are no distinct vulnerable social and cultural indigenous people, within the meaning of the policy, living in the area of influence of this project. The people using the reef platforms at both the Suva and Tonga ends are urban/peri-urban people maintaining a connection with their traditional subsistence lifestyle and supplementing their incomes by foraging. This activity will not be significantly affected by the project.
- **World Bank Operational Policy 4.11 – Physical and Cultural Resources** need not be triggered because there are no unmitigatable impacts on physical or cultural resources within the area of influence of this project.
- **World Bank Operational Policy 4.12 – Involuntary Resettlement** (World Bank 2007c) need not be triggered because there is no involuntary taking of land or involuntary restriction of access to land. The expiration of tenancy agreements for the government rental properties on the Tonga cable station site is properly viewed as a commercial impact that was programmed to occur anyway with the scheduled disposal of these properties.
- **Asian Development Bank Safeguard Policy Statement** (ADB 2009) has three key safeguard areas that parallel those of the World Bank:
    - **Environment** has already been triggered by the issue of the contract for this

study.

- **Involuntary Resettlement** need not be triggered because there is no involuntary taking of land or involuntary restriction of access to land. The displacement of tenants from the government rental properties on the Tonga cable station site is properly viewed as a commercial impact that was programmed to occur anyway with the scheduled disposal of these properties.
- **Indigenous Peoples** need not be triggered because there are no indigenous people within the meaning of the policy living in the area of influence of this project.

## 5.6 Limitation of the EA

This study is based on an extensive literature search in material relating to the locality, the subject domain, and the proposed development. It included extensive consultations with government and private-sector agencies and individuals. The EA Team inspected the landing sites and the actual/proposed cable stations in both Fiji and Tonga, and spent some time inspecting the nearshore environment in the vicinity of the proposed Sopu landing, including consulting and observing customary users of that environment.

This environmental assessment did not conduct any new field survey but, the agreement with Tonga Cable Limited, provided for the possibility of additional investigation (by the EA Team or other provider) if significant information gaps were exposed by this study. The EA Team are satisfied that no such gaps exist that cannot be reconciled during the marine route survey.

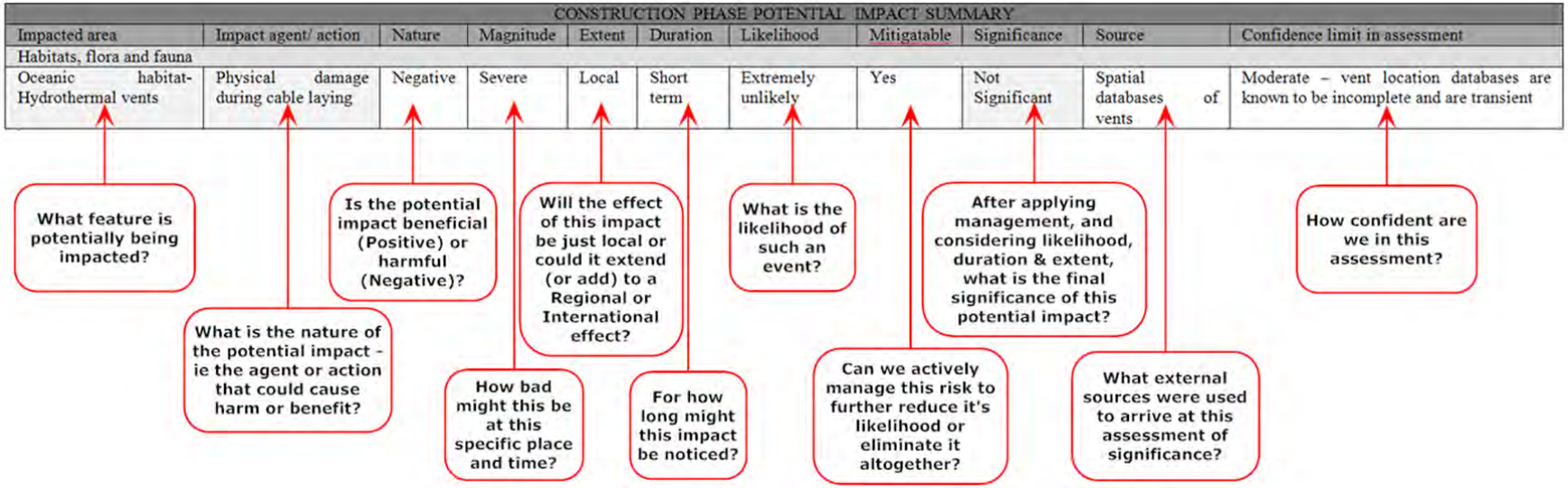
The EA Team therefore believes that, with the background and experience of the EA Team and those individuals and agencies consulted during the course of this assessment, the conclusions here, based on the information obtained, are robust and valid. We commend these findings to the project proponents (Tonga Cable Limited), the funding agencies (the World Bank and Asian Development Bank), and the Governments of Tonga and Fiji.

## 5.7 Summary of impacts

Impacts of both the construction and operational phase of the proposed development are outlined in the following tables. Each impact is first assessed for each of a number of characteristics followed by an overall assessment of significance at the end, as described in the interpretation guide above the first table.

### Environmental Assessment Table Interpretation Guide

The potential impact tables give a more structured summary of the risk associated with each potential impact. This risk assessment uses a number of commonly-considered characteristics, the meaning of which is explained for an example potential impact below:




The three tables that follow in this section (Tables 5-1, 5-2, 5-3) are summary impacts tables for the three identified phases of the proposed development (Design, Construction, and Operational). Some potential impacts are relevant to only one phase of the development, while others may be relevant to two or three phases. Similarly, because of the differing nature of activities in each phase, impacts that occur in two or more phases may differ in some aspects of their description or in their final assessment of significance.

## Potential Environmental Assessment Summaries

**Table 5-1.** Summary of Potential Environmental Impacts in the Design Phase

| DESIGN PHASE POTENTIAL IMPACT SUMMARY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Nature | Magnitude | Extent | Duration | Likelihood | Mitigatable | Significance | Source | Confidence limit in assessment |
| Physical environment | | | | | | | | | | |
| Climate | Release of Greenhouse Gases from survey machinery | Negative | Low | International | Short term | Certain | No | Not Significant | Knowledge | High |
| Topography | -NONE- | | | | | | | | | |
| Bathymetry | -NONE- | | | | | | | | | |
| Substrate | -NONE- | | | | | | | | | |
| Marine hydrology | -NONE- | | | | | | | | | |
| Habitats, flora and fauna | | | | | | | | | | |
| Protected areas | -NONE- | | | | | | | | | |
| Coastal habitat | (Accidental) discharge of pollutant by survey ship | Negative | Severe | Regional | Long term | Extremely unlikely | Yes | Not Significant | Precedent | High |
| Coastal habitat | (Accidental) discharge of pollutant by land based machinery and activities | -NONE- | | | | | | | | |
| Coastal habitat – sea grass | -NONE- | | | | | | | | | |
| Coastal habitat – coral communities | -NONE- | | | | | | | | | |
| Oceanic habitat | (Accidental) discharge of pollutants by survey ship | Negative | Severe | Regional | Long term | Extremely unlikely | Yes | Not Significant | Precedent | High |
| Oceanic habitat – Hydrothermal vents | -NONE- | | | | | | | | | |
| Oceanic habitat – Seamounts | -NONE- | | | | | | | | | |
| Species of interest – threatened species | -NONE- | | | | | | | | | |
| Species of interest – cetaceans | Acoustic impacts of active sonar during route survey | Negative | Moderate | Local | Short term | Unlikely | Partially | Moderate | Literature and pers. comm. WDCS | Moderate – acoustic impacts not studied on all cetaceans |
| Terrestrial habitats | (Accidental) discharge of pollutants | -NONE- | | | | | | | | |
| Terrestrial habitats, flora and fauna | -NONE- | | | | | | | | | |
| People and communities | | | | | | | | | | |
| Local communities | -NONE- | | | | | | | | | |
| Oceanic users – commercial fisheries | -NONE- | | | | | | | | | |
| Oceanic users – deep sea mining | -NONE- | | | | | | | | | |

| DESIGN PHASE POTENTIAL IMPACT SUMMARY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Nature | Magnitude | Extent | Duration | Likelihood | Mitigatable | Significance | Source | Confidence limit in assessment |
| Coastal users – marine tenure | -NONE- | | | | | | | | | |
| Coastal users – commercial shipping and ports | -NONE- | | | | | | | | | |
| Coastal users – gravel and sand extraction | -NONE- | | | | | | | | | |
| Coastal users – subsistence and artisanal fisheries | -NONE- | | | | | | | | | |
| Coastal users – game fisheries | -NONE- | | | | | | | | | |
| Coastal users – aquaculture | -NONE- | | | | | | | | | |
| Terrestrial users and uses | -NONE- | | | | | | | | | |
| Cultural heritage | -NONE- | | | | | | | | | |
| Conflicting infrastructure | -NONE- | | | | | | | | | |

**Table 5-2.** Summary of Potential Environmental Impacts in the **Construction** Phase

| CONSTRUCTION PHASE POTENTIAL IMPACT SUMMARY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Nature | Magnitude | Extent | Duration | Likelihood | Mitigatable | Significance | Source | Confidence limit in assessment |
| Physical environment | | | | | | | | | | |
| Climate | Release of Greenhouse Gases from laying and construction machinery | Negative | Low | International | Short term | Certain | No | Not Significant | Knowledge | High |
| Topography | -NONE- | | | | | | | | | |
| Bathymetry | -NONE- | | | | | | | | | |
| Substrate | -NONE- | | | | | | | | | |
| Marine hydrology | -NONE- | | | | | | | | | |
| Habitats, flora and fauna | | | | | | | | | | |
| Protected areas | -NONE- | | | | | | | | | |
| Coastal habitat | (Accidental) discharge of pollutant by cable laying ship | Negative | Severe | Regional | Long term | Extremely unlikely | Yes | Not Significant | Precedent | High |
| Coastal habitat | (Accidental) discharge of pollutant by land based machinery and activities | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Precedent | High |
| Coastal habitat – sea grass | Physical removal during trenching | Negative | Severe | Local | Short term | Certain | No | Low | Observation | High |
| | Smothering by settling disturbed sediments | Negative | Low | Local | Short term | Probable | Partially | Not Significant | Observation / knowledge | High |
| Coastal habitat – coral communities | Physical damage during trenching and laying | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Observation | High |
| | Smothering by settling disturbed sediments | Negative | Moderate | Local | Short term | Unlikely | Partially | Low | Observation / knowledge | High |
| Oceanic habitat | (Accidental) discharge of pollutants by cable laying ship | Negative | Severe | Regional | Long term | Extremely unlikely | Yes | Not Significant | Precedent | High |
| Oceanic habitat – Hydrothermal vents | Physical damage during cable laying | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Spatial databases of vents | Moderate – vent location databases are known to be incomplete and are transient |
| | Smothering by settling disturbed sediments | Negative | Moderate | Regional | Short term | Extremely unlikely | Partially | Not Significant | Spatial databases of vents | Moderate – vent location databases are known to be incomplete and are transient |
| | Physical impact on cable of vent water | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Spatial databases of vents/ inference | Moderate – vent location databases are known to be incomplete and are transient |
| Oceanic habitat – Seamounts | Physical damage during cable laying | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Spatial databases of mounts/ literature | High |

| CONSTRUCTION PHASE POTENTIAL IMPACT SUMMARY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Nature | Magnitude | Extent | Duration | Likelihood | Mitigatable | Significance | Source | Confidence limit in assessment |
| | Smothering by settling disturbed sediments | Negative | Moderate | Local | Short term | Extremely unlikely | Partially | Not Significant | Spatial databases of mounts/ literature | High |
| Species of interest – threatened species | Physical impact and disturbance during laying | Negative | Moderate | Local | Short term | Extremely unlikely | Yes | Not Significant | Literature | High |
| Species of interest – cetaceans | Contact with cable during laying | Negative | Severe | Local | Short term | Extremely unlikely | Partially | Not Significant | Literature and pers. comm. WDCS | High |
| Terrestrial habitats | (Accidental) discharge of pollutants | Negative | Severe | Regional | Long term | Extremely unlikely | Yes | Not Significant | Precedent | High |
| Terrestrial habitats, flora and fauna | Physical removal during trenching and construction | Negative | Severe | Local | Short term | Certain | No | Not Significant | Observation | High |
| | Disturbance to shorebird populations on mudflats at Suva landing site | Negative | Moderate | Local | Short term | Certain | No | Not Significant | Literature and pers. comm. South Pacific Regional herbarium staff | High |
| | Disturbance to islets on Suva reef | Negative | Moderate | Local | Short term | Extremely unlikely | Yes | Not Significant | Literature and pers. comm. South Pacific Regional herbarium staff | High |
| People and communities | | | | | | | | | | |
| Local communities | -NONE- | | | | | | | | | |
| Oceanic users – commercial fisheries | Entanglement of gear during laying | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Spatial database of fishing effort/ pers. comm., Solander Fiji Fisheries | High |
| | Displacement of effort during laying | Negative | Low | Local | Short term | Certain | No | Not Significant | Spatial database of fishing effort/ pers. comm., Solander Fiji Fisheries | High |
| Oceanic users – deep sea mining | Displacement of mining activities | Negative | Low | Regional | Long term | Extremely unlikely | Yes | Not Significant | Spatial database of prospect tenements/ pers. comm., Nautilus Minerals (Tonga) and KORDI minerals LTD | High |
| Coastal users – marine tenure | -NONE- | | | | | | | | | |
| Coastal users – commercial shipping and ports | Impedance of shipping movements during laying | Negative | Low | Regional | Short term | Certain | Yes | Not Significant | Shipping activity database, pers. comm., Pacific Forum Line, Dateline TransAm, Tonga Port Authority | High |
| | Physical injury of cable by shipping during laying | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Shipping activity database, pers. comm., Pacific Forum Line, Dateline TransAm, Tonga Port Authority, Nautical charts | High |
| Coastal users – gravel and sand extraction | Impedance of activities during laying | Negative | Low | Regional | Short term | Extremely unlikely | Yes | Not Significant | Literature, Tonga Port Authority, Pacific Forum Line | High |

| CONSTRUCTION PHASE POTENTIAL IMPACT SUMMARY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Nature | Magnitude | Extent | Duration | Likelihood | Mitigatable | Significance | Source | Confidence limit in assessment |
| Coastal users – subsistence and artisanal fisheries | Displacement of activities during laying | Negative | Moderate | Local | Short term | Certain | No | Low | Interviews with fishers, observation | High |
| | Damage to ecosystem processes and fisheries productivity | Negative | Low | Regional | Long term | Extremely unlikely | Yes | Not Significant | Observation / knowledge | High |
| Coastal users – game fisheries | Displacement of activities during laying | Negative | Moderate | Local | Short term | Extremely unlikely | No | Not Significant | Pers. comm., Game Fishing Association of Tonga | High |
| | Damage to ecosystem processes and fisheries productivity | Negative | Low | Regional | Long term | Extremely unlikely | Yes | Not Significant | Knowledge and inference | High |
| Coastal users – aquaculture | Sedimentation effects on filter feeding organisms by disturbed sediments | Negative | Severe | Local | Short term | Unlikely | Partially | Low | Knowledge and inference | High |
| Terrestrial users and uses | Change to land tenure | -NONE- | | | | | | | | |
| | Displacement of peoples | Negative | Severe | Local | Long term | Certain | Unnecessary | Not Significant | Knowledge | High |
| | Disruption | Negative | Moderate | Local | Short term | Certain | Partially | Low | Precedent | High |
| | Noise and dust | Negative | Low | Local | Short term | Certain | Partially | Low | Precedent | High |
| | Aesthetics | Negative | Low | Local | Short term | Certain | No | Low | Precedent | High |
| Cultural heritage | -NONE- | | | | | | | | | |
| Conflicting infrastructure | Damage to municipal services during trenching | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Precedent | High |

**Table 5.3.** Summary of Potential Environmental Impacts in the **Operational** Phase

| OPERATIONAL PHASE POTENTIAL IMPACT SUMMARY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Nature | Magnitude | Extent | Duration | Likelihood | Mitigatable | Significance | Source | Confidence limit in assessment |
| Physical environment | | | | | | | | | | |
| Climate | Release of Greenhouse Gases from power generation | Negative | Low | International | Long term | Certain | No | Not Significant | Knowledge | High |
| Topography | -NONE- | | | | | | | | | |
| Bathymetry | -NONE- | | | | | | | | | |
| Substrate | -NONE- | | | | | | | | | |
| Marine hydrology | -NONE- | | | | | | | | | |
| Habitats, flora and fauna | | | | | | | | | | |
| Protected areas | -NONE- | | | | | | | | | |
| Coastal habitat | (Accidental) discharge of pollutant by cable repair ship | Negative | Severe | Regional | Long term | Extremely unlikely | Yes | Not Significant | Precedent | High |
| Coastal habitat | (Accidental) discharge of pollutant from cable station | Negative | Severe | Local | Long term | Extremely unlikely | Yes | Not Significant | Precedent | High |
| Coastal habitat – sea grass | -NONE- | | | | | | | | | |
| Coastal habitat – coral communities | -NONE- | | | | | | | | | |
| Oceanic habitat | (Accidental) discharge of pollutants by cable repair ship | Negative | Severe | Regional | Long term | Extremely unlikely | Yes | Not Significant | Precedent | High |
| Oceanic habitat – Hydrothermal vents | Physical impact on cable of vent water | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Spatial databases of vents/ inference | Moderate – vent location databases are known to be incomplete and vents are transient |
| Oceanic habitat – Seamounts | -NONE- | | | | | | | | | |
| Species of interest – threatened species | -NONE- | | | | | | | | | |
| Species of interest – cetaceans | Entanglement in cable risk for deep diving cetaceans | Negative | Low | Local | Short term | Extremely unlikely | Partially | Not Significant | Literature and pers comm. WDCS | Moderate |
| Terrestrial habitats, flora and fauna | (Accidental) discharge of pollutants from cable station | Negative | Severe | Local | Long term | Extremely unlikely | Yes | Not Significant | Precedent | High |

| OPERATIONAL PHASE POTENTIAL IMPACT SUMMARY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Nature | Magnitude | Extent | Duration | Likelihood | Mitigatable | Significance | Source | Confidence limit in assessment |
| People and communities | | | | | | | | | | |
| Local communities | -NONE- | | | | | | | | | |
| Oceanic users – commercial fisheries | Entanglement of gear | Negative | Moderate | Local | Short term | Extremely unlikely | Yes | Not Significant | Spatial database of fishing effort/ pers. comm., Solander Fiji Fisheries | High |
| Oceanic users – deep sea mining | Physical injury of cable by mining operation | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Spatial database of prospect tenements/ pers. comm., Nautilus Minerals (Tonga) and KORDI minerals LTD | High |
| Coastal users – marine tenure | -NONE- | | | | | | | | | |
| Coastal users – commercial shipping and ports | Physical injury of cable by shipping | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Shipping activity database, pers. comm., Pacific Forum Line, Dateline TransAm, Tonga Port Authority, Nautical charts | High |
| Coastal users – gravel and sand extraction | Physical injury of cable by dredging activities | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Literature, Tonga Port Authority, Pacific Forum Line | High |
| Coastal users – subsistence and artisanal fisheries | Entanglement of gear | Negative | Severe | Local | Short term | Extremely unlikely | Yes | Not Significant | Interviews with fishers | High |
| Coastal users – game fisheries | Entanglement of gear | Negative | Severe | Local | Short term | Extremely unlikely | Partially | Not Significant | Pers. comm., Game Fishing Association of Tonga | High |
| Coastal users – aquaculture | -NONE- | | | | | | | | | |
| Terrestrial users and uses | Change to land tenure | -NONE- | | | | | | | | |
| | Displacement of peoples | -NONE- | | | | | | | | |
| | Disruption | -NONE- | | | | | | | | |
| | Noise and dust | -NONE- | | | | | | | | |
| | Aesthetics | Positive | Moderate | Local | Long term | Probable | No | Low | Precedent | High |
| Cultural heritage | -NONE- | | | | | | | | | |
| Conflicting infrastructure | -NONE- | | | | | | | | | |

# 6 Environmental Management Plan

This section is the Environmental Management Plan (EMP) and its associated material. The information from foregoing sections is assimilated here in a management context to identify procedures for controlling the occurrence and magnitude of potential adverse environmental impacts during the different phases of the development.

The EMP tables in this section have been divided into three phases (Design, Construction, and Operational). Impacts can potentially occur during one of these phases but, sometimes, if mitigation for an impact has been applied in a previous phase in the EMP, that impact may not appear (or may be of no residual significance) in the following section because it has been 'designed out' of the project. For example, the potential impacts on hydrothermal vent fields that could occur during the construction phase can be designed against with avoidance measures during the design phase. In this example, hydrothermal vents which have been raised as a construction phase problem in the previous section (section 5) are substantially handled in the design phase in this, the EMP section, with a view to removing this impact from contention.

The final component of the Environmental Management Plan is the monitoring plan, the plan to monitor the implementation of mitigation measures contained in the EMP and assess the effectiveness of these measures.

## 6.1 Introduction

This section describes how the adverse impacts of the proposed development should be managed during both the construction and operational phases in order to minimise effects on the environment and local communities. A series of mitigation measures form the core of the environmental management plan. This plan is followed in Section 6.6 with a monitoring framework to ensure compliance with the plan.

## 6.2 Environmental Management Plan

**Table 6.1.** Environmental Management Plan for the **Design** Phase

| DESIGN PHASE ENVIRONMENT PLAN | | | | |
|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Residual Impact after mitigation | Responsibility for implementing mitigation measures |
| Physical environment | | | | |
| Climate | Release of Greenhouse Gases from survey machinery | 1. Maintain plant and machinery | Minimised emissions of GHGs | Chief engineer – Survey company |
| Substrate | Foreign substances reacting with the environment or providing a medium for adventive organisms | 1. Specify in cable-laying specification that all backfill be with original material<br>2. Specify in cable-laying specification that only inert/stable materials be used in cable laying and anchoring | None | Chief Surveyor – Survey company, Chief Design Engineer – Cable company |
| Marine hydrology | Disruption to currents | 1. Specify in cable-laying specification that cable is laid with finished profile as low as possible<br>2. Specify in cable-laying specification that cable is anchored where it could chafe or drift<br>3. Specify in cable-laying specification that cable is buried in tidal areas (mudflats at Suva end and reef platform at Nuku'alofa end) | None | Chief Design Engineer – Cable company |
| Habitats, flora and fauna | | | | |
| Protected areas | Disturbance of marine protected areas | 1. Identify a cable route that provides 3 km clearance from marine protected areas and specify this route in the cable-laying specification.<br>2. Keep all survey and support vessels at least 1km clear of marine protected areas during survey period | None | Chief Surveyor – Survey company, Chief Design Engineer – Cable company |
| Coastal habitat | (Accidental) discharge of pollutant by survey vessels | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck<br>2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Low | Chief engineer – Survey company |
| Coastal habitat – sea grass | Destruction of sea grass beds | Confine survey footprint to as narrow a path as possible | Negligible | Chief Surveyor – Survey company, |
| Coastal habitat – coral communities | Destruction of coral communities | Identify a cable route that follows the sandy seabed and avoids coral reefs and outcrops, and specify this route in the cable-laying specification | None | Chief Surveyor – Survey company, Chief Design Engineer –Cable company |
| Oceanic habitat | (Accidental) discharge of pollutants by survey vessels | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck<br>2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Low | Chief engineer – Survey company |

| DESIGN PHASE ENVIRONMENT PLAN | | | | |
|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Residual Impact after mitigation | Responsibility for implementing mitigation measures |
| Oceanic habitat – Hydrothermal vents | Physical damage to vents by cable or cable-laying equipment | Identify a cable route that maintains a minimum clearance of 2 km from active hydrothermal vents, and specify this route in the cable-laying specification. Methods to identify vent sites will be agreed between TCL and the Survey company with input from the World Bank and Asian Development Bank and may include side scan sonar and sledge mounted temperature sensors to detect hydrothermal plumes | Negligible | Chief Surveyor – Survey company, Chief Design Engineer – Cable company |
| | Smothering by disturbed sediments | Identify a cable route that maintains a minimum clearance of 2 km from active hydrothermal vents, and specify this route in the cable-laying specification | Negligible | Chief Surveyor – Survey company, Chief Design Engineer – Cable company |
| | Physical impact on cable of vent water | Identify a cable route that maintains a minimum clearance of 2 km from active hydrothermal vents, and specify this route in the cable-laying specification | Negligible | Chief Surveyor – Survey company, Chief Design Engineer – Cable company |
| Oceanic habitat – Seamounts | Conflict with habitat and fishery | Identify a cable route that maintains a minimum clearance of 2 km from the base of seamounts, and specify this route in the cable-laying specification. The base of seamounts is considered to be when the slopes measured radially from the seamount are less than or equal to the ambient slope of the area | None | Chief Surveyor – Survey company, Chief Design Engineer – Cable company |
| Species of interest – cetaceans | Entanglement in cable risk for deep diving cetaceans | Identify a route to avoid suspended segments of cable by routing along terrain that does not have sharp changes in relief, and specify this route in the cable-laying specification | None | Chief Surveyor – Survey company, Chief Design Engineer – Cable company |
| | Acoustic affect of sonar | 1. Follow best practice for operating vessels in proximity to marine mammals (see Appendix 3)<br>2. Programme survey outside whale migration season if possible<br>3. Post a watch for whales and suspend activities when whales are within 1 km of vessel<br>4. Multi-beam and/or side-scan sonar only – No Air Guns | Low | Chief Surveyor – Survey company |
| Terrestrial habitats, flora and fauna | (Accidental) discharge of pollutants from cable station site | Design all fuel, lubricants and transmission fluids storage in type-approved tanks or drums in a secure bunded area | None | Chief Designer – Construction company |
| People and communities | | | | |
| Oceanic users – deep sea mining | Opportunity lost for mining from conflicting cable placement | Consult mining companies on cable route and endeavour to ensure safe clearance from future mining activities, and specify this route in the cable-laying specification | None | Chief Surveyor – Survey company, Chief Design Engineer – Cable company |
| Coastal users – marine tenure | Cable easement | Negotiate with Fiji customary fishing grounds owners; the Vanua Suva and the Vanua Burebasaga regarding easement for the cable | None | TCL |
| Coastal users – commercial shipping and ports | Physical injury of cable by shipping | 1. Design cable route to minimise risk of inadvertent damage from shipping, and specify this route in the cable-laying specification<br>2. Negotiate with Tonga Port Authority to get a No-anchor zone declared over the location of the cable | Low | Chief Surveyor – Survey company, Chief Design Engineer – Cable company |

| DESIGN PHASE ENVIRONMENT PLAN | | | | |
|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Residual Impact after mitigation | Responsibility for implementing mitigation measures |
| | Disruption to shipping during survey | 1. Follow maritime best-practice<br>2. Request Port Authorities notify local shipping of survey activity where this might pose an abnormal obstruction to shipping<br>3. Programme work to avoid overnight mooring in or alongside harbour shipping channels<br>4. Observe international and national rules of the sea and navigational protocol | Low | Captain – Survey company |
| Coastal users – subsistence and artisanal fisheries | Damage to ecosystem and fishery productivity | Design trenching/laying activities to as narrow a corridor as possible and restore site, and specify this in the cable-laying specification | None | Chief Design Engineer – Cable company |
| Coastal users – aquaculture | Sedimentation of oyster spat-lines in Nuku'alofa Harbour | 1. Specify silt screens to control sediment discharge through the small boat passage from reef platform during trenching and cable laying, and specify this in the cable-laying specification<br>2. Specify that trenching on Nuku'alofa reef platform will occur only within 2hrs of low tide, and specify this in the cable-laying specification | None | Chief Design Engineer – Cable company |
| Terrestrial users and uses | Displacement of peoples | Manage the non-renewal of leases in the three residential properties on the cable station site with understanding and sensitivity | Negligible | GoT, TCL |
| | Generator noise at cable station | Specify that generator rooms be lined sound attenuation material, mufflers are installed and other sound attenuation devices built as appropriate | | |
| Waste Management | Accumulation of inorganic waste in the environment | 1. Collect shipboard waste for ferrying to land-based recycling station or landfill<br>2. Follow waste management policy (see Appendix 5) | Negligible | Chief Engineer –Survey company |
| | Contamination or enrichment of the environment by organic waste and domestic effluent | Design toilets and sewerage system for Tonga cable station that avoids contamination or enrichment of the environment and complies with local regulations | None | Designer – Cable station |
| Health and Safety | Incidents and accidents | Implement a H&S Management Plan | Lost work-time incidents and accidents minimised | Chief Engineer – Survey company |
| Conflicting infrastructure | Damage to buried services during trenching/laying. | 1. Design to avoid Nuku'alofa water main when trenching, and specify this in the cable-laying specification.<br>2. Design to avoid Southern Cross cable when trenching/laying, and specify this in the cable-laying specification | None | Chief Design Engineer – Cable company |

**Table 6.2.** Environmental Management Plan for the **Construction** Phase

| CONSTRUCTION PHASE ENVIRONMENT PLAN | | | | |
|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Residual Impact | Responsibility |
| Physical environment | | | | |
| Climate | Release of Greenhouse Gases from cable-laying plant and machinery | 1. Maintain plant and machinery | Minimised emissions of GHGs | Chief engineer – Cable company |
| | Release of Greenhouse Gases from cable station construction plant and machinery | 1. Maintain vehicles and plant.<br>2. Minimise travel and haulage<br>3. Switch off engines when not in use | Minimised emissions of GHGs | Site supervisor – Construction company |
| Topography | Trenching and foundation work at cable station | 1. Backfill to original contour with original material as per cable laying specification<br>2. Confine disturbance to as small an area as possible as per cable laying specification | None | Site supervisor – Construction company |
| Bathymetry | Trenching over reef platforms | 1. Backfill to original contour with original material as per cable laying specification<br>2. Confine disturbance to as narrow a path as possible as per cable laying specification | None | Chief cable engineer – Cable company |
| Substrate | Foreign substances reacting with the environment or providing a medium for adventive organisms | 1. Backfill with original material as per cable laying specification<br>2. Use only inert/stable materials in cable laying and anchoring as per cable laying specification | None | Chief cable engineer – Cable company |
| Marine hydrology | Disruption to currents | 1. Lay cable with finished profile as low as possible as per cable laying specification<br>2. Anchor cable where it could chafe or drift as per cable laying specification<br>3. Bury cable in tidal areas (mudflats at Suva end and reef platform at Nuku'alofa end) as per cable laying specification | None | Chief cable engineer – Cable company |
| Habitats, flora and fauna | | | | |
| Protected areas | Disturbance of marine protected areas | 1. Lay cable along planned path where there is good clearance from marine protected areas as per cable laying specification<br>2. Keep all laying and support vessels at least 1 km clear of marine protected areas | None | Chief cable engineer – Cable company |
| Coastal habitat | (Accidental) discharge of pollutant by cable laying vessels | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck<br>2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Low | Chief engineer – Cable company |
| | (Accidental) discharge of pollutant by land-based machinery and activities | 1. Contain all fuel, lubricants and transmission fluids in small quantities in tanks or drums in a secure area<br>2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Low | Site supervisor – Construction company |
| Coastal habitat – sea grass | Destruction of sea grass beds or smothering by disturbed sediments | 1. Confine disturbance to as narrow a path as possible as per cable laying specification<br>2. Undertake trenching only within 2hrs of low tide as per cable laying specification<br>3. Erect silt screen around channel mouth and around trench as per cable laying specification | Low | Chief cable engineer – Cable company |

| CONSTRUCTION PHASE ENVIRONMENT PLAN | | | | |
|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Residual Impact | Responsibility |
| Coastal habitat – coral communities | Destruction of coral communities | Lay cable on designed path (on the sandy seabed, avoiding coral reefs and outcrops) as per cable laying specification | None | Chief cable engineer – Cable company |
| Oceanic habitat | (Accidental) discharge of pollutants by cable laying vessels | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck<br>2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Low | Chief engineer – Cable company |
| Oceanic habitat – Hydrothermal vents | Damage to vents or cable | Lay cable on designed path (minimum clearance of 2 km from active hydrothermal vents) as per cable laying specification | None | Chief cable engineer – Cable company |
| Oceanic habitat – Seamounts | Conflict with habitat and fishery | Lay cable on designed path (minimum clearance of 2 km from base of seamounts) as per cable laying specification | None | Chief cable engineer – Cable company |
| Species of interest – cetaceans | Entanglement in cable risk for deep diving cetaceans | Control cable tension so that laid cable conforms to undulations of seabed as per cable laying specification | Low | Chief cable engineer – Cable company |
| Terrestrial habitats, flora and fauna | (Accidental) discharge of pollutants from cable station site | 1. Contain all fuel, lubricants and transmission fluids in small quantities in type-approved tanks or drums in a secure area<br>2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Low | Site supervisor – Construction company |
| | Increased stormwater runoff and sedimentation from cable station site | 1. Minimise bare-ground exposure during demolition and site preparation as per cable station construction specification<br>2. Install sediment traps and settlement ponds as appropriate as per cable station construction specification<br>3. Store soil and aggregate away from drainage area.<br>4. Revegetate and rehabilitate worksite following work | Low | Site supervisor – Construction company |
| People and communities | | | | |
| Local communities | Disruption to subsistence fishing on reef platforms | 1. Minimise time spent trenching and laying on reef platforms as per cable laying specification<br>2. Minimise areal extent of trenching and laying on reef platforms as per cable laying specification | Negligible | Chief cable engineer – Cable company |
| Oceanic users – commercial fisheries | Entanglement of gear | 1. Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities<br>2. Notify cable location to authorities so it is issued as a Notice to Mariners and appears on electronic and paper charts | Negligible | Cable company |
| | Displacement of fishing during laying | Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities | Low | Cable company |
| Oceanic users – deep sea mining | Displacement of prospecting during laying | Advise mining companies of cable-laying, dates, and safe clearance for other activities | Negligible | Cable company |
| Oceanic users – deep sea mining | Physical injury of cable by possible future mining | Ensure cable is laid on agreed path | Negligible | Cable company |
| Coastal users – marine tenure | Cable easement | Advise Fiji customary fishing grounds owners; the Vanua Suva and the Vanua Burebasaga of cable-laying, dates, and safe clearance for other activities | None | TCL |

| CONSTRUCTION PHASE ENVIRONMENT PLAN | | | | |
|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Residual Impact | Responsibility |
| Coastal users – commercial shipping and ports | Physical injury of cable by shipping | 1. Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities<br>2. Request Port Authorities to advise local shipping of laying activities and avoidance measures<br>3. Notify cable location to authorities so it is issued as a Notice to Mariners and appears on electronic and paper charts | Negligible | Cable company |
| | Disruption to shipping during cable laying | 1. Follow maritime best-practice<br>2. Ensure marker buoys and navigational lights are deployed and activated on cable-laying and support vessels. Navigational lights are to be fully operational from 6.00 p.m. to 6.00 a.m. daily<br>3. Request Port Authorities notify local shipping of cable-laying activity<br>4. Programme work to avoid overnight mooring in or alongside harbour shipping channels<br>5. Observe international and national rules of the sea and navigational protocol | Negligible | Captain – Cable company |
| Coastal users – gravel and sand extraction | Disruption of dredging activities during cable laying | 1. Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities<br>2. Request Port Authorities to advise local operators of cable placement and avoidance measures | Negligible | Cable company |
| Coastal users – subsistence and artisanal fisheries | Displacement of activities during cable laying | 1. Request Fisheries authorities to advise local fishers of laying activities, dates, and avoidance measures<br>2. Confine trenching/laying activities to as short a period as possible | Low | Cable company |
| | Entanglement of gear | Consider placing warning markers along cable line in shallow (<10 m) waters | Negligible | Cable-laying company, TCL |
| | Damage to ecosystem and fishery productivity | 1. Confine trenching/laying activities to as narrow a corridor as possible and restore site when finished<br>2. Confine trenching/laying activities to as short a period as possible | Negligible | Chief cable engineer – Cable company |
| Coastal users – game fisheries | Displacement of activities during cable laying | 1. Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities<br>2. Request Port Authorities to advise local operators of laying activities and avoidance measures | Negligible | Cable company |
| | Entanglement of gear | Notify cable location to authorities so it is issued as a Notice to Mariners and appears on electronic and paper charts | Negligible | Cable company |
| | Damage to ecosystem and fishery productivity | 1. Confine laying activities to the planned corridor<br>2. Confine laying activities to as short a period as possible | Negligible | Chief cable engineer – Cable company |
| Coastal users – aquaculture | Sedimentation of oyster spat-lines in Nuku'alofa Harbour | 1. Install silt screens to control sediment discharge through the small boat passage from reef platform during trenching and cable-laying<br>2. Do trenching on Nuku'alofa reef platform only within 2 hrs of low tide | Negligible | Chief cable engineer – Cable company |
| Terrestrial users and uses | Disruption | 1. Communicate plans and expectations with neighbours – adapt plans where appropriate<br>2. Confine construction to work hours | Low | TCL, Construction company |

| CONSTRUCTION PHASE ENVIRONMENT PLAN | | | | |
|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Residual Impact | Responsibility |
| | Noise and dust | 1. Communicate plans and expectations with neighbours – adapt plans where appropriate<br>2. Confine construction to work hours<br>3. Water down bare ground during dry conditions | Low | TCL, Construction company |
| | Generator noise at cable station | Generator rooms lined with sound attenuation material, mufflers installed and other sound attenuation devices built as appropriate | Low | TCL, Construction company |
| | Aesthetics | 1. Keep work sites clean and tidy<br>2. Rehabilitate and landscape sites following work | Low | TCL, Construction company |
| Waste Management | Accumulation of inorganic waste in the environment | 1. Collect shipboard waste for ferrying to land-based recycling station or landfill<br>2. Collect cable station waste for recycling or disposal in landfill<br>3. Thoroughly clear all sites (terrestrial and marine) of discarded cordage, plastic and other waste<br>4. Follow waste management policy (see Appendix 5) | Negligible | Chief Engineer – Cable company, Site supervisor – Construction company |
| | Contamination or enrichment of the environment by organic waste and domestic effluent | 1. Provide temporary toilets for construction staff with disposal of effluent into municipal sewerage system<br>2. Collect other waste for composting or disposal in landfill<br>3. Follow waste management policy (see Appendix 5) | Negligible | Site supervisor – Construction company |
| Health and Safety | Incidents and accidents | Implement a H&S Management Plan | Lost work-time incidents and accidents minimised | Cable Company, Construction Company |
| Conflicting infrastructure | Damage to buried services during trenching/laying. | 1. Liaise with TWB to avoid Nuku'alofa water main when trenching.<br>2. Liaise with FinTel to avoid Southern Cross cable when trenching/laying. | None | Chief cable engineer – Cable company |

TCL in consultation with the contractor and affected stakeholders, will provide compensation in compliance with the CPF for the temporary or permanent loss, restriction or disturbance of these resources and/or infrastructure in both Fiji and/or Tonga, except in the case of negligence or breach of contract caused by any act and/or omission of the contractor, its sub-contractors, representatives, agents or employees, in which case the contractor will be solely responsible for all the costs.

**Table 6.3**. Environmental Management Plan for the **Operational** Phase

| OPERATIONAL PHASE ENVIRONMENT PLAN | | | | |
|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Residual Impact | Responsibility |
| Physical environment | | | | |
| Climate | Release of Global Greenhouse Gases | 1. Maintain generators and plant<br>2. Use least GHG-emitting national grid power wherever possible<br>3. Minimise travel – use electronic conferencing where possible | Minimised emissions of GHGs | TCL |
| Habitats, flora and fauna | | | | |
| Marine habitat | (Accidental) discharge of pollutant by cable repair ship | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck<br>2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Low | Cable repair company |
| Oceanic habitat – Hydrothermal vents | Physical impact on cable of vent water | New vents can appear in proximity to the cable and re-routing of cable may be required to maintain safe clearance | Negligible | Cable repair company |
| Terrestrial habitats, flora and fauna | (Accidental) discharge of pollutants from cable station | 1. Contain all fuel in type-approved tanks or drums in a secure bunded area<br>2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Low | TCL |
| People and communities | | | | |
| Terrestrial users and uses | Generator noise at cable station | Undertake maintenance during work hours | Negligible | TCL |
| | Aesthetics | Maintain landscaping and gardens at cable station | Significant positive impact | TCL |
| Waste Management | Accumulation of waste in the environment | Follow waste management policy (Appendix 5) | Negligible | TCL |
| Health and Safety | Incidents and accidents | Maintain a H&S Management Plan | Lost work-time incidents and accidents minimised | TCL |
| Conflicting infrastructure | Displacement/impairment of future activities by other agencies | Remain open to discussion that would lead to accommodation of future development | Negligible | TCL |

## 6.3 Mitigation measures

Proposals for mitigation are identified in Table 6.1 (for the Design phase), Table 6.2 (for the Construction phase) and Table 6.3 (for the Operational phase) and are summarised below as follows:

During Design:

- Conduct a marine route survey to identify a path for the cable that:
  - avoids, coral formations
  - avoids active and extinct hydrothermal vents by 2 km
  - avoids seamounts by 2 km from their base
  - ensures marine protected areas remain at least 3 km from the cable
  - follows terrain of gentle relief to avoid suspended segments of cable
- Recognising the potential effect of sonar on cetaceans:
  - avoid intensive sonar activity during the whale migrating season (Jul-Nov)
  - follow best practice for operating vessels in proximity to marine animals
- Design trenching in tidal and terrestrial areas to be as low impact as possible by:
  - minimising the extent of the disturbance
  - minimising the duration of the disturbance
  - restoring sites when complete using original materials where appropriate
- Specify avoidance of sediment discharges from construction/excavation sites by:
  - minimising bare ground exposure
  - installing sediment traps and settling ponds as appropriate
- Specify avoidance of discharge of pollutants to soil and water by:
  - containing fuels, lubricants, transmission fluids, etc., in secure places
  - maintaining a contingency plan to address spills and leaks
- Work toward mutually satisfactory outcomes with:
  - customary fishing groups with use rights over the Suva approaches
  - deep-sea mining companies with prospecting licences west of Tongatapu
  - neighbours potentially affected by building of the Tonga cable station
  - other infrastructure agencies potentially affected by the development
- Demonstrate social responsibility by:
  - instituting a Health and Safety Management Plan
  - adopting a waste management policy (within constraints imposed by in-country conditions)
  - designing toilets and a sewerage system for the Tonga cable station that avoid contamination or enrichment of the environment

During Construction:

- Avoid conflict with sensitive areas by:
  - laying cable exactly along the design path as determined in the marine route survey
- When trenching to bury the cable in tidal and terrestrial areas:
  - minimise the extent of the disturbance
  - minimise the duration of the disturbance
  - restore sites when complete using original materials where appropriate
- Avoid sediment discharges from construction/excavation sites by:
  - minimising bare ground exposure

    - installing sediment traps and settling ponds as appropriate
- Avoid discharge of pollutants to soil and water by:
    - containing fuels, lubricants, transmission fluids, etc., in secure places
    - maintaining a contingency plan to address spills and leaks
- Ensure cable is formally notified to marine users through:
    - issuing a 'Notice to Mariners'
    - updates to electronic and paper navigational charts
    - targeted notification of local users by port authorities and marine radio
    - dialogue with particular users as appropriate
    - placing warning markers along cable line in particular areas if appropriate
- Demonstrate social responsibility by:
    - instituting a Health and Safety Management Plan
    - adopting a waste management policy (within constraints imposed by in-country conditions)

During Operations:

- Minimise carbon footprint by:
    - maintaining generators and plant
    - using lowest footprint power provider where practical
    - utilising electronic conferencing as a substitute for travel where practical
- Avoid discharge of pollutants to soil and water by:
    - containing fuels, lubricants, transmission fluids, etc. in secure places
    - maintaining a contingency plan to address spills and leaks
- Demonstrate social responsibility by:
    - maintaining a Health and Safety Management Plan
    - following a sound waste management policy (within constraints imposed by in-country conditions)
    - remaining open to dialogue with other agencies contemplating future infrastructure development

To maximise the benefits to the kingdom of Tonga, and minimise the impacts from this development, we recommend that Tonga Cable Limited be open to genuine collaboration with other institutions to ensure effective delivery of public good outcomes to the people of Tonga, efficient use of resources and effective delivery of environmental results. Institutions (including MAFFF, MECC, MoT, and PAT) have common concerns and agendas in respect to the environmental management of the Fiji–Tonga Cable System, and must be prepared to pool their resources and engage in genuine partnerships to tackle common issues.

### 6.4 Institutional Capacity Assessment

Four agencies in Tonga have key responsibilities and/or jurisdiction for management of the project and its environmental and social impacts that may occur in Tonga:

- Tonga Cable Ltd, the implementing agency of the project.
- The Ministry for Environment and Climate Change, as the regulatory agency for environmental matters in Tonga.
- Tonga Port Authority, as the administrative agency in matters relating to shipping and operations in, and approaching, Nuku'alofa Harbour.

- The Ministry of Transport's Department of Marine and Ports as the focal agency for international conventions relating to maritime transport and shipping operations on the high seas.

One agency in Fiji, the Department of Environment, has key responsibilities and/or jurisdiction for management of the project and its environment and social impacts that may occur in Fiji.

### Tonga Cable Ltd

TCL is a new corporate entity that is currently majority-owned by the Government-owned, Tonga Communications Corporation (TCC), but there is an intention is to open 20% of shares to private investors. It currently has an interim managing director but no operational staff. The proposed development, articulated by the funding agencies (WB/ADB) in Appendix 1, intends to support TCL during the Design and Construction phases with funding and resources to provide project administration (procurement, financial management, and auditing) functions. This leaves a capability and capacity gap in the management of the Environmental Management Plan and the relationships that stem from it with regulatory and stakeholder agencies. Section 6.5 proposes resourcing TCL with additional capabilities to fill this gap.

### Ministry for Environment and Climate Change – Tonga

The newly created MECC has a small staff, some of whom have capabilities in the oceanic or coastal marine environment. Most of the Ministry's work is in policy and regulation and their capacity to undertake field work is limited by both staffing and funding (and mandate). In the context of this project, MECC will perform a key verification role and, while their lack of operational capacity prevents a more 'hands-on' role in monitoring, we do not believe their current mandate makes it appropriate and practical to build this capacity in the short-duration construction phase of this development.

### Port Authority Tonga

The Port Authority Tonga (PAT) was constituted by act of parliament in 1998 and now operates as a public enterprise under the Public Enterprises Act 2002. It operates the port at Nuku'alofa from its offices in the port complex. In many respects, dealing with the Project's maritime operation is 'business as usual' for the PAT, being, at a macro level, simply the entry and departure of one or more foreign-going vessels to the Port of Nuku'alofa. What makes the project's operation unusual is the cable-laying activity that will be contained, or adjacent to, the main shipping channel, and the sub-sea infrastructure (the cable) that remains afterward. The PAT should be engaged with three areas in the project:

- **Vessel management** during construction (cable-laying)
- **Contingency planning** for unlikely, but potentially catastrophic, events such as a vessel-grounding or a spillage
- **Notification and charting** is a responsibility shared between the development project and local and international maritime authorities. To expedite implementation in the environmentally-sensitive environs of Nuku'alofa Harbour, the project's Marine Coordinator (see Section 6.5) should work with the PAT (and DMP below) to ensure

that notices to mariners (including local users) are promptly lodged, and charts and plan edits made as appropriate and any markers or signage are quickly installed.

#### Department of Marine and Ports – Tonga

The Department of Marine and Ports (DMP) is a division of the Ministry of Transport. Its function is primarily regulatory although, under the Ports Management Act 2001, it does operate the ports in other islands in Tonga. Of relevance to this project is the role the DMP has as principle authority in respect to shipping and maritime operations out to the limit of Tonga's Exclusive Economic Zone. In that sense it is the offshore analogue of the PAT, with the same sort of engagement required in contingency planning and notification as well as general compliance with international maritime conventions.

#### Department of Environment – Fiji

The Department of Environment Fiji has a small staff with a very limited capability in the marine sector. Like their counterparts in Tonga, most of the Department's work is in policy and regulation and their capacity to undertake field work is limited by both staffing and funding. In the context of this project, the role of Department of Environment, Fiji is viewed as a verification agency role; and while we acknowledge the lack of institutional capacity for a more active role in monitoring, we do not believe this capacity needs building in order to fulfil a more supervisory role.

### 6.5 Implementation and administrative arrangements

The preceding assessment of the key environmental agencies of government in Tonga and Fiji has identified their limited capacity and/or mandate to take a leading operational role in the implementation of the Environment Management Plan. In addition, the role of each agency is fragmented across the EMP with no clear overall responsibility.

Recognising that severe impacts are unlikely to occur and the consequent lack of need for detailed actions under the EMP, the EA Team believes the capacity necessary to implement the plan should be embedded within TCL.

Under this plan, Tonga Cable Limited retains overall responsibility for the construction and operation of the Fiji–Tonga Cable System, with the Southern Cross cable station manager (currently FinTel) being contracted to provide services from the Fiji end.

The Chief Executive or Managing Director of TCL will take responsibility for environmental management and will employ a specialist environmental consultant for particular aspects of the operation that impacts upon the environment and for monitoring and reporting as appropriate.

All environmental monitoring will be done by TCL, who will report the compliance with the management plan using the monitoring plan framework to the Dept of Environment in Tonga, for activities conducted within Tongan jurisdictions, and to Fiji Dept of Environment, for activities conducted within Fijian jurisdiction.

The EA Team proposes supporting TCL's project management group with an environmental coordination role. This role could be vested in a single person or a small team (the cleanest,

most transparent and manageable option) but may also include partial delegation of this role to the survey and construction providers. The latter option is attended by some questions relating to independence and impartiality but may be an appropriate expedient in monitoring shipboard operations for example. Whatever is decided, the role of the Environmental Coordinator(s) (EC) would be to:

- apply the Monitoring Plan to monitor all service providers, and document their compliance with the Environmental Management Plan
- liaise with appropriate agencies of government in Fiji and Tonga to ensure they are fully engaged and comfortable with the conduct and performance of the Environmental Management Plan
- respond quickly and effectively with corrective and remedial action to unforeseen environmental impacts as circumstances demand
- engage appropriate ministries in their respective domains in evaluation, certifying compliance and reporting against the objectives in the EMP
- assist in securing requisite approvals and consents as directed by the Project Manager

The following indicative costs plan of the environmental coordination role is based on an assumed international consultant (or consultants) making an estimated six, approximately 2-week missions during the course of the project at the following key stages: marine route survey, detailed design, pre-cable lay, cable lay, post-cable lay, and commissioning. The Environmental Coordinator(s) assisting with the Marine Route Survey will also act as marine mammal observer(s). To fulfil this role, the individual(s) will need some instruction from an appropriate organisation or will need in some way to collaborate with that organisation.

| Component | Personnel | Est Operating | Est Labour |
|---|---|---|---|
| Environmental coordination | EC | US$23,000 | US$90,000 |

Appendix 6 contains the key elements of the terms of reference for the Environmental Coordination role.

## 6.6 Monitoring plan

The monitoring plan follows the same format as the environmental assessment and Environmental Management Plan (Tables 6.1, 6.2 and 6.3) being divided into the design, construction, and operation phases of the project. For each mitigation measure, the plan identifies the indicators necessary to verify that the mitigation has been applied. Each indicator has a means of verification that comprises the documentary evidence for the mitigation and the person/agency responsible for undertaking the monitoring. In most instances the main form of monitoring is compliance against the Environmental Management Plan.

**Table 6.4.** Monitoring Plan for the **Design** Phase

| DESIGN PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| Physical environment | | | | | | |
| Climate | Release of Greenhouse Gases from survey machinery | Maintain plant and machinery | Plant and machinery serviced according to manufacturers instructions | Citation of relevant section of service log books | TCL – Environment Coordinator (or delegate) | None |
| Substrate | Foreign substances reacting with the environment or providing a medium for adventive organisms | 1. Specify in cable-laying specification that all backfill be with original material | Specification contained in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |
| | | 2. Specify in cable-laying specification that only inert/stable materials be used in cable laying and anchoring | Specification contained in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |
| Marine hydrology | Disruption to currents | 1. Specify in cable-laying specification that cable is laid with finished profile as low as possible | Specification contained in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |
| | | 2. Specify in cable-laying specification that cable is anchored where it could chafe or drift | Specification contained in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |
| | | 3. Specify in cable-laying specification that cable is buried in tidal areas (mudflats at Suva end and reef platform at Nuku'alofa end) | Specification contained in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |
| Habitats, flora and fauna | | | | | | |
| Protected areas | Disturbance of marine protected areas | 1. Identify a cable route that provides 3 km clearance from marine protected areas and specify this route in the cable-laying specification | Proximity from marine protected areas | Cable route overlaid with protected area boundaries | TCL – Environment Coordinator | None |
| | | 2. Keep all survey and support vessels at least 1km clear of marine protected areas during survey period | Proximity from marine protected areas | Diarised observations and/or survey vessel position plotters | TCL – Environment Coordinator | None |

| DESIGN PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| Coastal habitat | (Accidental) discharge of pollutant by survey vessels | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck | Location of fuel, lubricants and transmission fluids | Visual inspection | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Maintain a contingency plan to address spills and cyclones (see Appendix 4). | Plan published and understood by relevant employees of survey company | Presence of plan and appropriate responders | TCL – Environment Coordinator (or delegate) | None |
| Coastal habitat – sea grass | Destruction of sea grass beds | Confine survey footprint to as narrow a path as possible | Specification contained in cable laying plan | Citation of relevant section of cable laying plan | TCL– Environment Coordinator | None |
| Coastal habitat – coral communities | Destruction of coral communities | Identify a cable route that follows the sandy seabed and avoids coral reefs and outcrops, and specify this route in the cable-laying specification | Specification contained in cable laying plan | Cable route overlaid on georeferenced charts and/or satellite imagery | TCL – Environment Coordinator | None |
| Oceanic habitat | (Accidental) discharge of pollutants by survey vessels | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck | Location of fuel, lubricants and transmission fluids | Visual inspection | TCL – Environment Coordinator | None |
| | | 2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Plan published and understood by relevant employees of survey company | Presence of plan and appropriate responders | TCL – Environment Coordinator | None |
| Oceanic habitat – Hydrothermal vents | Physical damage to vents by cable or cable-laying equipment | Identify a cable route that maintains a minimum clearance of 2 km from active hydrothermal vents, and specify this route in the cable-laying specification. Methods to identify vent sites will be agreed between TCL and the Survey company with input from the World Bank and Asian Development Bank and may include side scan sonar and sledge mounted temperature sensors to detect hydrothermal plumes | No hydrothermal vents detected within specified proximity | Data collected by survey vessel – cable route overlaid on vent sites identified | TCL – Environment Coordinator | None |
| | Smothering by disturbed sediments | Identify a cable route that maintains a minimum clearance of 2 km from active hydrothermal vents, and specify this route in the cable-laying specification. Methods to identify vent sites will be agreed between TCL and the Survey company with input from the World Bank and Asian Development Bank and may include side scan sonar and sledge mounted temperature sensors to detect hydrothermal plumes | No hydrothermal vents detected within specified proximity | Data collected by survey vessel – cable route overlaid on vent sites identified | TCL – Environment Coordinator | None |

| DESIGN PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| | Physical impact on cable of vent water | Identify a cable route that maintains a minimum clearance of 2 km from active hydrothermal vents, and specify this route in the cable-laying specification. Methods to identify vent sites will be agreed between TCL and the Survey company with input from the World Bank and Asian Development Bank and may include side scan sonar and sledge mounted temperature sensors to detect hydrothermal plumes | No hydrothermal vents detected within specified proximity | Data collected by survey vessel – cable route overlaid on vent sites identified | TCL – Environment Coordinator | None |
| Oceanic habitat – Seamounts | Conflict with habitat and fishery | Identify a cable route that maintains a minimum clearance of 2 km from the base of seamounts, and specify this route in the cable-laying specification. The base of seamounts is considered to be when the slopes measured radially from the seamount are less than or equal to the ambient slope of the area | No seamounts within specified proximity | Data collected by survey vessel – cable route overlaid on vent sites identified | TCL – Environment Coordinator | None |
| Species of interest – cetaceans | Entanglement in cable risk for deep diving cetaceans | Identify a route to avoid suspended segments of cable by routing along terrain that does not have sharp changes in relief, and specify this route in the cable-laying specification | No terrain along route likely to cause sections of suspended cable (as determined by qualified cable surveyor) | Data collected by survey vessel – cable route overlaid on map of bathymetry | TCL – Environment Coordinator | None |
| | Acoustic affect of sonar | 1. Follow best practice for operating vessels in proximity to marine mammals (see Appendix 3) | Best practice guidelines in Appendix 3 (or an equivalent) implemented | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Programme survey outside whale migration season if possible | Marine Route Survey programme | Survey dates cited in Marine Route Survey report | TCL – Environment | None |
| | | 3. Post a watch for whales and suspend activities when whales are within 1 km of vessel | Whale watcher(s) posted and active | Diarised observations | TCL – Environment Coordinator (or delegate) | Training of watcher in whale recognition |
| | | 4. Multi-beam and/or side-scan sonar only – No Air Guns | Marine Route Survey specification, applied in practice | Citation of relevant section of Marine Route Survey specification verified in practice by diarised observations | TCL – Environment Coordinator (or delegate) | None |
| Terrestrial habitats, flora and fauna | (Accidental) discharge of pollutants from cable station site | Design all fuel, lubricants and transmission fluids storage in type-approved tanks or drums in a secure bunded area | Specification and plans for Tonga cable station | Citation of relevant section of specification and plans for Tonga cable station | TCL – Environment Coordinator | None |
| People and communities | | | | | | |
| Oceanic users – deep sea mining | Opportunity lost for mining by conflicting cable placement | Consult mining companies on cable route and endeavour to ensure safe clearance from future mining activities, and specify this route in the cable-laying specification | Specification contained in cable laying plan | Citation of relevant section of cable laying plan supported by minutes of meetings with mining companies | TCL – Environment Coordinator | None |

| DESIGN PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| Coastal users – marine tenure | Cable easement | Negotiate with Fiji customary fishing grounds owners; the Vanua Suva and the Vanua Burebasaga regarding easement for the cable | Easement agreements reached with customary fishing ground owners | Agreements cited | TCL – Environment Coordinator | None |
| Coastal users – commercial shipping and ports | Physical injury of cable by shipping | 1. Design cable route to minimise risk of inadvertent damage from shipping, and specify this route in the cable-laying specification | Cable laying route plan | Cited section of Cable laying route plan supported by minutes of meetings with port authorities | TCL – Environment Coordinator | None |
| | | 2. Negotiate with Tonga Port Authority to get a No-anchor zone declared over the location of the cable | Cable path falls within No-anchor zone in vulnerable areas | Cable design path maps over No-anchor zone | TCL – Environment Coordinator | None |
| | Disruption to shipping during survey | 1. Follow maritime best-practice | Rules of the road at sea, followed operational notices issued, and other navigational / ship-handling practices applied | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Request Port Authorities notify local shipping of survey activity where this might pose an abnormal obstruction to shipping. | Local shipping notice(s) issued | Local shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator (or delegate) | None |
| | | 3. Programme work to avoid overnight mooring in or alongside harbour shipping channels | No overnight mooring in or alongside harbour shipping channels | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 4. Observe international and national rules of the sea and navigational protocol | Rules of the road at sea, followed operational notices issued, and other navigational / ship-handling practices applied | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| Coastal users – subsistence and artisanal fisheries | Damage to ecosystem and fishery productivity | Design trenching/laying activities to as narrow a corridor as possible and restore site, and specify this in the cable-laying specification | Specification contained in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |
| Coastal users – aquaculture | Sedimentation of oyster spat-lines in Nuku'alofa Harbour | 1. Specify silt screens to control sediment discharge through the small boat passage from reef platform during trenching and cable laying, and specify this in the cable-laying specification | Silt screen specification contained in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |
| | | 2. Specify that trenching on Nuku'alofa reef platform will occur only within 2 hrs of low tide, and specify this in the cable-laying specification | Trenching specification contained in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |
| Terrestrial users and uses | Displacement of peoples | Manage the non-renewal of leases in the three residential properties on the cable station site with understanding and sensitivity | Leases terminated | Cited correspondence and/or rental agreements | | None |
| | Generator noise at cable station | Specify that generator rooms be lined sound attenuation material, mufflers are installed and other sound attenuation devices built as appropriate | Generator noise attenuation specification in cable station construction plan | Citation of relevant section of cable station construction plan | TCL – Environment Coordinator | None |

| DESIGN PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| Waste Management | Accumulation of inorganic waste in the environment | 1. Collect shipboard waste for ferrying to land-based recycling station or landfill | Waste collected and transferred to land-based station | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Follow waste management policy (see Appendix 5) | Waste management policy in Appendix 5 (or an equivalent) specified in construction documents for Tonga cable station | Citation of relevant section of construction documents for Tonga cable station | TCL – Environment Coordinator | None |
| | Contamination or enrichment of the environment by organic waste and domestic effluent | Design toilets and sewerage system for Tonga cable station that avoids contamination or enrichment of the environment and complies with local regulations | Approved, compliant septic system specified in construction documents for Tonga cable station | Citation of relevant section of construction documents for Tonga cable station | TCL – Environment Coordinator | None |
| Health and Safety | Incidents and accidents | Implement a H&S Management Plan | Appropriate H&S Management is specified in all relevant specification documents associated with the project | Citation of relevant section of specification documents | TCL – Environment Coordinator | None |
| Conflicting infrastructure | Damage to buried services during trenching/laying. | 1. Design to avoid Nuku'alofa water main when trenching, and specify this in the cable-laying specification | Avoidance measures and appropriate authorities specified in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |
| | | 2. Design to avoid Southern Cross cable when trenching/laying, and specify this in the cable-laying specification | Avoidance measures and appropriate authorities specified in cable laying plan | Citation of relevant section of cable laying plan | TCL – Environment Coordinator | None |

**Table 6.5.** Monitoring Plan for the **Construction** Phase

| CONSTRUCTION PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| Physical environment | | | | | | |
| Climate | Release of Greenhouse Gases from cable-laying plant and machinery | Maintain plant and machinery | Plant and machinery serviced according to manufacturer's instructions | Citation of relevant section of service log books | TCL – Environment Coordinator (or delegate) | None |
| | Release of Greenhouse Gases from cable station construction plant and machinery | 1. Maintain vehicles and plant. | Plant and machinery serviced according to manufacturer's instructions | Citation of relevant section of service log books | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Minimise travel and haulage | Shared rides, multiple purpose travel | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 3. Switch off engines when not in use | No unnecessary engine running | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| Topography | Trenching and foundation work at cable station | 1. Backfill to original contour with original material as per cable laying specification | Original material stockpiled and re-used | Diarised observations | TCL – Environment Coordinator | None |
| | | 2. Confine disturbance to as small an area as possible as per cable laying specification | Construction footprint not excessive | Diarised observations | TCL – Environment Coordinator | None |
| Bathymetry | Trenching over reef platforms | 1. Backfill to original contour with original material as per cable laying specification | Cable laying specification followed – original material stockpiled and re-used | Diarised observations / photography | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Confine disturbance to as small an area as possible as per cable laying specification | Cable laying specification followed – construction footprint not excessive | Diarised observations / photography | TCL – Environment Coordinator (or delegate) | None |
| Substrate | Foreign substances reacting with the environment or providing a medium for adventive organisms | 1. Backfill with original material as per cable laying specification | Cable laying specification followed – original material stockpiled and re-used | Diarised observations / photography | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Use only inert/stable materials in cable laying and anchoring as per cable laying specification | Cable laying specification followed – only inert/stable materials used in laying and anchoring | Diarised observations | TCL – Environment Coordinator (or delegate) | None |

| CONSTRUCTION PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| Marine hydrology | Disruption to currents | 1. Lay cable with finished profile as low as possible as per cable laying specification | Cable laying specification followed – cable profile minimised | Diarised observations / photography | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Anchor cable where it could chafe or drift as per cable laying specification | Cable laying specification followed – anchoring systems used as appropriate | Observation and/or citation of cable laying report | TCL – Environment Coordinator (or delegate) | None |
| | | 3. Bury cable in tidal areas (mudflats at Suva end and reef platform at Nuku'alofa end) as per cable laying specification | Cable laying specification followed – cable buried on mudflat and reef platform | Observation and/or citation of cable laying report | TCL – Environment Coordinator | None |
| Habitats, flora and fauna | | | | | | |
| Protected areas | Disturbance of marine protected areas | 1. Lay cable along planned path where there is good clearance from marine protected areas as per cable laying specification | Cable laying specification followed – cable laid along planned path | As-laid plan overlaid on design plan | TCL – Environment Coordinator | None |
| | | 2. Keep all laying and support vessels at least 1km clear of marine protected areas | Proximity from marine protected areas | Diarised observations and/or vessel position plotters | TCL – Environment Coordinator | None |
| Coastal habitat | (Accidental) discharge of pollutant by cable laying vessels | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck | Location of fuel, lubricants and transmission fluids | Visual inspection | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Plan published and understood by relevant employees of survey company | Presence of plan and appropriate responders | TCL – Environment Coordinator (or delegate) | None |
| | (Accidental) discharge of pollutant by land-based machinery and activities | 1. Contain all fuel, lubricants and transmission fluids in small quantities in tanks or drums in a secure area | Location of fuel, lubricants and transmission fluids | Visual inspection | TCL – Environment Coordinator | None |
| | | 2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Plan published and understood by relevant employees of survey company | Presence of plan and appropriate responders | TCL – Environment Coordinator | None |
| Coastal habitat- sea grass | Destruction of sea grass beds or smothering by disturbed sediments | 1. Confine disturbance to as narrow a path as possible as per cable laying specification | Cable laying specification followed - construction footprint not excessive | Diarised observations / photography | TCL – Environment Coordinator | None |
| | | 2. Undertake trenching only within 2hrs of low tide as per cable laying specification | Cable laying specification followed - construction only within 2 hrs of low tide | Diarised observations / photography | TCL – Environment Coordinator | None |
| | | 3. Erect silt screen around channel mouth and around trench as per cable laying specification | Cable laying specification followed – screens used | Diarised observations / photography | TCL – Environment Coordinator | None |

| CONSTRUCTION PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| Coastal habitat – coral communities | Destruction of coral communities | Lay cable on designed path (on the sandy seabed, avoiding coral reefs and outcrops) as per cable laying specification | Cable laying specification followed – coral formations avoided | As-laid plan overlaid on design plan | TCL – Environment Coordinator | None |
| Oceanic habitat | (Accidental) discharge of pollutants by cable laying vessels | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck | Location of fuel, lubricants and transmission fluids | Visual inspection | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Plan published and understood by relevant employees of survey company | Presence of plan and appropriate responders | TCL – Environment Coordinator (or delegate) | None |
| Oceanic habitat – Hydrothermal vents | Damage to vents or cable | Lay cable on designed path (minimum clearance of 2 km from active hydrothermal vents) as per cable laying specification | Cable laying specification followed – known hydrothermal vents avoided | As-laid plan overlaid on design plan | TCL – Environment Coordinator | None |
| Oceanic habitat – Seamounts | Conflict with habitat and fishery | Lay cable on designed path (minimum clearance of 2 km from base of seamounts) as per cable laying specification | Cable laying specification followed – seamounts avoided | As-laid plan overlaid on design plan | TCL – Environment Coordinator | None |
| Species of interest – cetaceans | Entanglement in cable risk for deep diving cetaceans | Control cable tension so that laid cable conforms to undulations of seabed as per cable laying specification | Cable laying specification followed – design path followed | As-laid plan overlaid on design plan perhaps supported by cable tension record | TCL – Environment Coordinator | None |
| Terrestrial habitats, flora and fauna | (Accidental) discharge of pollutants from cable station site | 1. Contain all fuel, lubricants and transmission fluids in small quantities in type-approved tanks or drums in a secure area | Location of fuel, lubricants and transmission fluids | Visual inspection | TCL –- Environment Coordinator | None |
| | | 2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Plan published and understood by relevant employees of survey company | Presence of plan and appropriate responders | TCL – Environment Coordinator | None |
| | Increased stormwater runoff and sedimentation from cable station site | 1. Minimise bare-ground exposure during demolition and site preparation as per cable station construction specification | Cable station construction specification followed – construction footprint not excessive | Diarised observations | TCL – Environment Coordinator | None |
| | | 2. Install sediment traps and settlement ponds as appropriate as per cable station construction specification | Cable station construction specification followed – sediment traps and ponds used | Diarised observations / photography | TCL – Environment Coordinator | None |
| | | 3. Store soil and aggregate away from drainage areas | Soils and aggregate stored away from drainageways | Diarised observations / photography | TCL - Environment Coordinator | None |
| | | 4. Revegetate and rehabilitate worksite following work | Site landscaped and revegetated | Diarised observations / photography | TCL – Environment Coordinator (or delegate) | None |

| CONSTRUCTION PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| People and communities | | | | | | |
| Local communities | Disruption to subsistence fishing on reef platforms | 1. Minimise time spent trenching and laying on reef platforms as per cable laying specification | Construction time on reef platforms not excessive | Diarised observations / photography | TCL – Environment Coordinator | None |
| | | 2. Minimise areal extent of trenching and laying on reef platforms as per cable laying specification | Cable laying specification followed – construction footprint not excessive | Diarised observations / photography | TCL – Environment Coordinator | None |
| Oceanic users – commercial fisheries | Entanglement of gear | Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities | Shipping notice(s) issued | Shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator | None |
| | | Notify cable location to authorities so it is issued as a Notice to Mariners and appears on electronic and paper charts | Notice to Mariners and hydrographic authorities notified. | Notice(s) cited and notification to hydrographic authorities cited in verification report | TCL – Environment Coordinator | None |
| | Displacement of fishing during laying | Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities | Shipping notice(s) issued | Shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator | None |
| Oceanic users – deep sea mining | Displacement of prospecting during laying | Advise mining companies of cable-laying, dates, and safe clearance for other activities | Mining companies advised | Citation of advice issued or minutes of meetings with mining companies | TCL – Environment Coordinator | None |
| | Physical injury to cable by possible future mining | Ensure cable is laid as-planned on agreed path | Cable laying specification followed – cable laid along planned path | As-laid plan overlaid on design plan | TCL – Environment Coordinator | None |
| Coastal users – marine tenure | Cable easement | Advise Fiji customary fishing grounds owners; the Vanua Suva and the Vanua Burebasaga of cable-laying, dates, and safe clearance for other activities | Customary fishing ground owners advised | Citation of advice issued or minutes of meetings with owners | TCL – Environment Coordinator | None |
| Coastal users – commercial shipping and ports | Physical injury of cable by shipping | 1. Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities | Shipping notice(s) issued | Shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator | None |
| | | 2. Request Port Authorities to advise local shipping of laying activities and avoidance measures | Shipping notice(s) issued | Shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator | None |
| | | 3. Notify cable location to authorities so it is issued as a Notice to Mariners and appears on electronic and paper charts | Notice to Mariners and hydrographic authorities notified. | Notice(s) cited and notification to hydrographic authorities cited in verification report | TCL – Environment Coordinator | None |
| | Disruption to shipping during cable laying | 1. Follow maritime best-practice | Rules of the road at sea, followed operational notices issued, and other navigational / ship-handling practices applied | Diarised observations | TCL – Environment Coordinator (or delegate) | None |

| CONSTRUCTION PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| | | 2. Ensure marker buoys and navigational lights are deployed and activated on cable-laying and support vessels. Navigational lights are to be fully operational from 6:00 p.m. to 6:00 a.m. daily | Appropriate markers and signage employed | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 3. Request Port Authorities notify local shipping of cable-laying activity | Local shipping notice(s) issued | Local shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator (or delegate) | None |
| | | 4. Programme work to avoid overnight mooring in or alongside harbour shipping channels | No overnight mooring in or alongside harbour shipping channels | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 5. Observe international and national rules of the sea and navigational protocol | Rules of the road at sea, followed operational notices issued, and other navigational / ship-handling practices applied | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| Coastal users – gravel and sand extraction | Disruption of dredging activities during cable laying | 1. Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities | Shipping notice(s) issued | Shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator | None |
| | | 2. Request Port Authorities to advise local operators of cable placement and avoidance measures | Shipping notice(s) issued | Shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator | None |
| Coastal users – subsistence and artisanal fisheries | Displacement of activities during cable laying | 1. Request Fisheries authorities to advise local fishers of laying activities, dates, and avoidance measures | Shipping notice(s) issued | Shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator | None |
| | | 2. Confine trenching/laying activities to as short a period as possible | Construction time on reef platforms not excessive | Diarised observations / photography | TCL – Environment Coordinator | None |
| | Entanglement of gear | Consider placing warning markers along cable line in shallow (<10 m) waters | Warning markers considered and resolved | Outcome of resolution recorded in verification report | TCL – Environment Coordinator | None |
| | Damage to ecosystem and fishery productivity | 1. Confine trenching/laying activities to as narrow a corridor as possible and restore site when finished | Cable laying specification followed – construction footprint not excessive | Diarised observations / photography | TCL – Environment Coordinator | None |
| | | 2. Confine trenching/laying activities to as short a period as possible | Construction time on reef platforms not excessive | Diarised observations / photography | TCL – Environment Coordinator | None |
| Coastal users – game fisheries | Displacement of activities during cable laying | 1. Ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities | Shipping notice(s) issued | Shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator | None |
| | | 2. Request Port Authorities to advise local operators of laying activities and avoidance measures | Shipping notice(s) issued | Shipping notice(s) cited and/or content recorded in verification report | TCL – Environment Coordinator | None |

| CONSTRUCTION PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| | Entanglement of gear | Notify cable location to authorities so it is issued as a Notice to Mariners and appears on electronic and paper charts | Notice to Mariners and hydrographic authorities notified. | Notice(s) cited and notification to hydrographic authorities cited in verification report | TCL – Environment Coordinator | None |
| | Damage to ecosystem and fishery productivity | 1. Confine laying activities to the planned corridor | Vessels managed in reasonable proximity to cable corridor | Diarised observations and/or vessel position plotters | TCL – Environment Coordinator | None |
| | | 2. Confine laying activities to as short a period as possible | Construction time not excessive | Diarised observations / photography | TCL – Environment Coordinator | None |
| Coastal users – aquaculture | Sedimentation of oyster spat-lines in Nuku'alofa Harbour | 1. Install silt screens to control sediment discharge through the small boat passage from reef platform during trenching and cable laying | Cable laying specification followed – screens used | Diarised observations / photography | TCL – Environment Coordinator | None |
| | | 2. Do trenching on Nuku'alofa reef platform only within 2 hrs of low tide | Cable laying specification followed – construction only within 2 hrs of low tide | Diarised observations / photography | TCL – Environment Coordinator | None |
| Terrestrial users and uses | Disruption | 1. Communicate plans and expectations with neighbours – adapt plans where appropriate | Neighbours informed | Verified by meetings | TCL – Environment Coordinator | None |
| | | 2. Confine construction to work hours | No construction before 8.00am or after 6.00pm | Diarised observations | TCL – Environment Coordinator | None |
| | Noise and dust | 1. Communicate plans and expectations with neighbours – adapt plans where appropriate | Neighbours informed | Verified by meetings | TCL – Environment Coordinator | None |
| | | 2. Confine construction to work hours | No construction before 8.00 a.m. or after 6.00 p.m. | Diarised observations | TCL – Environment Coordinator | None |
| | | 3. Water down bare ground during dry conditions | No annoying dust from site | Diarised observations | TCL – Environment Coordinator | None |
| | Generator noise at cable station | Generator rooms lined with sound attenuation material, mufflers installed and other sound attenuation devices built as appropriate | Cable station specification followed – sound attenuation devices installed | Observation / photography | TCL – Environment Coordinator | None |
| | Aesthetics | 1. Keep work sites clean and tidy | Work site managed within reasonable expectations | Diarised observations / photography | TCL – Environment Coordinator | None |
| | | 2. Rehabilitate and landscape sites following work. | Construction site landscaped and planted | Diarised observations / photography | TCL – Environment Coordinator | None |

| CONSTRUCTION PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| Waste Management | Accumulation of inorganic waste in the environment | 1. Collect shipboard waste for ferrying to land-based recycling station or landfill | Waste collected and transferred to land-based station | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Collect cable station waste for recycling or disposal in landfill | Waste collected for recycling or landfill | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 3. Thoroughly clear all sites (terrestrial and marine) of discarded cordage, plastic and other waste | Sites cleared of waste | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 4. Follow waste management policy (see Appendix 5) | Cable station construction specification followed – waste management policy followed | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | Contamination or enrichment of the environment by organic waste and domestic effluent | 1. Provide temporary toilets for construction staff with disposal of effluent into municipal sewerage system | Cable station construction specification followed – temporary toilets supplied and used | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 2. Collect other waste for composting or disposal in landfill | Waste collected for composting or landfill | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| | | 3. Follow waste management policy (see Appendix 5) | Cable station construction specification followed – waste management policy followed | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| Health and Safety | Incidents and accidents | Implement a H&S Management Plan | Construction specifications followed – appropriate H&S Management implemented in marine and terrestrial construction | Diarised observations | TCL – Environment Coordinator (or delegate) | None |
| Conflicting infrastructure | Damage to buried services during trenching/laying. | 1. Liaise with TWB to avoid Nuku'alofa water main when trenching | Construction specifications followed – no conflict with water main | Observation supported as appropriate by citation from cable laying report | TCL – Environment Coordinator | None |
| | | 2. Liaise with FinTel to avoid Southern Cross cable when trenching/laying | Construction specifications followed – no conflict with cable | Observation supported as appropriate by citation from cable laying report | TCL – Environment Coordinator | None |

**Table 6.6.** Monitoring Plan for the **Operational** Phase

| OPERATIONAL PHASE MONITORING PLAN | | | | | | |
|---|---|---|---|---|---|---|
| Impacted area | Impact agent/ action | Proposed Mitigation Measures | Monitoring Indicator | Means of Verification | Responsibility for Monitoring | Training Needs |
| Physical environment | | | | | | |
| Climate | Release of Greenhouse Gases | 1. Maintain generators and plant | Plant and machinery serviced according to manufacturer's instructions | Maintenance of service log books | TCL Manager | None |
| | | 2. Use least GHG-emitting national grid power wherever possible | Fossil-fuelled generation sources used as last resort | Power use records | TCL Manager | None |
| | | 3. Minimise travel – use electronic conferencing where possible | Electronic communications used for most international meetings | Meeting minutes | TCL Manager | None |
| Habitats, flora and fauna | | | | | | |
| Marine habitat | (Accidental) discharge of pollutant by cable repair ship | 1. Contain all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck | Location of fuel, lubricants and transmission fluids | Visual inspection | TCL – Manager (or delegate) | None |
| | | 2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Plan published and understood by relevant employees | Presence of plan and appropriate responders | TCL – Manager (or delegate) | None |
| Oceanic habitat – Hydrothermal vents | Physical impact on cable of vent water | New vents can appear in proximity to the cable and re-routing of cable may be required to maintain safe clearance | Repair/relocation of cable to a surveyed, safe area | As-laid plans superimposed on map of known active vent sites | TCL – Manager (or delegate) | None |
| Terrestrial habitats, flora and fauna | (Accidental) discharge of pollutants from cable station | 1. Contain all fuel in type-approved tanks or drums in a secure bunded area | Location of fuel, lubricants and transmission fluids | Visual inspection | TCL – Manager (or delegate) | None |
| | | 2. Maintain a contingency plan to address spills and cyclones (see Appendix 4) | Plan published and understood by relevant employees | Presence of plan and appropriate responders | TCL – Manager (or delegate) | None |
| People and communities | | | | | | |
| Terrestrial users and uses | Generator noise at cable station | Undertake maintenance during work hours | No maintenance before 9:00 a.m. or after 5:00 p.m. | Maintenance records | TCL – Manager | None |
| | Aesthetics | Maintain landscaping and gardens at cable station | Landscaping and gardens maintained | Cable station maintenance records | TCL – Manager | None |
| Waste Management | Accumulation of waste in the environment | Follow waste management policy (Appendix 5) | Waste management policy followed | TCL records | TCL – Manager | None |
| Health and Safety | Incidents and accidents | Maintain a H&S Management Plan | Lost work-time incidents and accidents minimised | TCL records | TCL – Manager | None |
| Conflicting infrastructure | Displacement/impairment of future activities by other agencies | Remain open to discussion that would lead to accommodation of future development | TCL remains open to discussion with other infrastructure providers | TCL records | TCL – Manager | None |

# 7 Public Consultations

Stakeholder consultation, in whichever form, is a deliberate effort to ensure the preferences, interests and perspectives of different stakeholders are given systematic consideration. As well as being an effective method of obtaining different perspectives and insights it is often important for the credibility of an assessment. Without gaining first-hand insights from those responsible for aspects of the design and implementation of a development and those affected by a development, there will be a gap in understanding the various factors that influence its level of success or failure. Furthermore, as a development can be a highly political and sometimes controversial thing, it is important that the key players are involved and can inform the process. Stakeholder consultation in this Environmental Assessment was aimed at:

- eliciting stakeholders' interest in and influence over, the proposed development
- identifying stakeholders preferences and priorities in respect to aspects of, or factors influenced by, the development
- determining a manageable set of mitigation measures that will preserve stakeholders' interests.

There is an array of methods for eliciting stakeholders' preferences and priorities, ranging from specific recursive consultation and analysis techniques aimed at arriving at a consensus, through to various forms of one-off, face-to-face discussion and dialogue. Even within one method, differing styles may suit different stakeholders, for example, and in the context of this project, mandated authorities tend to prefer a different style than interested individuals.

Consultation for this assessment intended to piece together a patchwork of stakeholder interests, preferences and priorities in their respective areas of influence or impact without the need to arrive at a single point of consensus. In this situation one-off dialogue was determined to be the most appropriate approach.

Considering the administrative and social structures in Fiji and Tonga, the EA Team adopted particular face-to-face consultation styles to suit the nature of stakeholders identified:

- Government agencies, being generally knowledgeable about their mandate, were consulted in small one-on-one meetings, with the staff participation determined by senior managers
- Affected individuals, having various states of comprehension and interest, were approached individually, and either consulted individually or, if they preferred, in a community meeting so they could share their ideas with others
- Community groups with a coherent structure, usually having a shared interest and position in respect to the development, were consulted in group meetings
- Community groups without a coherent structure, notably the subsistence fishers on the Nuku'alofa reef platform, were met informally on site
- Interest groups, including NGO's and recreational fishers, were consulted in group meetings.

All meetings proceeded in a generally similar fashion. Appreciating that few stakeholders possessed the requisite knowledge of submarine cables and the project at the outset, the meetings began with an introduction or illustrated presentation on the proposal. The introduction was adjusted to emphasise those aspects expected to be of relevance to each stakeholder group so that their comments could be on an informed basis. To promote thought and elicit the most considered response the EA Team often led a conversation about general

or specific stakeholder activities before considering together any effects the project might have on those activities. In this way, previously unknown risks were exposed (e.g. the oyster aquaculture lines in Nuku'alofa Harbour) and sensitive subjects bought out into the open for evaluation (e.g. the grounds for compensation to customary fishing groups in Laucala Bay).

All those consulted were invited to elaborate or pursue their interests with the EA Team after the meetings.

Potentially affected or interested stakeholders in this project occur in both Fiji, Tonga, and internationally. The EA Team identified national and local stakeholder agencies and international environmental NGOs as indicated in the project terms of reference and in collaboration with the project proponent, and key agencies of government in both Tonga and Fiji.

The Team engaged these stakeholders both at intervals during this investigation and during an intensive consultation programme over the period 23–29 July 2010. In addition to institutional stakeholders, the EA Team consulted with communities: in group meetings in Nuku'alofa and Suva, in one-on-one meetings in both Tonga and Fiji, and with local subsistence fishers on the Nuku'alofa reef platform.

Included among those consulted were:

In **Fiji**[21]

- Whale & Dolphin Conservation Society
- IUCN
- WWF
- Fiji Islands Maritime Safety Agency
- Ministry of Primary Industries – Fisheries Division
- Department of Environment
- Vanua Suva customary fishing rights owners
- Vanua Burebasaga customary fishing rights owners
- Department of Lands and Survey

In **Tonga**

- Tonga Cable Ltd
- Pacific Forum Line, Tonga
- Peace Corps
- Ministry for the Environment and Climate Change
- Fishing Industries Association of Tonga
- Sports Fishing Association
- Deepwater Fishing group
- Tonga Chamber of Commerce
- 'Alatini Fishing Company Ltd
- ANZ Bank
- Ministry of Lands, Survey and Natural Resources

[21] Greenpeace verbally accepted the EA Team's invitation to a meeting with NGOs but failed to attend. Given breadth of knowledge and interests attending from WDCS, IUCN and WWF and the high quality of the comments received, the EA Team did not think it necessary to schedule another meeting time for Greenpeace.

- Ports Authority Tonga
- Dateline Transam Shipping
- KORDI Minerals
- MAFFF-Fisheries
- Nautilus Minerals

Without exception, stakeholders were supportive of the proposed development and they were content that potential impacts affecting their interest domains were able to be mitigated to low levels. The outcome of these consultations could be summarised as follows:

- Environmental regulatory authorities confirmed the need for an environmental assessment but agreed that the WB/ADB terms of reference satisfied their needs. Considerable interest was expressed in the areas of biodiversity and natural habitats with general agreement on the mitigation measures proposed.
- Agencies concerned with maritime operations generally regarded the proposed development as 'business as usual' and largely pointed to their usual requirements for compliance and reporting.
- Government agencies with oversight of fisheries saw little potential impact in the oceanic environment, and a few manageable impacts in the coastal environment
- Other government agencies were relaxed about the development and assisted with advice about compliance and reporting.
- NGOs showed their considerable expertise in their respective areas of interest (e.g., cetaceans, biodiversity hotspots, etc.) and constructively contributed to identifying mitigation measures to minimise or eliminate the residual impact.
- Local interest groups, including recreational fishers, described their areas of interest and methods, and concluded that there was little conflict with their activities.
- Community groups were interested in any deleterious effect on them, and were generally reassured that there were none.
- Individuals, most commonly neighbours, were keenly interested in the development and its potential affect on them, but were generally reassured that the effects would be minor.
- Subsistence fishers were amenable to adapt their activities during the construction phase and content that the impact on their activities would be brief and minor, though the customary fishing owners in Laucala Bay considered requesting payment for allowing the cable to pass through their grounds.

A full record of these meetings is presented in Appendix 2. The information obtained has been incorporated in the baseline and impacts sections of the report and appropriate mitigation measures included in the environmental management plan.

# 8 Conclusions

The Fiji–Tonga Cable System is a significant development for the Kingdom of Tonga. It will help bridge the 'digital divide' that besets countries with small populations, dispersed over great oceanic distances with limited connectivity to the outside world. The proposed development is a first step in bringing the advantages of secure, high-capacity, high-speed and lower cost communications to Tonga, with an expected positive outcome in terms of improved economic and social development and a country better able to play its part in the Pacific and World community.

The need for an Environmental Assessment is clear:

- it is a multi-million dollar investment funded by loans and grants from the World Bank and Asian Development Bank,
- it has connections to the land territories of two island nations, both of whom have well-articulated EA legislation and a growing awareness of environmental sustainability, and
- it traverses over 800 km of ecologically sensitive, and seismically, volcanically and tectonically active seabed, the nature of which is only just becoming understood.

The Fiji terminal of the cable is the existing Southern Cross cable station managed by FinTel, Fiji. Given that the development effectively replicates an existing system within an established infrastructure, there is no new ground being broken here and the additional cabling does not compound any pre-existing environmental impact. There are, however, local arrangements to be made with Fiji authorities about routing, logistics, and approvals, and there are local community interests that may require negotiation of an easement for the cable through two customary fishing grounds.

Detailed mapping of the seafloor will only be revealed by the marine route survey but the extensive literature search and consultation programme employed by the EA Team revealed sufficient information about the general nature of the deep oceanic passage between Fiji and Tonga, and the potential impacts of the development, to formulate an environmental plan to guide implementation. The findings for the oceanic environment are almost equally divided into factors that affect the cable and factors that are affected by the cable. Hazards *to* the cable exist from fishing around seamounts, hydrothermally altered water in volcanic vent zones, and future mining in mineralised areas. The simplest mitigation measure (and the one recommended) in these situations is avoidance. The most significant hazards *from* the cable (or cable-laying operation) are to cetaceans caused by intensive sonar operations by survey and/or cable-laying vessels. The mitigation measures recommended here are a combination of avoidance (of the whale migrating season) and suspension of activities where conflict is anticipated or observed. After mitigation the project effect is reduced to one of low to no-significant residual impact in the deep ocean environment.

In the Tongan coastal environment there are potential threats *to* the cable from fishing, shipping and dredging which require mitigation in the form of notification and operational awareness. Potential impacts *from* the cable are to coral reef communities, aquaculture, and subsistence fishing. Mitigation measures proposed to reduce these effects to low or not-significant levels are a combination of avoidance and minimisation.

The proposed new cable station in Tonga is very close to the intended landing site, thus requiring minimal earthworks in trenching. There is a small displacement effect to individuals presently occupying the site, but this was scheduled to occur anyway as these and

adjacent properties came up for sale. The residual impact on the neighbourhood after establishment is overall positive. The cable station site is in an area vulnerable to natural events such as cyclone/storm surge and tsunami – factors that should be mitigated for by resilience in design.

The residual impact of the proposed development after all mitigation measures are applied is one of low, not-significant, or no environmental or social impact and a net positive economic and social development outcome for the Kingdom of Tonga.

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# 11 Appendices

## Appendix 1 Terms of Reference

### Tonga Cable Limited

**Terms of Reference**
**For the Environmental Assessment**
**for**
**Phase 1: Tonga –Fiji Connectivity Project**
**of the**
**Pacific Regional Connectivity Program**

### A. BACKGROUND

The Government of Tonga has asked the World Bank and the Asian Development Bank to part finance the Tonga – Fiji Connectivity Project. The Project includes three components: (1) Construction of an international submarine cable system, (2) enabling environment (legal and regulatory technical assistance), (3) project management. Component 1 entails construction of a submarine fibre-optic cable from Nuku'alofa (Tonga) to the Southern Cross Cable landing station in Suva (Fiji) and construction of a new submarine cable landing station in Nuku'alofa.

The proposed Tonga-Fiji cable would be commissioned and operated as a wholesale telecommunications business by a new corporate entity, Tonga Cable Ltd (TCL). TCL is currently majority-owned by the Government-owned Tonga Communications Corporation (TCC); the intention is to open 20 percent of shares to private investors. TCL is to finance 20 percent of the capital investment cost of the cable, with the balance to be sourced from the Asian Development Bank and the World Bank. The Government has committed to ensuring, through appropriate regulation, that the cable will be available to all potential service providers on an "open access" basis, with fair and transparent pricing.

Steps undertaken so far to progress the Tonga-Fiji Cable include the following:

- Establishment of a Project Steering Committee ("Steering Committee"), including representatives from the Ministries of Information and Communications, Public Enterprises, TCC, and prospectively private participants.
- Establishment of the managing entity, Tonga Cable Ltd, as noted above. TCL has applied for a telecommunications license
- Preparation of detailed technical specifications and economic/financial model, and draft bidding documents

The key issues to be addressed at this stage include.

(a) *Validation of technical and economic analysis and business model*: ongoing.

(b) *Legal and regulatory assessment*: formulation of "open access" and other applicable regulations. Planned, March-April 2010

(c) *Environmental Assessment and mitigation plan*: this is the subject of these terms of reference.

## B. SCOPE OF SERVICES

The Steering Committee will be the counterpart for this assignment. The Steering Committee seeks the services of a suitably qualified and experienced Consultant (firm) to provide the services outlined in these Terms of Reference which are to:

1) Undertake a full and detailed, qualitative and quantitative environmental analysis of Component 1 (the project).
2) Prepare corresponding Environmental Management Plans for the Design, Construction/laying, Operations and Maintenance Phases of Component 1.
3) Submit a final and acceptable Environmental Assessment Report and Environmental Management Plan.

These TORs are to be read in conjunction with the projects detailed technical specifications and all other relevant project documents.

## C. PROJECT DETAILS

### C1. Project Development Objective

The immediate objectives of the Project are to improve the enabling environment for telecommunications and ICT in Tonga and promote increased access to infrastructure and services by reducing the costs of international connectivity and strengthening the telecommunications regulatory environment. Expected sector-specific outcomes are: (i) increased volume of international, regional and national traffic and, (ii) decreases in average price of international, regional and national communications.

### C2. Project Description

**Component 1. International Submarine Cable System linking Nuku'alofa and Suva**. The cable system comprises 827 km repeatered cable plus a landing station in Tonga, and the cost includes cable materials, marine survey and laying costs, and cable equipment. [Detailed technical specifications are available]. The design capacity for the cable system would be a minimum of 320 Gbps per fiber pair with an initial lit capacity of 20 Gbps. A new cable landing station will be constructed in Nuku'alofa. In Fiji, the cable will be connected to the existing Southern Cross Cable Network landing station in Suva. The Southern Cross Cable connects Fiji with the US (Hawai'i) and Australia (Sydney) and is owned by a consortium of operators. This new cable is expected to provide substantially higher capacity than through existing satellite links, and reduce international bandwidth costs from their present level of about US$3,500 per megabit per month by 59 percent by 2015, based on current bandwidth prices in Fiji.

**Component 2. Enabling environment.** This component will finance technical assistance for telecommunications policy, legal and regulatory development. Although Tonga has liberalized the telecommunications market, its regulatory institutions are relatively new. The Government has advised that the Communications Act (2000) needs to be updated, and new regulations developed that reflect changes in technology and market structures. A key element in this component is development of regulations that promote open access and fair and transparent pricing for cable infrastructure so that the benefits of the new investments are realized by all market players. In this regard, the Government has committed to ensuring, through appropriate regulation, that the cable will be available to all potential service providers on an "open access" basis, with fair and transparent pricing.

***Component 3.*** **Project administration (procurement, financial management, audit):** This component will provide support to the Implementing Agency, Tonga Cable Ltd (see below).

**D. Detailed Tasks for the Consultant**

**Task A: Determine the Project's Influence Area –** The consultant is to determine, define and map out the project's marine and land based influence areas based on the proposed corridor of the marine cable, location of marine and land based infrastructure and construction methods. The consultant will clearly delineate these areas into two – (i) marine and coastal based and (ii) in-land based.

**Task B: Marine Protected Areas** – The consultant will undertake a detailed and extensive review and catalogue all relevant Marine Protected Areas and describe other Natural Habitats as defined by the World Bank's Operational Policy OP4.04 that overlap and are adjacent to the project's marine area of influence and illustrate these on maps and will describe the legal status, significance and developmental restrictions and compliance requirements for these MPAs.

**Task C: Baseline Data in the Project Influence Area and/or Marine Protected Areas -** The Consultant will undertake a comprehensive gathering, collection and review of the required baseline data from existing credible sources within these areas. Where the required data is missing, inadequate or unreliable, the consultant will undertake the necessary surveys and/or collection in the bio-physical and/or social environment to obtain this data. The consultants shall present the obtained baseline data pertaining to,

(i) the physical marine environment, (i.e. ocean floor topography, etc), and land based environment such as geology, climate and meteorology, surface and ground water hydrology, land use, land acquisition needs, etc.),

- (ii) biological environment, (i.e. flora and fauna and habitat and ecosystems values, rare and endangered species, migratory species, within or adjacent to the project's influence area /MPA'setc),
- (iii) socio-economic and cultural environment, including screening for the presence of Indigenous Peoples in these areas and Physical Cultural Resources as defined by respectively World Bank policies on Indigenous Peoples (OP4.10) and Physical Cultural Resources OP4.11, where applicable. The consultant will also investigate, determine and confirm the presence or absence of critical natural habitats, as defined by the World Bank's Natural Habitats Policy (OP4.04) in the areas, and
- (iv) information on existing or planned infrastructure/projects in these areas that may have direct, induced and/or cumulative impacts on this projects activities.

**Task D: Review of Applicable Law** – The consultant will review all relevant and applicable environmental laws of Tonga, Fiji, and all international laws protecting marine life, fisheries, etc, marine protected areas, and adequately identify the compliance requirements of these laws.

**Task E: Review of applicable World Bank, and Asian Development Bank requirements-** The consultant will review all World Bank and Asian Development Bank safeguards policies and their respective requirements to ensure project compliance.

Applicable World Bank Policies:

- Environmental Assessment (EA) (OP4.01) – inter alia, requires (i) detailed qualitative and quantitative analysis to determine project impacts,(ii) determination of tangible measures to prevent, minimize, mitigate or compensate for these adverse impacts, (iii) public consultation and disclosure as part of the EA process and (iv) requires an Environmental Management

Plan (EMP) to address set of mitigation, monitoring and institutional measures to be taken during design, implementation, operation of maintenance phases of the project.

- Natural Habitats (OP4.04) – This policy requires the conservation of natural habitats and specifically prohibits the support of projects that involve significant conversion or degradation of critical natural habitats, as defined by the policy. The policy further requires the EA to indentify impacts on biodiversity and species and to determine endemism, endangered species and to determine project impacts on these species and to propose acceptable mitigation and monitoring measures.
- Physical Cultural Resources (PCR) (OP4.11) – This policy seeks to avoid the disturbance and or destruction of PCR as defined by the policy by the projects activities. PCR includes places of worship, buried artifacts, cemeteries and archeological assets, etc. The policy further requires, (i) EA to undertake an exhaustive desk review and/or site investigation to pre-identify and locate PCR's in the project influence area, (ii) EA/EMP to propose management measures and (ii) to include chance find clauses in civil works contracts during construction and maintenance stages.
- Indigenous Peoples (IPs) (OP.4.10) – requires the Governments of Tonga and Fiji to engage in a process of free, prior and informed consultations with Indigenous peoples, as described by the policy in situations where IP's are present in, or have collective attachment to, the project area and for the preparation of an Indigenous Peoples Plan (IPP) and/or Indigenous Peoples Planning Framework (IPPF).
- Involuntary Resettlement (OP4.12) – this policy addresses direct economic and social impacts from the projects activities that will cause (a) involuntary taking of land resulting in (i) relocation or loss of shelter, (ii) loss of assets or access to assets or (iii) loss of income sources or livelihoods and (b) involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons. The policy requires siting of project infrastructure to be so chosen so as to avoid these impacts altogether or to minimize them to the extent possible. Where these cannot be avoided, the policy requires the preparation of either or both of these instruments (i) resettlement policy Framework, (ii) Resettlement Action Plan, and for meaningful consultations with potentially affected people. The policy prohibits Community donations of lands for location-specific infrastructure.

Applicable Asian Development Bank policies are contained in ADB's *Safeguard Policy Statement* (2009)[22] which covers three key safeguard areas of (i) Environment, (ii) Involuntary Resettlement, and (iii) Indigenous Peoples. Chapter V. Safeguard Policy Statement and Appendixes 1 to 6 will be closely reviewed for implications of the Project.

**Task F: Analysis of Direct, Induced and Cumulative Environmental Impacts** - The consultant will undertake a detailed analysis to determine the positive and negative environmental and social impacts associated with each phase of the project, i.e. Phase 1 - Cable Laying and construction of land based infrastructure, (ii) Phase 2- Operations & Maintenance Phase. For each phase in the project influence area and/or marine protected areas identified above, based on the technical specifications the consultant will undertake an

[22] ADB. 2009. *Safeguard Policy Statement*. Manila. http://www.adb.org/Documents/Policies/Safeguards/Safeguard-Policy-Statement-June2009.pdf

in depth and detailed quantitative and qualitative analysis for likely timeline scenarios using appropriate methodologies and hydro-graphic modeling if required, to predict and/or determine the intensity, scale, and scope of the direct, induced and cumulative positive and negative environmental impacts associated with this project. These impacts are to be determined as a change in the baselines identified above.

**Task G: Analysis of Alternatives-** The consultants will provide an evaluation of reasonable alternatives [i.e. alternative routings, sites for landing station] by assessing the extent to which these alternatives may be more appropriate from an environmental (and socio – economic and cultural) requirement than the proposed measures, technical specifications, corridor and plans project. Propose alternative feasible changes in the proposed marine cable alignment, and other associated sub marine and land based infrastructure to reduce or otherwise to more sustainably manage these impacts. This work will be done in consultation with technical specialists on submarine cable infrastructure, including consultants retained by the Bank and consultants retained by the Steering Committee.

**Task H: Meaningful Consultations –** The consultant will identify and hold meaningful consultations with the project's national and local potentially affected peoples and other stakeholders and including international environmental NGOs ( IUCN, WWF, and Greenpeace ), in only one central location (either in Fiji, New Zealand or Australia) , to present and discuss the findings and proposed measures in the EA, and to seek their respective views and inputs before finalizing the EA process. The consultant will maintain adequate records of this process and will present a detailed summary in the EA reports. The consultants will use suitable participatory methods to consult potential PAPs. In its inception report, the consultant will include a consultation plan to be agreed with the projects steering committee.

**Task I: Institutional Assessment** - Having determined the environmental and social issues that would be associated with this project, the consultant is to undertake a detailed qualitative review of the relevant Government of Tonga own national ministries and other institutions, and Tonga Cable Ltd (TCL), with responsibility and/or jurisdiction for management of the project and its environment and social impacts, with the purpose of (i) determining their capacity to manage these issues and (ii) making recommendations to the Government of Tonga and to TCL on how best to effectively address any identified capacity gaps these issues during project implementation.

**Task J: Environmental Management Plan (EMP) –** the consultant will prepare the Environmental Management Plan or each phase of the project, which are the Design, Construction ( including laying of submarine cable), Operations and Maintenance phases, in accordance with the World Bank's OP 4.01 and ADB's Safeguard Policy Statement (2009) which will include (a) details of environmental mitigation and monitoring program to be implemented, (b) clear definition of institutional arrangements and responsibilities for EMP implementation, (c) assessment of current institutional capacity to implement the EMP and proposed capacity building/institutional strengthening activities; and (d) scope, budget, schedule, frequency, location and responsibilities for implementation of environmental mitigation, monitoring, and capacity building and institutional strengthening activities.

The consultants will be required to visit Tonga and Fiji for initial assessments, and to conduct stakeholder workshops to discuss and disseminate findings and recommendations.

## E. Required Skills of the Consultants

The project steering committee is seeking the services of one national consultant and one international consultant to support the national consultant. Both consultants must be highly competent and have relevant academic qualifications and experience to deliver the services

that are being sought in this TOR. Significant knowledge of and relevant professional experience conducting Environmental Assessments for projects with substantial submarine works are desired. The successful completion of these services will require the team of consultants to have the following competencies and skills in the following areas.; oceanography, marine biology/biodiversity, international environmental marine law, environmental assessments with particular focus on cumulative impacts on marine resources and ecosystems, natural resource management ( for fisheries), and social scientist. Please note that this is a list of skills required, rather than a list of individual consultants.

**F. Deliverables of the Consultant subject to the Guidance and approval of the Project Steering Committee**

- Detailed, modern and accurate maps, charts and other visual presentations of data and analysis in electronic and print form.
- Workshop to present interim and final draft reports. These workshops will be held in Tonga
- Training of key Government of Tonga, TCC and TCL [training scope to be specified]
- Reports – EA Inception report, draft and final draft EA reports.

**G. Indicative Timeline** [for discussion]

T – Date of Contract Signature
T + 0.5 months – mobilization of Team to Tonga.
T + 0.75 months – submission of EA Inception Report.
T + 1.5 months – hold meaningful consultations with stakeholders.
T+ 2.0months – submission and Presentation of First Interim Draft Final EA Report.
T + 3.0 months – submission of Final Draft EA Report.

## Appendix 2 Schedule and Record of Consultations

2 June 2010 – Inception Meeting

'Inoke Vala (Chairman, TCL),
Robert Bolouri (Managing Director, TCL),
Timote Katoanga (Director, TCL)

Governance:

- The GoT owns TCC as a public enterprise. TCC currently owns TCL but the intention is to offer 20% of this holding to other investors. TCL reports to TCC and TCC reports to GoT on its subsidiary. TCC appoints the board of TCL and provides business direction. MPEI oversees the return on assets of SOEs and ensures compliance with business practice as determined by the Companies Act and Public Enterprise Act (with the latter being superior to any specific SOE act). MPEI reviews the business's annual Statement of Corporate intent and 6-monthly reports.
- Initially the planning was in the hands of a Steering Committee comprising Alfred Soakai (Dir, Ministry of Communications), Robert Bolouri and Timote Katoanga. An Australian consultant, John Hibbard, did the feasibility study. 'Inoke Vala succeeded Alfred when Alfred departed for overseas. TCL was established as a private company in Nov 2009 and the Steering Committee was disestablished in March 2010.
- TCL will be regulated by the Ministry of Communications. The WB is organising a team of advisors to visit Tonga in June to look at the regulatory environment to ensure that trading is fair without favouritism to TCC.
- Business case: The business case for the Project is very strong. Initially it was believed that funding would be via a US$27M loan at 7% interest. Under this scheme the business case showed an internal rate of return of 17% on 50% of the expected revenue (for the purpose of calculation Digicel's participation was not relied on). This would see the repayment of the loan in 9 years. Currently, the plan is for US$20M to be a grant (US$10.2 from the WB and US$9.7 from ADB) with the balance of US$7M being a loan from ADB at 4.3% interest.

Project history:

- TCC approached the GoT with the Fiji–Tonga cable concept. The GoT was initially un-easy with the prospect of TCC's monopoly position so the decision was made to create a separate entity called TCL. TCL is cautious about outside investment because future development opportunities for the outer islands would confer a significant public good but would not be attractive to a private investor. With TCL as the vehicle for delivery of enhanced data services, the GoT retains full control.

Project Description:

- The intent is that TCC simply provides a point of contact to the fibre-optic terminal for TCC, Digicell, and any other company to begin their distribution from. The terms of this access will be the same for all distributors.
- At the Tonga end this service will be provided from a new terminal planned to be built on a site on GoT land in Sopu near Nuku Maanu and the ANZ Managers residence. The present tenants of the three residences on the site are currently on monthly rent and the leases have been approved for sale and registration with MLSNR. Sopu is low-lying (about 1m asl) and the 2-storey terminal buildings will be of cyclone-proof ferro-cement construction elevated about 1m above ground. Plans of this proposed structure are among documents given to the EA Team.
- The TCL connection in Fiji will be a parallel connection independent from national network connection to the SC cable – ie it connects to SC, via FinTel's Backhaul and

not through any other connection. This will allay some concern that the political situation in Fiji could make Tonga's connection vulnerable to arbitrary disconnection. The other precaution is to retain access to the current satellite communication link in case traffic has to return there in emergencies.

- At present there is no intention to bury the cable at any point along its route unless this is advised by the EA or other source.
- The Fiji end will be the current Southern Cross Cable terminal. Presently (and at least until Nov 2010) this is managed by FinTel. TCL is negotiating a Landing Party Agreement with FinTel, with FinTel retained as the contractor for the Fiji end of the cable. In this role they will operate as the distance arm of TCL, but with TCL retaining ownership of the connection and Tonga-specific infrastructure in the terminal building. Once the Landing Party Agreement is secure, FinTel have agreed to facilitate approvals at the Fiji end and manage negotiations with the GoF. There are some possible issues with this process in that a) Fiji usually requires public notification of EAs and input to the ToR, b) reliance on the SC approvals may be insecure because Fiji's Environment Act wasn't in place when the SC cable was installed. However our ToR is probably more detailed that Fiji's requirements so should be acceptable.
- Knowledge of this project is currently confined to Cabinet, MPEI, MoC, but by mid June TCL will schedule a presentation to the Prime Minister explaining the full scope and revised funding of the project. From that time it will be public knowledge.

## FIJI CONSULTATION MEETINGS

### 23 July 2010 – NGO Stakeholders

Cara Miller (Programme Manager, Whale & Dolphin Conservation Society)
Bernard O'Calaghan (Programme Manager – Oceans, IUCN)
Seremia Tuqiri (Ocean Policies Officer, WWF South Pacific Programme
Akisi Bolabola Coastal Management & Inshore Fisheries Programme Coordinator, WWF South Pacific Programme)
Duncan Williams (Greenpeace Pacific Oceans campaigner) – verbally confirmed but absent

- Topographic irregularities (especially seamounts and canyons) are important feeding grounds for fish and marine mammals. Submarine canyons are especially important to whales. Recommend the cable avoid these features.
- Calving of Humpback whales occurs in waters of up to 200 m depth. [The meeting noted that this only occurs in the approaches to Suva and Nuku'alofa.
- The electromagnetic field from telecommunications cables (high voltage <10KV but very low amperage ≈1A) is not described in the literature. The meeting assumed that the EMF effect is negligible or low.
- Cara provided references to publications that discussed sonar effects on whales, noting that both single-beam, multi-beam and side-scan sonar have negligible to low impact, but air-gun arrays have potentially serious impact on marine mammals.
- Potential affect on whales will be of low significance if sonar work avoids the period June–November.
- If sonar work is undertaken during the migration period observers must be used. These observers will require training if they have not performed that function before and work must be discontinued while whales are in the vicinity. (See Lau report

referred to above)

- The survey vessel(s) could do a service to science during their operation by liaising with WDCS on observations they could make and data they could collect while undertaking the marine route survey and cable laying.
- Recommend the cable be buried in nearshore and tidal areas for its own protection as well as visual/aesthetic reasons.
- Local communities are important stakeholders at both ends of the cable, especially where customary fishing rights are present.
- Upon decommissioning, recommend that visible nearshore and tidal segments of the cable be uplifted and disposed of safely.

**26 July 2010 – Fiji Islands Maritime Safety Agency**

Felix Maharaj (Assistant Director, FIMSA)
Philip Hill (Port Master)

- There are no known open-sea activities that would conflict with the proposed development.
- Felix recalls that SOPAC did some deep-water dredge sampling of coral communities some years ago.
- The existing no-anchor zone will accommodate the new cable without modification. However, the Port are currently considering a narrowing of the zone to more closely around the cable site to allow mooring of decommissioned vessels and vessels awaiting berths and long-stay vessels that are presently clogging up Suva Harbour.
- No large ships currently use either reef passage in which the Southern Cross cable lies (and in which the proposed Fiji–Tonga will lie).
- FIMSA is the notifiable authority for new maritime features (such as submarine cables). Once notified (with an accurate map/plot of location), then FIMSA will notify British Admiralty and ensure paper and electronic charts are updated and a Notice to Mariners and a chart correction is issued.
- During construction, FIMSA will issue a coastal warning to mariners on 3DP radio advising all shipping of the activity and the separation distances required.
- Accidents and spillages are catered for under the normal 3-tier PACPLAN/NATPLAN contingency plan for marine spills.
- No waste may be discharged overboard from the survey or construction vessels and no bilge pumping in Fiji Territorial waters.
- FIMSA have good bathymetry of Laucala Bay done for the SC cable
- Ministry of Foreign Affairs needs to be notified of survey and laying vessels – this is usual practice.

**26 July 2010 – Fiji Ministry of Primary Industries – Fisheries Division**

Aisake Batibasaga (Principle Fisheries Officer – Central Division)
Meli Raicebe (Fisheries officer – licensing)
Netani Tuivaga (Fisheries Officer – data)
Margaret Tabunakawai (Fisheries Technical Officer – Conservation)

- Customary fishing ground ownership and consent from these owners may be a significant legal obstacle. Though the affect on customary fishing is almost certainly negligible, it is likely that compensation will be demanded (based upon precedent established by other projects). [Compensation was sought from the Southern Cross cable some 2 years after laying, but the demand was later dropped]. The argument for compensation is weakened by burying the cable (which would then put it into the

jurisdiction of the Mineral Resources department), but this would a) not remove the basis for a claim on purely legal grounds as an easement over land and b)almost certainly trigger need for an EA from DoE.

- Burial of the cable in nearshore area is advised because:
  - 'out of sight, out of mind'
  - after laying, jurisdiction over the cable will rest with Mineral Resources, not the customary fishing area owners
- Ensure the cable lies on the seabed throughout its length.
- Bottom trawling is prohibited and is not practiced in this area. Long-line fishing is shallow (10–70 m).
- There are about 18 deepwater snapper licences around Fiji, but not so much in this area.
- Normal multibeam sonar should not be a problem for cetaceans, but nonetheless, they would prefer this work were done outside the humpback migrating season of June-November.
- Part II of the Offshore Fisheries decree is due to be passed later this year which will probably require offshore research results to be lodged with the Government of Fiji. This is going for consultation mid August 2010.

**26 July 2010 – Department of Environment**

Aminiasi Qareqare, Head of EA unit was unexpectedly absent

- Nothing could be usefully done with the relevant staff member absenting himself so we arranged to return another time.

**9 August 2010 – Department of Environment**

Aminiasi Qareqare, Head of EA unit

Presentation of the proposed development and a copy of the ToR provided to consultants was relayed to DoE staff

- DoE were happy with the extent and content of the ToR and the level of detail that the consultants had gone into in the report and summary presentation
- They had no outstanding environmental concerns; though there are residents in the immediate vicinity of the Suva landing site that they would like to be informed about the proposal
- The Fiji government (Department of Mineral Resources) are in the process of issuing exploration tenement leases to deep sea mining companies to opearate within Fiji EEZ and which are likely to be crossed by cable route. Request was made for this to be noted in the report
- Three options were to be provided by Mr Qareqare to his superior who has final say on the needs for and content of EA in Fiji
- No EA be required
- EA be required but the ToR the consultants are working from at present is sufficient and therefore the report will also be sufficient- this would also include an opportunity for the report to be put to interested stakeholders in Fiji not consulted during report production and included in this document
- EA be required and DoE Fiji write their own independent ToR.
- The recommendation of Mr Qareqare is for the second option
- A written formal response to this issue will be provided by 13th August

**10 August 2010 – Fishing rights owners- Vanua Suva and Vanua Burebasaga, Fiji**

Metuisela Mudunavosa, Tui (King of) Suva
Niko Yacalevu, Roko (Provincial officer) Rewa Province
Ro Dona Takalaiyale, Liuliu ni Sau Turaga (head spokesperson for Roko Tui Dreketi (Rewa))
Pita Tagicakiverata, Chairman Rewa Provincial Development Committee and Deputy Chairman, Rewa Provincial Council

Presentation of the proposed development

- All rights owners accepted the findings of there being no significant environmental impacts likely to accrue from the proposed development
- There were no residual concerns over impacts on the fishing ground and therefore ability of the rights owners to fish
- There was some wish raised that fishing ground rights owners receive some form of recompense for allowing the cable to cross their fishing ground thus benefiting Tonga- this would seem contrary to normal practice in Fiji of compensating for lost ecosystem and therefore lost fisheries productivity- however-
- It was explained that this is the prerogative of the rights owners; though that this was beyond the work of the environmental assessment and that the assessment does not foresee any lost fisheries productivity. This was accepted by the attendees.

**18 August 2010 – Department of Lands and Survey**

Mr Kalivati Ratucicivi Director, Department of Lands and Survey

Presentation of the proposed development was relayed to the Director

- The potential for exploration/mining tenements within the Fiji portion of the Lau hydrothermal vent field was raised. It was agreed this would rely on dialogue between Government of Fiji, TCL and any potential tenement lese for conclusion
- Foreshore lease is unlikely to be needed given size of project footprint and the lack of restriction over access that the cable would entail when buried in the intertidal at Suva end; though applying letter of the law it would be needed.
- This matter would need further high-level Ministerial discussion likely through Ministry of Foreign Affairs for resolution and permission to lay the cable within Fijian EEZ to be granted
- The Director raised the likelihood of customary fishing rights owners to seek some form or compensation/payment; this clearly needs to be resolved as soon in the process as possible

**TONGA CONSULTATION MEETINGS**

**27 July 2010 – Tonga Cable Limited**

Robert Bolouri (Managing Director)

- Prime Minister is now fully aware of and supportive of the project.
- Cabinet decision (#583) of 2 July approved the lease of the three residential sections in Sopu to TCL for the purpose of a cable station.

**27 July 2010 – Pacific Forum Line**

Derek Leonard (Manager)

- No real problem for shipping.
- Oil tankers can use the Hukaumama'o Channel or other channels if need be.
- Frequency of shipping would readily allow cable laying to occur between scheduled

ship visits.

- There is now a lot of vessel sharing between lines so that there is better frequency out of Aust/NZ with fewer ships.
- Speak to David Wright of the Port Authority about proposals for any maintenance dredging of the shipping channel.

**27 July 2010 – Peace Corps**

Kelly Cullen (Manager)

- Peace Corps are an immediate neighbour to the proposed landing site and cable station.
- Pleased to hear of this intended development for Tonga
- Currently no one is living on the Peace Corps site because the building is unsafe
- No objection to the development.

**27 July 2010 – Ministry for the Environment and Climate Change**

'Asipeli Palaki (Acting Director)
Lupe Matoto (Asst Director)
Tupe Samani (Head of Conservation)
Seini Fotu (Conservation Officer)
Soana 'Otuafi (Environment Officer)
Kathy Zischka (Australian Volunteer)
Lisiate Bloomfield (Engineer – Sustainable Land Management)
'Ofa Ma'asi (GTZ Project)

- MECC have determined that an EA is necessary. MECC accept that the current WB/ADB ToR is more demanding than that of the EA Act so they will be satisfied with the EA focussing on the WB/ADB ToR. [A letter to this effect was thought to have been sent, but has not been received by TCL].
- Suggest the EA discuss and if appropriate discount any chemical or waste contamination of soil or groundwater contamination from the development at the cable station.
- Be sure to discuss economic benefit to Tonga.
- Agree that the small boat passage is the best approach onto the reef platform.
- Agree that there is good separation from marine protected areas.
- When it comes to monitoring compliance, MECC would prefer to be a passive partner – checking off compliance verified by another party rather than doing it themselves.

**27 July 2010 – Fishing associations**

Mr Pau mo Levuka Likiliki – Program Officer
(Fishing Industries Association of Tonga)
Mr Roger Miller – Rep for Sports Fishing
Mr Siua Finau – Rep for Deep Fishing
Ms 'Aina Kavaliku – CEO Tonga Chamber of Commerce
Mr 'Alo Fe'iloakitau – Rep for 'Alatini Fishing Company Ltd

- Entanglement of fish with cable most unlikely, especially if laid at intended depth, on the seabed, and with no suspended sections.
- Deepwater snapper fishing is usually down to 300-600m.
- Definitely avoid seamounts.
- Only two boats are currently longlining in Tongan waters.
- They suggest burying the cable over the reef platform leading up to the landing site.

**28 July 2010 – ANZ Bank**

Arthur Hubbard (CEO)

- ANZ Bank rents a residential property diagonally opposite the proposed cable station.
- Pleased to hear of this intended development for Tonga
- No objection to the development.

**28 July 2010 – Ministry of Lands, Survey and Natural Resources**

Dr Sione Nailasikau Halatuituia – CEO

- The public reserve at the landing site is government land, under the control of the Minister of Lands.
- Also the road reserve at the landing site is government land, under the control of the Minister of Lands.
- It is a legal requirement to obtain a permit to trench over the public reserve and road reserve.
- KORDI minerals also have prospecting licences in the area.

**28 July 2010 – Ports Authority Tonga**

Mr Mosese Lavemai – CFO/Acting GM
Mr 'Esau Tupou – Pilot
Mr Andrew Niukapu – Draughtman
Mr Iketau Kaufusi – Operation Manager

- The tidal current at the harbour entrance is a max of 2 kt (and probably less than a quarter of that on the seafloor).
- Port Authority has a plan to sink derelict ships (presently cluttering up the harbour) in a spot outside the harbour entrance about 2–3 miles south of the cable path.
- The Port Authority would want to be very sure the cable did not move from its laid position.
- The area offshore from Sopu is good holding ground and is used for mooring vessels awaiting berths and for mooring vessels caught in harbour by cyclones. Therefore, the PA would be reluctant to dedicate that area as an extension to the current no-anchor zone to protect the cable.
- The future may see more development of the harbour to the west out toward Sopu. Included among such long-term developments is a 2000-t slipway proposed in 1992 at Sopu near to the proposed landing site.
- The PA dredge comprises a barge carrying a crane with a grab bucket. It usually operates down to depths of 5–6 m.
- Larger vessels (e.g. Emirates and cruise liners) in the future may require deepening of the main channel to 11+ metres. [Note, at present the floor of the channel is considerably deeper (about 20m), but upstanding coral heads limit depth in some places and would have to be removed].
- The cable-laying operation is just business as usual for the PA and poses no problems.
- The marine notification authority for Tonga is the MoT – Marine Division, who then notifies the TDS-Navy. Advice of new structures is sent to the NZ Hydrographic Office. MoT is also responsible for reporting under international maritime legislation.
- Fishermen often fish (and snorkel) in the main shipping channel (and vandalise/steal PA structures like navigational beacons).
- Super yachts usually moor off the wharves or use Queen Salote wharf.

**28 July 2010 – Dateline Transam Shipping**

Fine Tohi (Manager)

- Communications is vital to their operation so they are fully supportive of the proposal.
- No real problem for shipping movements.
- The Sopu mooring area is used infrequently but routinely by, for example, ships arriving in harbour on a Sunday and unable to take up a berth until work begins on Monday.

**28 July 2010 – KORDI Minerals Ltd**

Hyeon Su Jeong (Leader, Seafloor Sulphides Research and Development Organisation (SERADO), KORDI Minerals Ltd)
Jang Wan Bang (Secretary, KORDI Minerals Ltd)

- Members of the KORDI delegation upon seeing the proposed route confirmed the cable will pass through their tenement areas.
- KORDI have plans to apply for mining licences for some of their tenement areas in the immediate future and start active mining in early 2011 pending issuance of approvals
- Members of KORDI expressed concern that with the proposed cable route passing through areas that may want to mine, this may interfere with their operations
- It was left that KORDI would contact TCL as and when the detailed route survey was undertaken and a route was identified and that the consultants would include recommendations for spatial separation between cable route and possible extinct hydrothermal vent areas

**28 July 2010 – Community public meeting**

Mr Feonisia Sikalu – Acting Administration Officer (Peace Corps)
Ms Kaati Pale – IT Specialist (Peace Corps)
Ms Robina Nakao – Nakao Family
Mr Tsutomu Nakao – Nakao Family
Mr George Nakao – Nakao Family
Mr Juhei Nakao (Nako family)
Mr Robert Bolouri – Managing Director TCL
Mr Timote Katoanga – CEO TCC
Mr 'Inoke Vala – CEO, Public Enterprises
Mr Hugh Mc Garry, Principal Garnet Consulting Ltd (ADB Consultant)
Gisoon Song – Governance Specialist, ADB
Mr Tevita Puluka, Puluka Group Construction

- Keenly interested in the timing and nature of construction around their neighbourhood.
- Also interested in the nature of the cable station – what will it look like, how much noise in operation, etc.
- Relieved to learn that site will not be a transmitting station so no radiation from the site.
- Generally acknowledging the benefits of the project to Tonga and accepting of the short-term disruption.

**29 July 2010 – MAFFF-Fisheries**

Mr Vili Mo'ale (Principal Fisheries Officer & Acting CEO of Fisheries)
Mr Siola'a Malimali, Principal Fisheries Officer
Ms Mele Ikatonga, Fisheries Officer

Mr Poasi Ngaluafe, Senior Fisheries Officer
Mr Silivenusi Ha'unga, Fisheries Officer

- Possible future aquaculture (clams, sea cucumber) in the harbour offshore from Fisheries. Certainly no conflict in the shipping channel, but primary area being considered for aquaculture is in the sandy bottom area offshore from the reef platform and west of the shipping channel [note, this may be in conflict with ship mooring advised by Port Authority and Dateline Transam].
- Cable would be no threat to fishing if buried. Should certainly be buried in the small boat passage to ensure sufficient clearance for boats using the passage.
- In the outer harbour the main fishing activities are hand-lining and spear-fishing – no problem from cable.
- There has been, and there remains a remote possibility for, dynamite fishing in the locality.
- Stay away from seamounts because they are hotspots for fish breeding, have high habitat value and there is a concentration of fishing activity down to 600-1000m.
- Ensure the cable stays in place and doesn't drift with current or extraordinary events like storms.
- MAFFF currently does some monitoring both sides of the cable route. There was some discussion about whether a) this is useful to the cable and b) whether the cable company would be doing more. Agreed position was that the effect of cable would be negligible such that fluctuations in such monitoring data would obscure any trend and generally not provide anything of value.
- There is an oyster spat line anchored parallel to the reef-front, just west of the small boat passage – this would need to be protected from disturbance and siltation during construction.

**29 July 2010 – Nautilus Minerals**

Mr Paula Taumoepeau (Country Manager)

- If mining were to proceed in this area, it would be on extinct hydrothermal vents.
- Suggest we contact Mike Johnson (VP-exploration) for details.
- Most prospecting areas have been surveyed at a reconnaissance level only, but a few have received more detailed study by ROV.
- If the EA comes up with some rules regarding separation between the cable and both active and extinct hydrothermal vents, then that should ensure no conflict with mining interests.
- Nautilus (and they suspect KORDI also) would welcome opportunity to advise of any conflicting interest they might have once the final cable route has been determined.
- Nautilus does not plan to mine in the Tonga area for a few years yet. They are focussing their energy on PNG at present), but they are continuing to prospect the Tonga licence areas.

**29 July 2010 – Tonga Chamber of Commerce and Industry Inc**

Mr Paula Taumoepeau (President)

- There are considerable economic and social benefits for Tonga arising from the proposed development and the Chamber of Commerce is fully supportive of the development.

# Appendix 3 Best Practice for Vessels Operating near Cetaceans

## Best practice for vessels operating acoustic apparatus within areas known to be frequented by cetaceans[23]

### Guidelines for all vessels

1. When piloting vessels, vessel operators shall alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles;
2. Reduce vessel speed to 10 knots or less when piloting vessels in the proximity of marine mammals;
3. Reduce vessel speed to 5 knots or less when piloting vessels in areas of known or suspected turtle activity;
4. Marine mammals and sea turtles should not be encircled or trapped between multiple vessels or between vessels and the shore;
5. If approached by a marine mammal or turtle, put the engine in neutral and allow the animal to pass;
6. Unless specifically covered under a separate permit that allows activity in proximity to protected species, all inwater work will be postponed when whales are within 100 yards, or other protected species are within 50 yards.
7. Activity will commence only after the animal(s) depart the area;
8. Should protected species enter the area while in-water work is already in progress, the activity may continue only when that activity has no reasonable expectation to adversely affect the animal(s); and

### Guidelines for vessel operating acoustic apparatus

#### General requirements

1. The minimum source level required to achieve results should be used and frequencies chosen to minimise impacts on marine mammals.
2. Continuous noise is likely to be more damaging to marine mammals than pulsed sounds and should be avoided where possible.
3. Qualified and experienced Marine Mammal Observers1 (MMOs) must be present on board all vessels conducting seismic (including boomers) or electromagnetic surveys at all times during the survey.
4. The MMO must use a distance measuring stick, reticle telescope or binoculars to ascertain distances to marine mammals.
5. MMOs must be engaged solely in monitoring the operator's implementation of these guidelines and conducting visual/acoustic observation of mammals during the survey.
6. The MMO must submit copies of the reporting template as outlined at the end of these guidelines and must submit this report to the competent government agencies both in Tonga and Fiji

[23] Gudelines modified from a number of sources including Department of the Environment, Heritage and Local Government, Government of Ireland 2007 Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters; EA report for American Samoa Cable prepared by PacRim Deployment LLC, 2008; JNCC guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys, 2009. Available at https://www.og.decc.gov.uk/environment/jncc_seismic_guide.pdf and pers. comms, Cara Miller, Pacific Islands Region Programme Leader for the Whale and Dolphin Conservation Society

7. The vessel operator must provide a report (including a daily log) on the operation of the seismic equipment that will indicate the soft starts and their duration to the MMO.

**Multibeam and side-scan sonar surveys**

*Pre-start scan for marine mammals*

1. If survey work is to be conducted in sheltered and enclosed waters, survey work must start at the inner most part of the bay, inlet or estuary to be surveyed and work outwards. This is to ensure that cetaceans are not driven into an enclosed area which could cause them to panic.
2. MMOs should survey the area for the presence of cetaceans 30 minutes before the starting of operations.
3. A minimum distance of 1000 metres is required between the centre of the array/sound source and the nearest cetacean before starting.
4. If marine mammals are seen within 1000 metres of the centre of the sound source the start of the sound source(s) should be delayed until they have moved away, allowing adequate time after the last sighting for the animals to leave the area (30 minutes).
5. If the cetaceans do not leave the area it is recommended that the survey vessel alter course to ensure that the animals are outside the 1000 metres exclusion zone when soft start commences.

*Soft-start procedures for multibeam and side-scan sonar*

1. The sound level must be allowed to gradually build over a period of 20 minutes; where this is not possible, the equipment should be turned on and off over a 20 minute period to act as a warning signal and allow cetaceans to move away from the sound source.
2. Multibeam or side-scan sonar start-up must occur during daylight hours when MMO's can carry out the required start-up procedure.
3. The start-up procedure should be implemented at all times including during testing of the sound source.
4. If, for any reason, the sound source is stopped and not restarted for at least 5 minutes a full start-up procedure should be carried out.
5. Once the sound source has achieved its maximum output the survey need not be halted if cetaceans approach the vessel.
6. If turn-around time between sample lines or stations is greater than the time required to conduct a start-up procedure (30 minutes), then the sound source should be stopped and a full start-up procedure should be used prior to commencing the new line.

*Standard reporting template*[24]

## MARINE MAMMAL RECORDING FORM - RECORD OF SIGHTING

*Options in italics should be circled or underlined as appropriate*

| Date | Time (UTC) | | Sighting no. |
|---|---|---|---|
| **How did this sighting occur?** (please tick box)<br>While you were keeping a continuous watch for marine mammals _<br>Spotted incidentally by you or someone else _<br>Other (please specify) _ | | | |
| **Ship** | | **Observer** | |
| **Ship's position** (latitude and longitude) | | | **Water depth** (metres) |
| **Species** | | **Certainty of identification (underline)**<br>Definite / probable / possible | |
| **Total number** | | **Number of adults**<br>**Number of juveniles** | |
| **Description** (include features such as overall size; shape of head; colour and pattern; size, shape and position of dorsal fin; height, direction and shape of blow)<br>  | | | **Photograph or video taken**<br>*Yes / No*<br>**Direction of travel of animals in relation to ship** (draw arrow) |
| **Behaviour** | | | **Direction of travel of animals** (compass points) |
| **Activity of ship** | **Airguns firing**<br>(when animals first seen)<br>*Yes / No / Soft-start* | | **Closest distance of animals from airguns** (metres)<br>(Record even if not firing) |

[24] Taken from Department of the Environment, Heritage and Local Government, Government of Ireland 2007 Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters

# Appendix 4 Cyclone and Hydrocarbon Spill Contingency Plans

The project proponent and their contractors will manage a contingency plan aimed at identifying and managing unplanned events, focussing on two types of event that can arise and affect the implementation of the development – Cyclone and Hydrocarbon Spills.

### Cyclone Preparedness Plan

This is the most common natural phenomenon occurring in Tonga and Fiji and one that could serious curtailment of the development. The cyclone season in the south Pacific is concentrated in the period November to April. The purpose of this plan is to ensure the maximum safety of property and lives during an incoming storm.

The main elements of the plan in its various stages are:

1. **Preliminary alert**
    - Stay informed by radio and television of the storm progress
    - Communicate with vessels and emergency management officials
2. **36-hour alert**
    - Clear the cable-laying vessels to a safe area
    - Identify safe shelter for personnel
3. **24-hour alert**
    - Remove vulnerable equipment to a safe place.
    - Secure the site
    - Ensure personnel have safe refuge
    - Schedule resumption of activities when storm has passed
4. **All clear**
    - Survey damage and remediation required
    - Schedule resumption of activities as appropriate

### Hydrocarbon Spill Contingency Plan

This plan will cover any hydrocarbon spill and/or leak that could occur on vessels or the cable station. This plan institutes the need for a timely and effective response to incidents. Contingency plans describe information and processes for containing and cleaning up a spill that occurs in a defined area of the project.

The magnitude of spills determines the response and the responder(s) as follows:

**Marine Spill Levels**

| Tier | Quantity (litres) | Location | Response |
|---|---|---|---|
| I | <50 000 | Coastal/ Marine | To be managed by polluter |
| II | 50 000 – 500 000 | Coastal/ Marine | Requires government assistance for management |
| III | >500 000 | Coastal/ Marine | Requires Government and/or external Assistance |

**Inland Spill Levels**

| Tier | Quantity (litres) | Location | Response |
|---|---|---|---|
| A | <5000 | On land or Inland | To be managed by polluter |
| B | 5000 or presents significant health hazard and requires evacuation | On land or Inland | Responsible party requires government assistance to manage the discharge |

#### *Fuel Management*

Fuel will be managed to prevent spills and leaks via the following:

- Storage: Fuel will be stored inside the vessels built-in fuel tanks that have reinforced steel containment wall. To protect against any accidental fire the tank will be sited away from all electrical installations within the vessel.
- Maintenance: It is necessary to inspect the fuel tanks, dispensing pumps, hoses, supply fuel lines and generators for spills and/or leaks.

#### *Waste Oil Management*

Waste oil will be managed according to the following:

- Storage: All waste oil will be stored in properly sealed drums and inside a containment wall.
- Handling: Used oils are a legal responsibility of the user and thus should be handled adequately and with care.
- Disposal: Although the volume may be very small, it is important to properly discard the accumulated waste oil. Once stored, the waste oil should be disposed of by an approved contractor.

### *Contingency Equipment and Safety Priorities*

Spill response equipment is the most important component in the Spill Contingency Plan. This equipment can vary depending on the size and type of the activity. The following equipment will be required:

- Spill Response Kits – these will be installed at key locations such as dispensing pumps, generators, maintenance areas, etc.
- Containment Booms – mostly for marine spills which will be deployed if need be the case.

The following priorities are taken into consideration:

- Safety to human life is the highest priority in any response, and should be ensured that all personnel are protected.
- Containment of incident to stabilize the situation.
- Minimize and prevent any adverse environmental impact.

## Appendix 5 Waste Management Policy

Tonga Cable Limited will deal with waste in accordance with local regulations and the following guiding principles:

- Recyclable plastic, paper, glass and metal will be separated and disposed of through the municipal recycling facility.
- Organic waste will be separated (where practical) and disposed of by composting or used as pig food.
- Sewage sludge pumped from the septic tank will be disposed of by licensed disposal contractors.
- Used lubricants, toxic electric/electronic components, and other hazardous material will, where possible, be disposed of at an industrial recycling/waste facility.
- Non-recyclable organic and inorganic waste will be disposed of in the municipal landfill.

# Appendix 6 Environmental Coordination Role – key terms of reference

The project steering committee is seeking the services of a consultant or consultant team to deliver environmental coordination services to the Tonga-Fiji Connectivity Project.

**SCOPE OF SERVICES**

1) Apply the Monitoring Plan to monitor all service providers, and document their compliance with the Environmental Management Plan (EMP)
2) Liaise with appropriate agencies of government in Fiji and Tonga to ensure they are fully engaged and comfortable with the conduct and performance of the Environmental Management Plan
3) Respond quickly and effectively with corrective and remedial action to unforeseen environmental impacts as circumstances demand
4) Engage appropriate ministries in their respective domains in evaluation, certifying compliance and reporting against the objectives in the Environmental Management Plan
5) Assist in securing requisite approvals and consents as directed by the Project Manager

**TASKS**

**Task 0: Environmental Compliance Report**

Develop the Monitoring Plans in the Environmental Assessment into an environmental compliance report template. Agree with the Project Manager whether this report is organised by phase (Design & Construction) or by task, as below. This report will be the vehicle for recording and verifying compliance with the EMP in Tasks 1–5 below.

**Task 1: Detailed Design**

Review the plans and specifications for the Tonga cable station for compliance with the EMP and ensure corrective action is taken to remedy any shortfall. Brief the Chief Surveyor and Chief Design Engineer on the objectives of the EMP and its' mitigation measures. Liaise with agencies of government in Fiji and Tonga (Table 2.1) to ensure they are fully engaged and comfortable with the conduct and performance of the Environmental Management Plan. Accompany the marine route survey verifying compliance of that operation with the EMP, especially in regard to marine mammal and marine pollution precautions. Verify that the revised cable route follows a path that avoids or minimises all potential conflicts identified in the EMP (especially those associated with hydrothermal vent fields and seamounts), documenting compliance as appropriate. Certify that the overall detailed design has followed the EMP and avoids, or reduces to acceptable levels, the potential environmental impacts identified in the EMP (and any others identified during the marine route survey).

**Task 2: Fiji Cable Landing**

Liaise with agencies of government in Fiji, FinTel, and customary fishing groups (Table 2.1) to ensure they are fully engaged and comfortable with the conduct and performance of the Environmental Management Plan. Assist the Project Manager in securing the necessary permissions as appropriate. Brief the Chief Cable Engineer on the objectives of the EMP and its' mitigation measures in regard to the nearshore approaches of the cable to the Fiji cable station. Verify that the cable path and construction avoids or minimises all potential conflicts identified in the EMP. Certify that the Fiji Cable Landing operation has followed the EMP and avoids, or reduces to acceptable levels, the potential environmental impacts identified in the EMP (and any others identified during construction).

**Task 3: Tonga Cable Landing**

Liaise with agencies of government in Tonga (Table 2.1), roading and utilities authorities, to ensure they are fully engaged and comfortable with the conduct and performance of the Environmental Management Plan. Assist the Project Manager in securing the necessary permissions as appropriate. Brief the Chief Cable Engineer on the objectives of the EMP and its' mitigation measures in regard to the nearshore approaches of the cable to the Tonga cable station. Verify that the cable path and construction avoids or minimises all potential conflicts identified in the EMP. Certify that the Tonga Cable Landing operation has followed the EMP and avoids, or reduces to acceptable levels, the potential environmental impacts identified in the EMP (and any others identified during construction).

**Task 4: Cable Lay**

Brief the Chief Cable Engineer on the objectives of the EMP and its' mitigation measures. Liaise with agencies of government in Fiji and Tonga (Table 2.1) to ensure they are fully engaged and comfortable with the conduct and performance of the Environmental Management Plan. Accompany the cable-laying vessel verifying compliance of that operation with the EMP, especially in regard to accurate cable placement, marine mammal and marine pollution precautions. Verify that the as-laid cable path overlies the design path and avoids or minimises all potential conflicts identified in the EMP, documenting compliance as appropriate. Certify that the cable lay operation has followed the EMP and avoids, or reduces to acceptable levels, the potential environmental impacts identified in the EMP (and any others identified during the cable lay).

**Task 5: Tonga Cable Station**

Brief the Construction Engineer/Site Supervisor on the objectives of the EMP and its' mitigation measures relating to the cable station construction. Liaise with agencies of government in Tonga (Table 2.1), regulatory authorities and affected stakeholders to ensure they are fully engaged and comfortable with the conduct and performance of the Environmental Management Plan. Verify that the station construction avoids or minimises all potential conflicts identified in the EMP (especially those related to waste disposal and pollution), documenting compliance as appropriate. Certify that the station construction operation has followed the EMP and avoids, or reduces to acceptable levels, the potential environmental impacts identified in the EMP (and any others identified during construction).

## REQUIRED SKILLS

The project steering committee is seeking the services of a consultant or consultant team to deliver environmental coordination services during the design and construction phases of the project. The consultant or consultants must be highly competent and have relevant academic qualifications and experience to deliver the services that are being sought in this TOR. The successful completion of these services will require the competencies and skills in the following areas; oceanography, marine biology/biodiversity, environmental law, environmental assessments with particular focus on marine resources and ecosystems, natural resource management, and social science. Significant knowledge of, and relevant professional experience in, environmental assessment and project management is desirable.

## DELIVERABLES

1) The principal deliverable will be a comprehensive environmental compliance report that documents, with supporting evidence or references to such evidence, the environmental compliance of the project with the Environmental Management Plan.

Tonga Cable Limited

# Grievance Redress Mechanism

# Tonga Cable

# Grievance Redress Mechanism

## Tonga Connectivity

*Prepared By:*

*Tonga Cable Limited*

*May 2011*

The Grievance Redress Mechanism – Tonga Cable is a document prepared by Tonga Cable Limited in relation to its fibre optic cable project to connect Tonga to Southern Cross Cable in Fiji.

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# Grievance Redress Mechanism

## INTRODUCTION

The main objective of Tonga Cable Project (the Project) is to provide fast, reliable, economical and efficient way of communication for people of Tonga. The project will connect Tonga via a fibre optic cable to Southern Cross Cable Network in Suva, Fiji.

It is possible that people may have grievances about the Project's social or environmental impacts. These grievances will need to be addressed quickly and transparently, and without retribution to the affected person (AP). This document provides a mechanism for receiving, evaluating and facilitating resolution of affected people's grievances in respect to construction and operation of the Project.

## GRIEVANCE REDRESS MECHANISM (GRM)

In order to respond to AP's concerns effectively and in timely manner, Tonga Cable Limited (TCL) has adopted the following procedures to be used at different levels of management, to address social and environmental safeguard grievances that may arise from the Project.

For the purpose of this document and in order to facilitate receiving and addressing concerns from AP, the Project is divided into two sections;

1. Construction of Landing Station in Tonga and installation of its cable (Tonga Section).
2. Installation of fibre optic cable in Fiji (Fiji Section).

For Tonga Section the following procedure will be followed;

### A. During construction:

1. During construction the contractor will be initially responsible for monitoring and supervising the compliance with the Environmental Management Plan (EMP) and the Compensation and Resettlement Framework (CRF) and responding to any AP's concerns. The Project Manager appointed by the contractor (PMC), will be the first point of contact. The overall responsible entity is TCL.
2. Most complaints arising during construction are expected to be minor complaints concerning dust or noise that should be able to be resolved quite easily and acted upon immediately at the site by the Project Manager. Where the complaint is of a more serious nature the PMC will have up to two weeks to resolve the compliant.
3. All complaints arriving at the Site Office[25] are to be entered in a Register that is kept at TCL's office, showing; date, name, contact address and reason for the complaint. A duplicate copy of the entry will be given (if requested) to the AP for their record at the time of registering

[25] The Site Office will be accessible to all segments of affected people

the complaint. The Register will show who has been directed to deal with the complaint and the date when this was made together with the date when the AP was informed of the decision and how the decision was conveyed to the AP. The Register is then signed off by the person who is responsible for the decision and dated. The Register will be kept at the TCL Office and is a public document. There are no fees attached to the AP for making a complaint.

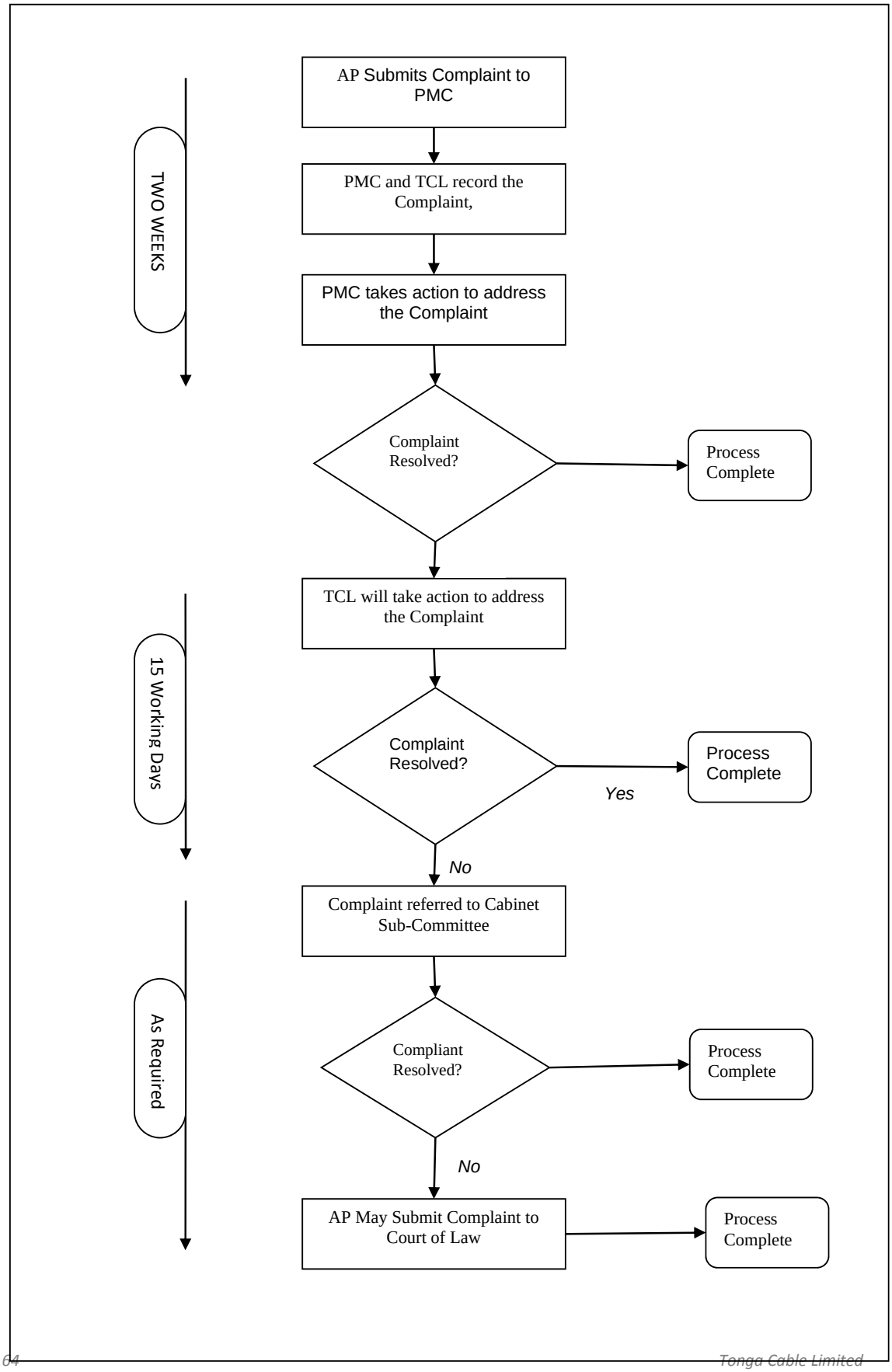
4. The PMC will consider the complaint and within a maximum of two weeks will convey[26] a decision to the AP. The AP also may, if so desired, discuss the complaint directly with the Project Supervisor (PS) who oversees the project on behalf of TCL. Prior to the dismissal of a complaint, the PS will present the case to the Managing Director of TCL (MD) for review. Should the MD concur that the complaint be dismissed the AP will be informed of their rights to take it to the next level as indicated below and in the chart. A copy of this decision is to be sent to the PMC.
5. Should the AP not be satisfied, they may submit an appeal in writing (form is attached as Appendix 1) to the Board of Directors of TCL. The Board will meet within 10 working days from the receipt of complaint to address the concern and will convey its decision in writing to AP within 5 working days after the Board meeting.
6. Should the AP not be satisfied with the Board's decision, the AP may take the complaint to the Cabinet Sub-Committee who is in charge of monitoring and overseeing of the whole project. The Sub-Committee will make a determination on the AP's grievance.
7. If the AP is dissatisfied with the determination of the Sub-Committee, the AP may appeal/file a complaint to the Judicial System in Tonga. This will be at the AP's cost but if the court decides that the contractor or TCL have been negligent in their operation or their determination the AP will be able to seek costs.

### B. During Operation

8. The same procedure is followed except that the complaint is now directed to the Manger Director of TCL to rectify. During operation the same conditions apply; i.e. there are no fees attached to the AP for making a complaint, the complainant is free to make the complaint which will be treated in a transparent manner and the AP will not be subject to retribution for making the complaint.

Below chart shows the outlines of the process in respect to the Tonga Side for responding to any concerns by Affected Person.

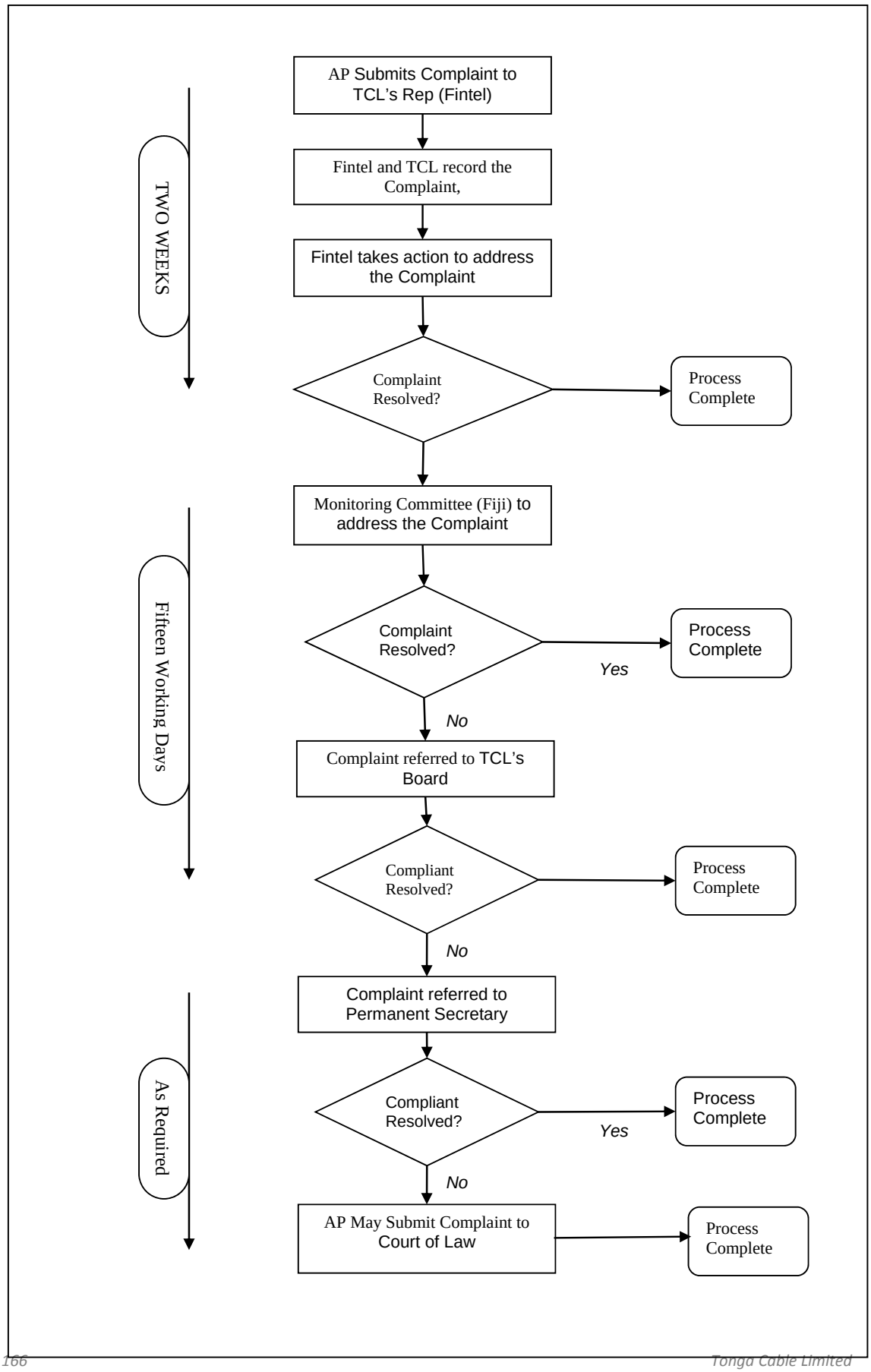
[26] The method of conveying the decision depends on the nature of complaint. For example if the neighbour complains verbally about the noise of equipment, the Project Manager will respond verbally and address the concern immediately. But if the neighbour has more serious concern it may require putting it in writing and therefore will receive response in writing.


AP Submits Complaint to PMC
PMC and TCL record the Complaint,
PMC takes action to address the Complaint
TWO WEEKS
Complaint Resolved?
Process Complete
TCL will take action to address the Complaint
15 Working Days
Complaint Resolved?
Process Complete
Yes
No
Complaint referred to Cabinet Sub-Committee
As Required
Compliant Resolved?
Process Complete
No
AP May Submit Complaint to Court of Law
Process Complete

For Fiji Section; as there is no construction involved no complaint is expected to arise however; installation of cable at Fiji Section may create some grievances by local fishermen.

9. During cable-laying the contractor will be initially responsible for monitoring and supervising the compliance with the Environmental Management Plan (EMP) and the Compensation and Resettlement Framework (CRF) and responding to any AP's concerns. The overall responsible entity is TCL.
10. In case of any grievances the AP will submit its complaint to TCL's representative (REP) at Fintel Office located at 158 Victoria Parade, Suva, Fiji.
11. All complaints arriving at the Fintel Office are to be entered in a Register that is kept at Fintel's Office, showing; date, name, contact address and reason for the complaint. A duplicate copy of the entry will be given (if requested) to the AP for their record at the time of registering the complaint. The Register will show who has been directed to deal with the complaint and the date when this was made together with the date when the AP was informed of the decision and how the decision was conveyed to the AP. The Register is then signed off by REP and dated. The Register will be kept at the Fintel's Office and is a public document. There are no fees attached to the AP for making a complaint.
12. The REP will inform the Monitoring Committee (Fiji) of the nature and the outcome of the complaint.
13. The REP will consider the complaint and within a maximum of two weeks will convey a decision to the AP. The AP may, if so desired, discuss the complaint directly with the Secretary of the Monitoring Committee (Fiji) or his/her Representative. Prior to the dismissal of a complaint, the REP will present the case to the Managing Director of TCL (MD) for review. Should the MD concur that the complaint be dismissed the AP will be informed of their rights in taking it to the next level. A copy of this decision is to be sent to the Fintel's Office.
14. Should the AP not be satisfied, they may appeal to the Monitoring Committee (Fiji) which in turn will be sent to the Board of Directors of TCL. The Board will meet within 10 working days from the receipt of complaint to address the concern and will convey its decision to the Monitoring Committee (Fiji) and AP within 5 working days after the Board meeting.
15. Should the AP not be satisfied with the Board's decision, depending on the nature of complaint, the AP may take the complaint to Permanent Secretary of the Ministry of Indigenous Affairs. The Permanent Secretary will make a determination on the AP's grievance.
16. If the AP is dissatisfied with the determination of the Permanent Secretary, the AP may appeal/file a complaint to the Judicial System in Fiji. This will be at the AP's cost but if the court shows that the contractor or TCL have been negligent in their operation or their determination the AP will be able to seek costs.

Below chart shows the outlines of the process in respect to Fiji Side for responding to any concerns by Affected Person.


AP Submits Complaint to TCL's Rep (Fintel)
Fintel and TCL record the Complaint,
Fintel takes action to address the Complaint
TWO WEEKS
Complaint Resolved?
Process Complete
Monitoring Committee (Fiji) to address the Complaint
Fifteen Working Days
Complaint Resolved?
Process Complete
Yes
No
Complaint referred to TCL's Board
Compliant Resolved?
Process Complete
No
Complaint referred to Permanent Secretary
As Required
Compliant Resolved?
Process Complete
Yes
No
AP May Submit Complaint to Court of Law
Process Complete

**Appendix 1**

# Grievance Registration Form

## Tonga Cable

| | | |
|---|---|---|
| Registration No.: | Date Received: | Received by: |
| Name: | Address: | Contact Numbers<br>Mobile:<br>Telephone: |
| Nature of grievance: | | |
| Responded by: | Date of Response: | |
| ( ) Accepted. Action taken: | ( ) Declined. Reasons for decline: | |
| Signed by: | Approved by: | |
| Conveyed to AP verbal/written | By: | Date: |