Environment and Social Impact Assessment Document

Grant No. D004-FM
Project No. P130592

March 2016

PALAU FSM CONNECTIVITY PROJECT

Environmental and Social Safeguards: Yap and Chuuk Cable System Components

Initial Environmental Examination

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ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
BMH	Beach Manhole
BMR	Bureau of Marine Resources - Palau
BU	Branching Unit
CA	Conservation Area
CBO	Community Based Organization
COFA	Compact of Free Association
CPP	Community Participation Plan
CPUC	Chuuk Public Utilities Company
DMR	Department of Marine Resources – Chuuk State
DMRD	Department of Marine Resources Development
DTCI	Department of Transportation, Communication & infrastructure
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EPA	Environmental Protection Agency
EQPB	Environment Quality Protection Board
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
FSM	Federated States of Micronesia
FSMTC	Federated States of Micronesia Telecoms Corporation
GDP	Gross Domestic Product
GPS	Global Positioning System
GRM	Grievance Redress Mechanism
HDD	Horizontal Direct Drilling
IA	Implementing Agency
ICPC	International Cable Protection Committee
ICT	Information and Communications Technology
IPP	Indigenous Peoples Plan
IUCN	International Union for the Conservation of Nature
Km	Kilometres
MARPOL	International Convention for the Prevention of Pollution From Ships
MGD	Millennium Development Goal
MICROPAL	Micronesia-Palau Project Management Committee
MNRET	Ministry of Natural Resources, Environment and Tourism
MPA	Marine Protected Area
MRMD	Marine Resources Management Division – Yap State
NGO	Non-Government Organisation
OP	Operational Policy (of World Bank)
PAN	Protected Area Network
PIA	Project Influence Area
PNCC	Palau National Communications Corporation
PNG	Papua New Guinea

ROW	Right of Way
RP	Resettlement Plan
SCS	Submarine Cable System
SPC	Secretariat of the Pacific Community
SPS	Safeguard Policy Statement 2009 (of ADB)
TA	Technical Assistance
TOR	Terms of Reference

EXECUTIVE SUMMARY

The FSM is comprised of more than 600 islands and atolls spanning across almost 3000 Km off of the tropical Pacific Ocean (Map 1). The total population is estimated at roughly 100,000, spread across the four states of Pohnpei, Kosrae, Chuuk and Yap. The economy of the country is based on natural resources exploitation, mostly fisheries, tourism, the transfers through United States (U.S.) Federal Government Compact of Free Association (COFA) grants and remittances from expatriate workers. Further it is dominated by a large public sector.

FSM has slow and expensive telephone and internet connectivity, affecting all public and private services, including education and health, limiting access to international markets and affecting social connection among its rural and urban population. The proposed fibre optic project (the project) will facilitate faster and reliable internet connectivity among the Federated States of Micronesia (FSM) and from there to the rest of the world. The project will be funded by the World Bank (WB). ADB funds were used to finance the preparation of the safeguard documentation pre-project approval. The IEE for FSM has been prepared as stand- alone report, but meeting the common objectives of ADB Safeguard Policy Statement 2009 (SPS) and WB's Operational Policy 4.01. This version is the second amendment of the initial IEE. A prior amended version was published on December 17, 2015.

FSM will receive a $47.5 million grant which will finance fiber optic connectivity for Yap and Chuuk and improved satellite connectivity for Kosrae. ADB provided a $250,000.00 grant (divided between Palau and FSM) for preparation of the safeguard documentation.

The cables will be placed along the seafloor, with deep sea sections resting on the seabed, and sections inside the 40m contour (approximation), buried about 0.75m below the seabed. The cables will be brought to shore by following existing shipping channel routes and landing at low ecological impact areas, thereby minimally interfering with coastal ecology.

The project will impact a corridor of not more than 0.5 m wide on the sea floor, and in some locations up to 0.75 m beneath the sediment. The cable, 5-7.5 cm in diameter, will be either sitting on the seafloor in the deep ocean, or be buried as it passes through the natural channel through the barrier reef into the Yap or Chuuk nearshore zone. Burial of the cable will be done to reduce interference with coastal fishing gear and reduce the risk of damage from severe storms. As it enters into the nearshore waters, the cable alignment will be in the shipping channel which, inside the barrier reef, is coral rubble and sand seafloor. For the last 1 - 2 Km the cable will be buried at a depth of about 0.75m, using a special trenching device (Figure 1) which disturbs an area of about 0.4m wide x 0.7m deep, threads the cable into the trench and closes the trench as it is towed by the cable laying vessel or other heavy equipment, will be used. There is no other disturbance to the sea floor or the water column.

The operation of large ocean going vessels which burn low grade diesel fuel will result in large emissions of greenhouse gases. To begin to address this the contractor will be required to submit emission certificates for their vessels, and show that they meet international standards, most particularly the USEPA's diesel emission standards for PM,SO_2 NOx and the visual-Black smoke test, as defined in the Environmental and Social Management Plan (ESMP).

The distance of the cable from any potentially sensitive habitat such as corals and specific protected areas will be at least 75m for both Yap and Chuuk, eliminating any chances that the work will negatively impact the marine environment.

In Yap, the first 30 metres of the landing site including the placement of the beach manhole will be on private land. The landowner has voluntarily agreed to donate an easement for the cable and beach manhole. From the beach landing the cable will run up an existing road easement for approximately 7 kms. to the landing station at the existing Federated States of Micronesia Telecom Corporation (FSMTC) premises.

In Chuuk the landing site is at the North East end of the Chuuk airport. Depending on technical considerations, the cable could run directly into an existing easement along the airport runway fence or across private property for about 30 meters to the runway fence easement. The private landowner has voluntarily agreed to donate an easement for the cable and beach manhole. From the airport fence, the cable will run through a culvert under the road to the landing station to be constructed on the existing FSMTC premises.

The preferred alignments for Yap and Chuuk will not interfere with any of the existing Marine Protected Areas on Yap, the Chuuk's proposed Marine Protected Areas or any other protected areas; and will maintain a minimum 100m safe distance from these areas.

The ESMP, describing 35 mitigative and monitoring actions, including a full set of working area boundaries, work restrictions and timing limits, will be included in the construction contract specifications. The contractor must comply with the ESMP. Compliance will be monitored by the Project Coordinator and project management team.

Given the small scale impact of the work, and the fact that nearly all of the work takes place on board a vessel at sea with a specially trained crew, no negative social impacts are predicted during any stage of the project. The installation and construction of terrestrial works, including cable laying and cable facilities will require a small crew of local contract workers working under the supervision of the contractor and monitored by the Project Coordinator and project management team.

In order to effectively implement the mitigation and monitoring tasks defined in the ESMP, as needed, the Project Coordinator will hire senior safeguards technician(s) or monitor(s). These monitors will assist with implementation and enforcement of the ESMP, in each state, primarily during the construction period of the project.

In order to insure no significant environmental and social impact occur, the Department of Transportation, Communication & Infrastructure (DTCI), DTCI's Project Coordinator, and any ESMP monitor are to be fully committed to implementing the ESMP. They will meet all the reporting requirements in a timely manner and consistently monitor the contractor, then provide regular feedback and immediately address any non-compliance issues and public complaints.

For the social sector specifically, post installation awareness raising among new subscribers on methods for controlling access to some socially undesirable sites and what to do about them, will be a mandatory requirement for whoever becomes the service provider. The respective state governments will enforce this requirement.

With these actions, it is recommended that no additional environmental or social sector studies are needed, and that this project can move to detailed design and construction.

I. INTRODUCTION

A. The Proponent and Purpose of the IEE

1. The FSM is comprised of more than 600 islands and atolls spanning across almost 3000 Km of the tropical Pacific Ocean (Map 1). The total population is estimated at roughly 100,000, spread across the four states of Pohnpei, Kosrae, Chuuk and Yap. The economy of the country is based on natural resources exploitation, mostly fisheries, tourism, transfers through United States (U.S.) Federal Government Compact of Free Association (COFA) grants, and remittances from expatriate workers. Further it is dominated by a large public sector.

2. One of the main challenges facing the FSM is to overcome its remoteness and dispersed geography by developing the infrastructure it needs to connect its people domestically and internationally, and thus to encourage social and economic development. The long-term viability of the FSM hinges on domestic and international economic integration. Improved connectivity and lower communications costs will contribute both to national economic development and to regional coordination and the integration of the FSM in the Pacific and internationally. Broadband internet offers improved connectivity, lowers transaction costs, creates new economic opportunities, and increases service delivery options.

3. The project, as currently envisaged, no longer proposes the joint construction by Palau and FSM of a standalone cable from Guam to Palau with a spur to Yap. A new–lower impact–solution has been identified. FSM will construct a spur linking Yap to the SEA-US cable system and will buy capacity on the SEA-US cable system connecting Yap to the global telecommunications network via an existing landing facility on Guam (a United States Territory). By utilizing capacity on SEA-US, rather than building a duplicate standalone cable system, these revised implementation arrangements would reduce costs, project management risks and social and environmental impacts significantly. The SEA-US consortium has selected NEC Corporation of Japan (NEC) to construct the SEA-US cable system. NEC would also construct the spur for FSM connecting Yap to the SEA-US cable system. SEA-US and NEC are reputable international operators and accordingly major environmental risks on the applicable deep-sea cable segment used to supply capacity to FSM are not anticipated. NEC's Submarine Network Division is ISO9001 compliant, is a member of ICPC and adheres to ICPC recommendations.

4. The lateral connecting cable to landfall in Yap is approximately 262 km in length, connecting to the main SEA-US cable beyond 1,000 m isobath. This is well beyond the territorial seas and contiguous zone of FSM, and well off the continental shelf. Deep ocean fiber optic cables are no larger than 17-21 mm diameter-about the size of a domestic garden hose-and are laid mainly upon the surface of the ocean floor. No specific environmental studies are undertaken for submarine cables which lie in deep sea. However, prior to laying cables, a detailed Cable Route Survey is done to ensure that the cable is not located in high risk locations or geological features (e.g., thermal vents) that often harbor unique faunal assemblages at abyssal depths. The International Cable Protection Committee (ICPC) publishes recommendations on key issues such as cable routing, cable protection and cable recovery and prescribes strict environmental standards. Extensive studies that are undertaken by cable suppliers prior to final cable laying work as effective safeguards against any possible environmental disruption, since in large part they are intended to identify routes for the cable that will avoid seamounts, volcanoes, canyons, vents, seeps, deep water reefs, dissected terrain—all areas that tend to be associated with higher biological value than the general abyssal plain.

5. The lateral cable spur between the main SEA-US cable and Yap will land in Yap at Magachgil, which is at the very southern tip of the Yap main island. The SEA-US cable system which will supply capacity to Yap between the branching unit and Guam will follow the same route and installation methodology as originally appraised. FSM will have no

control or influence over the design, installation or functioning of the SEA-US cable. Nor will FSM contribute to the financial or technical feasibility of the SEA-US cable. The spur for Yap will likely be placed in deep water up to the beach landing at Magachgil, which is outside any marine conservation areas, up an existing road easement, to the state owned landing facility site. For Chuuk, it will likely be the corridor from the Guam-Pohnpei cable junction skirting a number of atolls, also outside of the marine conservation zones, to the North East end of the airport runway and then to the existing FSMTC premises..

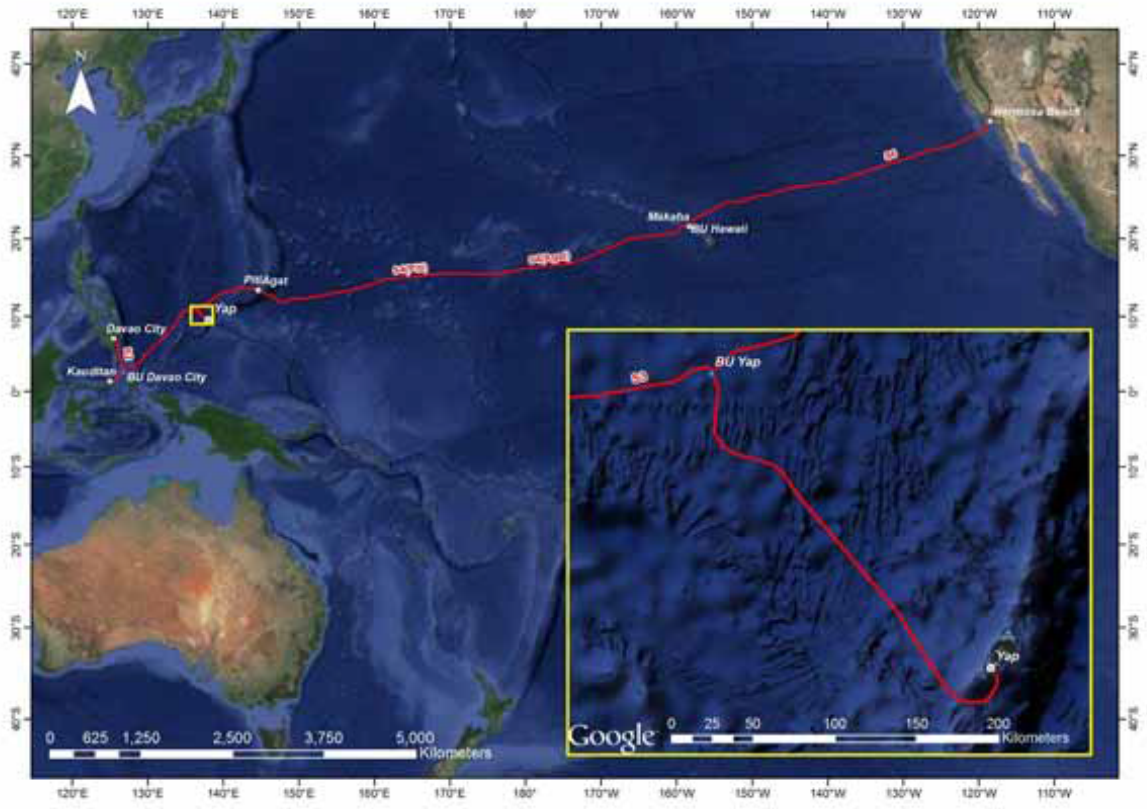
6. In Yap, the inland location for the landing site, and the site for the cable station are on government easements or land that has not been developed for any use. No structures, crops, or productive trees will be used will be affected. No land acquisition will be required and no involuntary resettlement has been identified. The owner of the shore approach and beach landing area has agreed to donate access for the cable and beach manhole through his property up to the road easement. The cable landing site in Chuuk is at the airport, which was purchased by the State from local landowners. The local landowners have been consulted and consented to the landing. The State has an existing road easement that runs from the road on the outside of the airport fence to the area in side the airport fence where the cable will be laid. Although the alignment may avoid airport property altogether, for any works on airport property U.S. Federal Aviation Authority Regulations apply and would designate the Secretary of DTCI to make necessary authorizations. .

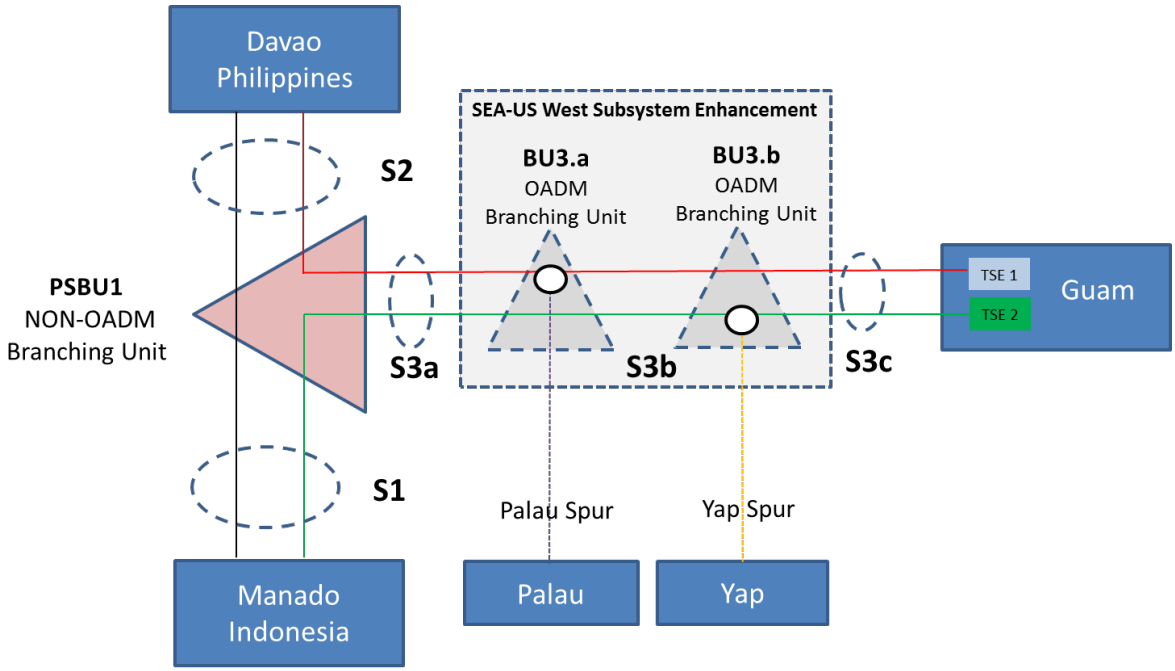
7. The revised Environmental and Social Management Plan (ESMP), included as part of this Initial Environmental Examination (IEE) report, shall extend to the extent relevant and practicable to the construction of the SEA-US segment which will be used in the supply of capacity to FSM. Due diligence reporting shall be carried out, and provided to the World Bank, on environmental and social management systems and instruments applied by SEA-US in connection with the construction of the segment of the SEA-US cable which will supply capacity to FSM, consistent with FSM's status as a customer of SEA-US and accepted commercial practices. It is noted that, as a purchaser of capacity from SEA-US under a contract for an Indefeasible Right of Use (IRU), FSM would have no influence or control over the activities of SEA-US or the design, installation or functioning of the SEA-US cable. All of the parts of the SEA-US cable south east of the branching unit that would connect Yap to SEA-US are outside the area likely to be affected by the project and do not fall within the area of influence of this Project. Any activities from Guam to Hawaii and beyond carried on by SEA-US are similarly outside the area of influence of this Project.

8. Appendix A of OP 4.01 defines Project area of influence as: The area likely to be affected by the Project, including all its ancillary aspects, such as power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, and construction camps, as well as unplanned developments induced by the Project (e.g. spontaneous settlement, logging, or shifting agriculture along access roads). The area of influence may include, for example, (a) the watershed within which the Project is located; (b) any affected estuary and coastal zone; (c) off-site areas required for resettlement or compensatory tracts; (d) the airshed (e.g. where airborne pollution such as smoke or dust may enter or leave the area of influence; (e) migratory routes of humans, wildlife, or fish, particularly where they relate to public health, economic activities, or environmental conservation; and (f) areas used for livelihood activities (hunting, fishing, grazing, gathering, agriculture, etc.) or religious or ceremonial purposes of a customary nature.

9. All of the parts of the SEA-US cable south east of the branching unit to connect Yap (to Indonesia and Philippines) are outside the area likely to be affected by the Project and do not fall within the area of influence of this Project. Any activities from Guam to Hawaii and beyond carried on by SEA-US are similarly outside the area of influence of this Project.

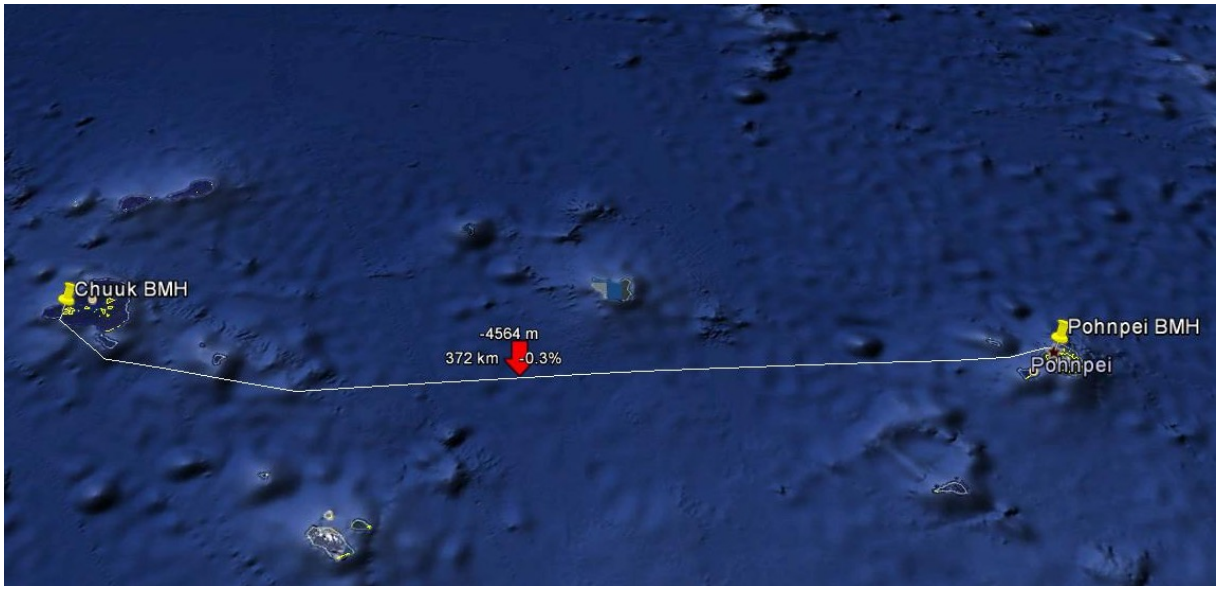
Map 1: Yap Spur Cable Configuration in SEA-US Cable System





10. The Project area of influence includes: (1) the 'Yap Spur' (yellow line in diagram above); (2) and the section between BU3.b branching unit and Guam (S3c) (green line in diagram above) which will supply capacity to Yap.

Map 2. Chuuk project area



11. **Yap State** is the western-most island State in the FSM, located between latitudes 7 to 10 degrees north, longitudes 137 to 148 degrees east and contains four main islands (Yap, Gagil, Tomil and Rumung) known as Yap Proper or Wa'ab, with a land area of approximately 100 km^2. It also has 134 low coralline islands and atolls (22 populated islands) collectively referred to as the 'outer' or 'neighbouring islands' or 'Remathau'. The lifestyle of Yap islanders is among the most traditional in the FSM, with a highly sophisticated marine tenure and marine resource management system.

12. **Chuuk State** is made up of five island regions: Chuuk Lagoon, Mortlocks, Pattiw, Halls and Nomunweito. Chuuk lagoon consists of 11 high mangrove fringed islands located within the lagoon and consists of a series of 24 outer lying atolls and low islands surrounding the lagoon (209 in total) with a total estimated area of 2,150 Km^2 and a barrier reef that is approximately 225 kilometers long. Chuuk state has the largest populations within the FSM with the majority of people living on the main islands of Weno, Tonoas, Uman, and Fefan, located in Chuuk Lagoon. Due to activities of WW II battles, Chuuk Lagoon has over 50 shipwrecks and numerous relics on the ocean floor. Unexploded munitions from this time period still remain scattered throughout the lagoon and need to be address during the deployment of the communication cable.

13. With the exception of Pohnpei, FSM's telecommunication system uses unreliable and costly satellite service for all their needs. This means poor, sometimes interrupted serves and very slow internet connections. Given that much of FSM's economy is service oriented and required reliable and quick internet services, not having such a system for the country is hampering the national economy and is resulting in FSM loosing tourist dollars to other destinations. Based on worldwide experience, in particular the countries in the Pacific Region, reliable, fast and competitively priced internet and telecommunication is essential for attracting business and satisfying tourism demand. To that end the Republic of Palau and the FSM requested the support of the Asian Development Bank and the World Bank for a broadband connectivity project that would link both countries to the global internet. And it is on this basis that FSM and Palau have collaborated in negotiating for submarine fibre optics cable system connectivity for Palau, Yap, and Chuuk to the global ICT network. A World Bank- IDA grant is providing the funding for the project in FSM. Palau is financing the cost of its spur and capacity on SEA-US via an ADB loan.

14. FSM's economy is highly reliant on tourism and fishing, with tourism accounts for more than 20% of the gross domestic product (GDP) and services represent 77% of the

GDP. Between 2008 and 2012 tourism arrivals to all of FSM dropped from 47,600 in 2009 to 38,260 in 2012 and climbed back over 41,000 for 2013 (FSM Bureau of Statistics, 2013). The provision of high quality services such as high-speed affordable internet connection is therefore essential to support and sustain economic growth over time.

15. The executing agency of this project is the DTC&I through its Project Coordinator and project team, until such time as an Open Access Entity is established and operationalized to own and operate the fiber optic infrastructure. The FSM Broadband Taskforce has also been established to provide policy oversight and guidance. The collaborative aspects of the project between FSM and Palau are being coordinated via the international steering group referred to as MICROPAL, assisted by an international technical Project Manager.

16. The IEE was prepared in order to identify any negative environmental and social effects due to the project and to design ways to prevent them from occurring or define ways to minimize them, such that any impacts do not exceed national or international standards.

17. The ADB retained an international consultant to prepare the IEE, which FSM submitted to the World Bank and received clearance for prior to project approval. Prior to any disbursement, the IEE has been amended to be in conformity with the final project design. In addition to the IEE, the ADB consultants also prepared a Social Assessment, a Land Acquisition and Resettlement plan, as well as Gender and Indigenous Peopled Due Diligence Reports. An Environmental Code of Practice for undersea cable facility siting and construction was prepared and included with the IEE. The IEE was first publicly noticed in September, 2014. In December, 2015, it was amended in consideration of the SEA-US system cable routing. The second amendment in March, 2016 contemplates the results of the desk top study and updated marine survey for the SEA-US Cable System routing and alignment to the Magachgil landing at the southern tip of Yap proper.

B. Project Status and Documentation

18. At the time when this IEE was prepared, a project feasibility study[1], as well as an economic and financial analysis[2] of the proposed project had been completed. The project is categorized as Category B, signifying the requirement of an IEE instead of a full environmental impact assessment. World Bank and ADB agreed that the IEE would adhere to the content and format requirements of the ADB, but would include additional social items in the environmental management plan, reflecting the World Bank's heavier emphasis on this component in its environmental and social assessment process and reporting.

19. Given that the focus of this IEE is on coastal zones and nearshore marine areas, various marine surveys were completed, are summarized in the IEE, and attached as a detailed report in Annex 4 of this IEE. These include the reports of the surveys of the six landing points evaluated prior to project approval, as well as the survey conducted at the Magachgil landing point once that was confirmed under the SEA-US cable system arrangements for the Yap spur.

20. For the social assessment, a stand-alone set of documents was prepared, consisting of a summary poverty reduction and social strategy, a gender action plan, and due diligence reports on involuntary resettlement and effects on Indigenous People.

21. The IEE has been updated since the document was publicly disclosed in November 2015, to reflect a new, preferred route for the Yap Spur. This version, March 2016, supersedes all other previous versions of the IEE.

C. Extent and Boundaries of the IEE

1) The Project Influence Areas: Nearshore and Landing Sites

22. The cable, which will be between 4 and 7.5cm (1.5-2.7”) in diameter will be buried in a trench dug by a towed submarine plough[3], requiring a corridor no more than 0.75m wide (accounting for the trenching machine dimensions). The trench will average around 25 cm (10”) in width, and about 0.5-0.75m (20-30”) depth (depending on need), which is opened and then closed once the towed plough (Figure 1) lays the cable into the trench. Therefore the project influence area (PIA) in the nearshore and coastal waters is no more than a 2-4m wide corridor allowing for all possible disturbances and lateral deviations of the plough.

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[1] Hibbard, John. 2011. Submarine Cable system for Palau. 45pgs
[2] World Bank. 2014 . Financial Connectivity Study for Palau-FSM (PolyConseil Consultants):35pg
[3] This method was selected as the preferred method during the analysis alternatives (Chapter V).

Figure 1. An example of submarine cable ploughs at sea and being towed from shore to deeper water by a cable laying ship

23. All specially designated areas such as marine conservation areas and special habitats such as spawning aggregation areas and seagrass beds are being treated as sensitive habitats and the project’s impact on these areas were identified.

24. **Yap**- For Yap the preferred routing and landing is at the southernmost point in Yap in Magachgil Village. Immediately off shore from the landing point a small channel exists, after which the inner coral reef extends to the outer reef. The cable will lay across the small channel, after which a narrow trench will be excavated across the inner reef to the outer reef where the cable will be buried. The outer reef is approx. 450 meters from the landfall, which is the closest point to the out reef on the outer island allowing for direct cable landing and minimal impact on the reef area. The beach manhole will be on private property about 15 metres from the shoreline (depending on the tide) and 15 metres from an unpaved loop road, and approximately 50 metres from the intersection of the asphalt road that runs the length of the island back to Colonia and the landing station premises. Except for the beach landing area, the terrestrial routing is all on existing easements or government lands. Permission has been granted by the private landowner for the beach landing and beach manhole placement. There is no planned development, existing structures or activity of any sort at the landing site. Offshore at the landing site area, there are no identified MPAs, turtle nesting areas, or fish aggregating/FADs. Yap also has many coastal dive sites located around the island inside the 35 m (approx. 120 ft) depth contour (Map 4) but none within the landing site area. The proposed landing point position coordinates are roughly at 09°26.632’ N, 138°03.933’E. The approximate coordinates of the proposed beach manhole position are 09°26.650’ N, 138°03.914’E.

25. Therefore the PIA will be the 10m wide (5m on either side of the cable) area on the shore approach of the cable through the outer and inner reef to the beach landing and then will be entirely within existing government easements for public works..

26. **Chuuk-** For Chuuk the proposed route will enter Chuuk Lagoon, through the NE Channel, then proceed in the main shipping channel to the NE end of the Weno airport runway and then proceed along the airport fence to a point where it will cross under the city road in an existing conduit to the FSMTC site.

27. Therefore the PIA for Chuuk will be a 10 m wide corridor for the cable laying operation, through the NE channel and to the NE end of the airport runway and then along the landside route to the FSMTC site in a 5m wide impact corridor (Map 3).

2) Coastal and offshore corridors

28. **Yap-** The sea floor drops rapidly to great depth once outside the 35m contour and the cable will be laid in the waters well outside this depth, so at to avoid any possible interference with dive sites or Fish Attraction Devices (FADs). The exact location of the cable will only be known once the oceanographic mapping of the alignment is completed (as part of the construction contract). The Yap spur will link into the SEA-US cable (Map 1), making for a relatively short spur cable length of 265 Km (165 miles)

29. **Chuuk-**The deep ocean portion of the Chuuk cable will be linked to the existing HANTRU1 cable, via an existing connection located about 10 Km from Pohnpei in the ocean. Alternatively, depending on technical and commercial considerations, the cable could land directly on Pohnpei at the existing landing site for HANTRU-1 and run along the existing easement to the FSMTC premises. The cable will be laid on the ocean floor avoiding a number of coral atolls and small islands (Map 10) or about 1,200 Km or 735 miles.

D. The IEE Methodology

30. The first version of the IEE was completed based on consultations with government officials to establish a set of alternative alignments and landing sites and secondly a scoping activity defining a preferred alignment and landing site, based mostly on minimizing coastal zone environmental impacts and eliminating land acquisition . This initial scoping easily revealed a preferred alignment and landing site for which the IEE was been completed. It has since been updated to take into account the changes in design.

31. The work has included a review of relevant secondary information sources, site visits, key respondent interviews, focus group discussion and public consultations to determine existing environment conditions in the PIA corridor and at the landfall. This was followed by an analysis of the potential impacts that the construction and operation of the fibre optic cable could have on the corridor's natural and socio-cultural environment. The topics for which data were collected included:

- sensitive components of the environment within the PIAs, including Conservation Areas, Fish Attraction Devices and special tourism sites, such as dive sites;
- marine ecology of the coastal zone and nearshore waters likely affected by the cable project, including bathymetry, benthic and coral conditions along the PIA corridor;
- any land acquisition needs and any other potential impacts;
- poverty and gender conditions in relation to the proposed work;
- social impacts of faster and more reliable internet connections; and
- cultural heritage and archeological sites within the PIA corridor.

32. In addition, formal half day consultation and information sessions were completed in Yap on July 29th and in Chuuk on August 6th, 2014., with 42 and 30 people respectively, present. Each meeting presentation was followed by lively discussion and both meeting minutes, attendance records and the slide show presentation are provided in Annex 2.

33. When the landing point was changed to Magachgil, additional consultations were completed in Yap on February 22, 2016 and March 8, 2016. Records of attendance for the February 22, 2016 meeting, and records of attendance, a presentation, meeting minutes and a public press release from the March 8, 2016 meeting are provided in Annex 2.

34. A rapid in-water visual field assessment and benthic profiling of the marine environment and key indicator species associated with the proposed cable alignment locations was undertaken in late July and early August 2014.

35. **Yap**, For Yap, the marine assessment for the Magachgil landing focused on the inner and outer reef area in the landing zone. An in-water visual field assessment and benthic profile of the marine environment and key indicator species associated with the proposed cable delivery location for Yap was undertaken in March, 2016. The area assessed included the inshore marine environments located within an extended area of influence of the cable. This included the outer barrier reef, sub-tidal and tidal lagoonal reef areas and the cables terminal location on the shoreline at Magachgil.

36. **Chuuk-** For Chuuk the marine field assessment focused exclusively on the waters from the entrance to Chuuk Lagoon to the landing site at the airport runway. It involved snorkelling surveys at eight sites along the corridor, including both visual observations and photographic records of bottom conditions.

37. The assessment on both islands took a systematic approach collecting biological and environmental information at each site before moving to the next site location. Assessment site locations were selected due to their location and proximity to the cable route, representation of different biological habitats and conservation/protected status. The assessment methodology, specific site locations and detailed findings are presented in Annex 4.

38. Information obtained from the marine assessment provided a holistic description of the natural reef system and resources associated with the cable alignment. This information was then used to gauge potential environmental impacts that will need to be considered and mitigated during the deployment of the cable in the offshore and nearshore ocean.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Physical and Ecological Environment

2) Relevant Marine Regulations

39. The FSM government is mandated through the nation's constitution to provide overarching laws and regulations associated with the nation's marine environment and resources for the nation. Due to the traditional and customary traditions of the various ethnic groups that make up the FSM and their traditional coastal and marine ownership patterns, the regulation of marine resources within 12 nautical miles (22.22 Km) of the coast has traditionally been considered the legal province of the States. Therefore, the States are ultimately responsible for protection of their marine resources within the 12-mile limit. However, national legislation associated with resource management within this zone is mandatory at the state level.

40. Through Article IX of the FSM Constitution provides a long list of powers to the Congress, including regulation of the ownership, exploration, and exploitation of natural resources beyond 12 miles from island baselines. National legislation pertaining to the management and protection of marine environment include:

Federated States of Micronesia Code (FSCMC) Title 18 – Territory, Economic Zones

and Ports of Entry establishes the 200 mile extended fishery zone of the National Government and the 12-mile exclusive fishery zone of the States, their islands, and atolls. Section 106 states that traditionally recognized fishing rights in submerged reef areas shall be preserved and protected.

FSMC Title 24 – Marine Resources creates the Micronesian Maritime Authority, now known as National Oceanic Resource Management Authority (NORMA), which regulates the management and exploitation of marine resources within the 200 mile (322 Km) Exclusive Economic Zone (EEZ), addresses foreign fishing agreements, and administers the fishing permit system. Provision is also made for the States to establish entities to regulate commercial use of marine resources within their jurisdictions.

FSCMC Title 23, – Resource Conservation, Chapter One addresses conservation of marine species. It prohibits fishing using destructive methods, including the use of explosives, poisons or chemicals. It also sets limits on the taking or killing of hawksbill sea turtles and regulates the taking of sponges. Penalties for violation of its provisions are inadequate, with a fine up to $100 and/or six months imprisonment.

FSCMC Title 23, – Resource Conservation, Chapter Two provides for the protection of endangered species of fish, shellfish and game. The Chapter was established in anticipation of ratification of CITES, which has not yet occurred. In 1976, a Regulation went into effect listing several endangered species, including the following marine species: Blue Whale, Sperm Whale, Hawksbill Turtle and the Leatherback Turtle. However, Chapter Two of this Title allows for taking of these species for subsistence food or traditional uses, provided such taking does not further endanger the species involved. Violations may result in a maximum fine of $10,000 and/or imprisonment up to one year.

Federated States of Micronesia Environmental Protection Act protects the environmental quality of air, land and water in Micronesia. The Secretary of Health , Education and Social Affairs (HESA) is given general authorization to control and prevent pollution. The Secretary administers a permit system for this purpose and is also authorized to enter into cooperative agreements with the States to implement environmental programs at the State level. The Act contains ample civil penalties for violations of its provisions.

2) Marine Management

41. **Yap-** The state government under the direction of the national government legislation govern the management of State's inshore coastal and marine resources. The State government managers the marine resources on behalf of the landowners of Yap from high water on any point of land and extend 12 nautical miles directly offshore. Yap State's waters consist of the internal waters and the State Fishery Zone. The Fishery Zone includes those waters within "12 miles from island baselines". An "island baseline" is defined in the Yap State Code as an island or atoll with a fringing reef or barrier reef as a "line following the contour of the seaward edge of the reef system" (i.e. the outer edge of the reef). Internal waters are defined as "waters landward of the baseline, including the lagoons of atolls or islands" (Gravitt, 2006). Adjacent to the state waters is the Economic Excusive Zone (EEZ) that extends out to 200 nautical miles which is managed by the FSM national government.

42. Yap's Marine Resources Management Division (MRMD) that sits under the portfolio of the Department of Resources and Development (R&D) is mandated to manage the States inshore marine resources in collaboration with other State government divisions and agencies.

43. The R&D Department is charged with promoting "economic development and the conservation and development of agricultural, mineral, forest, water, and land and other

natural resources." The strategic goal of MRMD is to "manage, conserve and develop the marine resources of Yap State in a manner that will provide the best possible economic and social benefit to the people of Yap both today and in the future".

44. The Yap State code through its chapters provides the legal mandate for the MRMD to manage the nation's resources. There are a number of laws that provide various levels of protection and management of coastal and marine resources. These include the protection of:

- Coconut crabs (*Birgus latro*) or "ayuy" by banning the taking of crabs with a shell diameter is less than three inches during the closed season between 01st of June through to the 30th of September and a complete ban on the sale of these animals.
- Turtles by the banning of the sale of any turtle meat or eggs, however the collection can be undertaken for traditional purposes.
- Harvesting seasons of giant clams and a set of size limits for harvesting and the ban on all sale of clam meat.
- Complete harvesting ban on Trochus (*T. niloticus*) unless an open season has been declared, and
- A complete ban on the use of fish poisons (by natural – plant material and made – hypochlorus acid), and
- A complete ban on the use of explosives.

45. **Chuuk-**The Chuuk State Constitution recognizes all traditional rights and ownership over all reefs, tidelands, and other submerged lands subject to legislative regulation of their reasonable use. Tidelands traditionally are those lands from the dry land to the deep water at the edge of the reef, and must be shallow enough for Chuukese women to engage in traditional methods of fishing (Gravitt, 2006).

46. Thus, the state government under the direction of the national government legislation govern the management of State's inshore coastal and marine resources. The government managers the states marine resources on behalf of the landowners of Chuuk from high water on any point of land and extend 12 nautical miles directly offshore. Chuuk State's waters consist of the internal waters and the State Fishery Zone. The Fishery Zone includes those waters within "12 miles from island baselines". An "island baseline" is defined in the Chuuk State Code as an island or atoll with a fringing reef or barrier reef as a "line following the contour of the seaward edge of the reef system" (i.e. the outer edge of the reef). Internal waters are defined as "waters landward of the baseline, including the lagoons of atolls or islands" (Gravitt, 2006). Adjacent to the state waters is the EEZ that extends out to 200 nautical miles which is managed by the FSM national government.

47. Chuuk States Department of Marine Resources Development (DMRD) is governed by the Chuuk State Law 5-92 which was signed in 1984 which itself was based on the State Fishery Act of 1983 and is mandated "to promote economic development and to manage and conserve living sea resources" within the jurisdiction of the State. The Department has four divisions, which include: Operational and Technical Supply, Research and Development, Conservation and Management and Fisheries. The State's Attorney General is the primary body responsible for enforcement of the Act.

48. The Chuuk State code through its chapters provides the legal mandate for the DMRD to manage the nation's resources. The management and/or protection of coastal and marine resources include only a total ban on the use of explosives (dynamite fishing) and the sale of fish collected using this method. There are currently no other laws in the Act that place restrictions on species or methods of harvest. The FSM regulations that protect the harvest of turtles and their eggs, the collection of black pearl oyster (*Pinctada margaritifera*) and Trochus are not included in the Act, although acknowledged (anecdotal

information DMRD).

B. Socio-Economic Environment

3) Customary Ownership and Marine Areas

49. **Yap-** In Yap, almost all land and aquatic areas are owned or managed by individual estates and usage is subject to traditional control.
A key agency associated with the development of community based conservation areas is the Yap Community Action Program, or Yap CAP. This agency mission is to operate or support programs aimed at environmental and cultural preservation and other sustainable economic and social development programs in the pursuit of self-reliance for all Yap citizens. The agency's environmental goals include:

- Implement the Yap Biodiversity Strategy and Action Plan to ensure the preservation of Yap's unique environment.
- Work with communities to identify and develop environmental projects, and then link communities with the appropriate government agencies to aid implementation.
- Seek funding for environmental projects identified by community groups and other environmental agencies, and administer and regulate the funds.

50. **Chuuk-** In Chuuk State the majority of the land and aquatic areas are privately owned and acquired through inheritance, gift or, recently, by purchase. In all States, land cannot be sold to non-citizens of the FSM.

51. Due to the presence of a large number of WW II historic shipwrecks and other munitions the Chuuk Lagoon State District Monument Act has been adopted which provides for these items to be designated as a State district monument and therefore preserved. The removal of any equipment associated with these items is illegal.

52. These land and marine ownership patterns greatly influence the strategies and actions required to manage the resources of the states in a sustainable manner.

2) Legislations on Land Acquisition

53. **Yap.** Most of the lands in Yap are privately owned. Approximately ninety-eight percent of land in Yap State is privately owned, with the majority of State owned land located in the capital of Colonia in the municipalities of Rull and Weloy.4 There is no established Act or Law for Yap State to acquire or determine fair market value of private land in Yap. However due to the need to acquire land for public infrastructure, the Attorney General has developed a Land Acquisition Procedure for acquiring land under the ADB-funded Yap Renewable Energy Project. Pending the approval of the Land Registration Bill, the said land acquisition procedure may guide future land acquisitions for public purpose in Yap State.

54. The Land Registration Bill or Bill No. 7-130, a bill aims to provide for the survey and registration of lands in the State of Yap, and for other purposes. This bill was introduced to the Yap State Parliament in 2010.

55. Non-citizens cannot own land in Yap but they can lease land for a maximum of 99 years, including options to renew. Leasing of lands or making landowners partners or shareholders of projects, therefore, is viewed as the most appropriate arrangement for utilization of land. Upon request, the Yap State Government may act as an intermediary in finding suitable land arrangements. The Yap State Mortgage Law provides the necessary legal framework for land mortgages.
Chuuk- The majority of land in Chuuk is privately or commonly family- owned lands thus the State Government has limited land to locate public infrastructure. This has resulted to continuous challenge of acquiring land for public infrastructure such as power, water and

airport. Executive Order (EO) No. 04-2007 of Chuuk State Government adopted the Asian Development Bank valuation zoning system. The EO also provided a zone map and base valuation, with modifications, and promulgating its implementation for acquisition or leasing of private land for public purpose in Chuuk State. The Chuuk State Constitution provides for acquisition of land on its infrastructure requirement based on fair market value. EO No. 04-2007 aims to address concerns determining fair market value, with clear land title and preventing real or apparent conflicts of interest in acquiring lands for the State.

56. The EO was updated after a valuation study supported by a previous ADB technical assistance project (ADB Private Sector Development Program Loan No. 1874) in April 2006 and 1998. From the valuation study, 30 valuation maps were produced. To avoid complicated transactions and perceived unfairness and confusion among and between landowners and the government involved, the valuation came up with simpler adjustments to the zone and base values, using an annual rent of per square meter of10% of the base value, considered fair market value.

3) Legislation on Cultural Preservations

57. **Yap-** Historic preservation provision exists in the Yap State Code as well as in the State Constitution. A Historic Preservation Office is established pursuant to the "Preservation of Culture" Code Sections. Under this legislation, no person may wilfully remove historic property from Yap or disturb, damage or destroy such property without the express written permission of Governor, a local member of the Council of Traditional Chiefs, and a Historic Preservation Office.

58. **Chuuk-** The Draft Chuuk Historic Preservation Act. This Bill recognises the importance of physical cultural and historic heritage as well as the intangible heritage in tradition, arts, crafts and songs. The Bill proposes for the establishment of a Historic Protection Office (HPO) within the Department of Commerce and Industry whose principal objectives shall be to protect and conserve places of historic and cultural interest including intangible heritage.[6]

59. Legislation exists (as above) which declares the approximately 80 submerged wrecks in the Chuuk Lagoon to be a war memorial and historic site. Removal of artifacts from the wrecks is prohibited and divers must have permits and be accompanied by licensed guides.[7]

C. International and Regional Treaties, Conventions and Agreements.

60. The FSM through its membership in a number of international and regional treaties, conventions and agreements (Table A4.2 Annex 4) and its membership in international and regional organizations associated with the marine sector (Table A4.3 Annex 4) manage the nation's environment, species and inshore and offshore foreign commercial fishing activities that are undertaken within the EEZ.

D. ADB and World Bank

61. According to ADB's SPS 2009, the FSM environmental assessment was classified as a Category B undertaking, requiring the initial environmental examination that is described in this report. The approach to and content of the IEE is defined in Appendix 1 of SPS 2009. OP/BP 4.01, is the World Bank's equivalent to SPS 2009. It was revised in early 2013 and now reflects social sector requirements more clearly. Its focus however is on defining the environmental assessment requirements for all WB projects, including a description of the screening and suggested content of the environmental assessment document. The World Bank's equivalent to the IEE is the Category B Environmental and Social Assessment.

III. PROJECT DESCRIPTION

A. Need and Details

4) Need for Project

62. At present, FSM relies entirely on satellite links for international connectivity. The high cost, variable and limited availability of this international bandwidth is a major constraint to future development of the country, and slows FSM's economic and social development. The proposed project would support an investment in a submarine fibre optic cable that would connect FSM with Guam and the rest of the world.

63. The proposed project will contribute to improved public services (including online government services such as health, education and financial services), support the tourism sector, and facilitate better trade and communication among north Pacific island economies.

B. Project Details and Components of the Work

64. The overall project involves obtaining wavelength capacity on a submarine fibre optic cable from Guam to Palau with a spur to Yap and a long link connecting Chuuk to the Guam Pohnpei cable, for total of over 1,500 Km, much of it in deep ocean waters. The capacity from Guam to the Yap Spur is on the SEA-US cable System, which extends from Manado, Indonesia to Hermosa Beach, California. (Map 3). The SEA-US cable system is aligned on virtually an identical route as was proposed for a standalone Palau-Yap-Guam cable system or on another cable of opportunity. (Map 4)

Map 3: Proposed SEA-US cable system

Map 4: Proposed SEA-US cable system and other proposed cables

65. The proposed SEA-US cable is in purple. The originally proposed standalone cable for Palau and Yap is in red. Another proposed cable system (BEST) is shown in yellow.

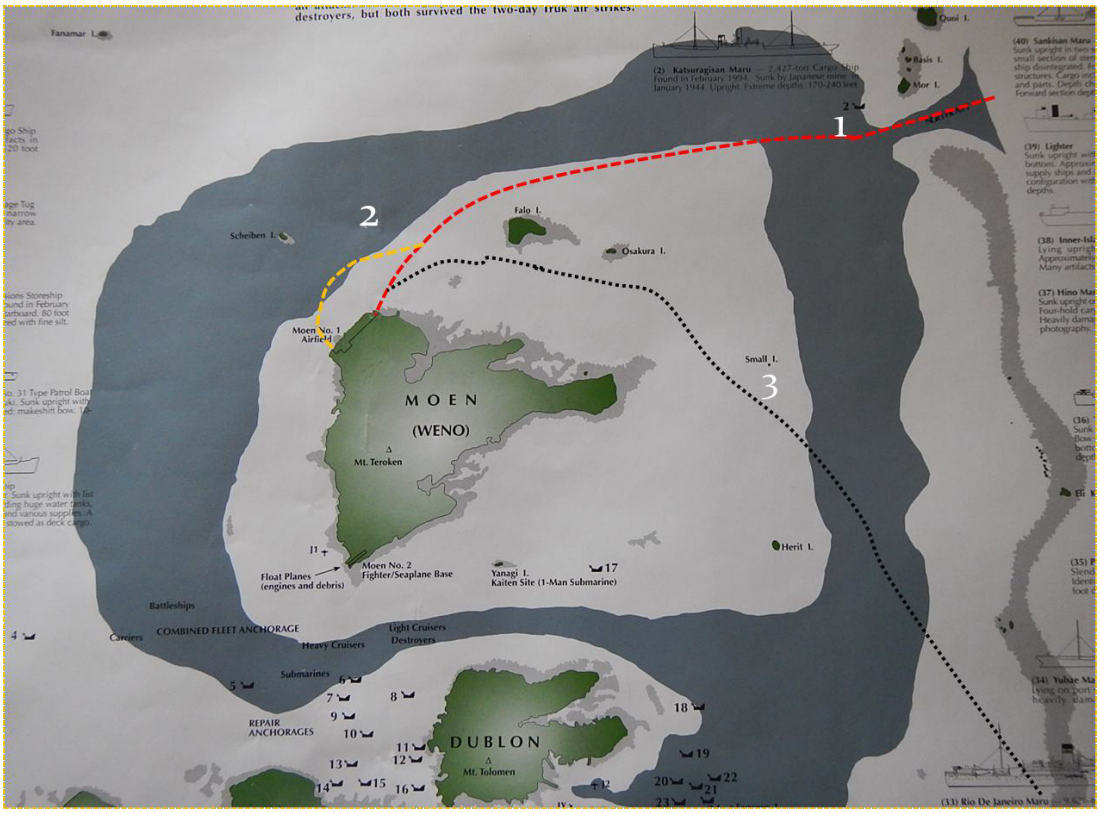
66. For Yap the cable will likely make landfall at the southern tip of Yap in Magachgil and run along the existing road easement to the landing station (Map 5). It does not impact any MPAs or FADs in the wet alignment area and it does not impact any existing commercial or residential development in the land alignment area.

Map 5: Yap Spur Cable Landing

Map 6: Yap Island MPAs and FADs in Project Influence Zone

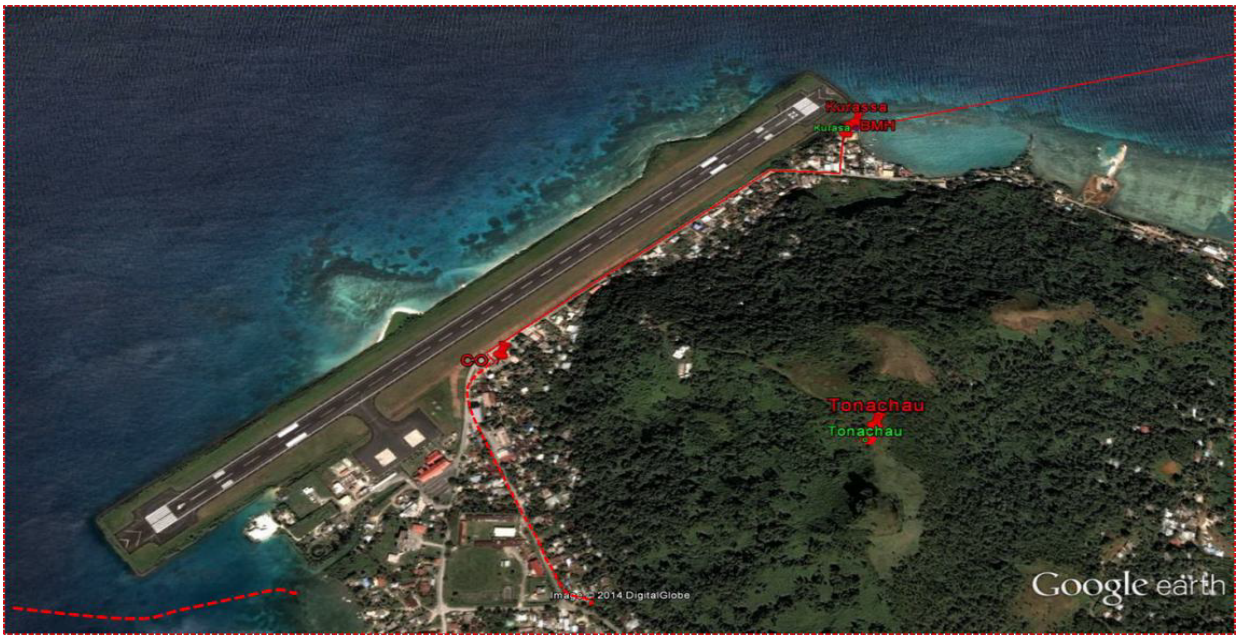
67. For Chuuk there are a number of cable route options once the cable passes through the natural pass in the barrier reef and enters the lagoon (Map5).

Map 7. Alternative Alignments Routing through Chuuk Lagoon



68. The preferred alignment for Chuuk enters the lagoon through the NE pass, and then along the bottom of the main shipping channel, making landfall at one of several locations near either end of the airport runway (Map 6). A third option is from the south, requiring navigation through a large number of wreck dive sites and likely unexploded ordinance. That pass through the barrier reef, known as the Neuri Pass (or SE Pass), is also a known fish aggregation site, where napoleon grouper come to spawn.

Map 8: Alternative Landings on Weno, Chuuk



C. Project Layout and Components of the Work

69. The project consists of three main components: i) the oceanographic and nearshore bathymetric survey to establish a specific route for the cable joining Magachgil, Yap State to SEA-US, and the cable connecting Chuuk to the network along the Guam to Pohnpei cable. The placement of the cable along these two routes will require the use of a special cable laying vessel; and the preparation of the landing facility and structure (about 40m^2) at both locations.

70. **Yap-** For Yap, the cable will likely be placed in the deep water up to the beach landing at the southern tip of Yap in Magachgil with minimal trenching through reef and nearshore work due to the shortness of the reef area and the existence of a short channel in the inner reef area. It then runs up an existing road easement for 7 Kms to the state-owned landing area and facility site (Map 3).

71. **Chuuk-** For Chuuk it will likely be the corridor from the Guam-Pohnpei cable junction skirting a number of atolls to the NE end of the airport runway and then to the existing FSMTC facitlity. (Map 6).

72. The small 'footprint' of the cable means that a very narrow corridor will be needed and that the environmental 'footprint' of the project will be that associated with a small diameter basically inert cable (glass, steel and rubber) placed on or buried beneath the seafloor. An example of an older cable is below. New cables are considerably narrower in diameter.

IV. BASELINE DATA

73. The Federated States of Micronesia are located within the Caroline Island group of Micronesia and together form the western most archipelago of Oceania. Yap is located approximately 740 Km east of Mindanao in the south west of the Philippines, 480 Km and 1,300km south west of Yap State and Guam, respectively. Yap State is bordered to the east and east west by the remaining three States of the FSM (Chuuk, Pohnpei and Kosrae), Guam to north east. Chuuk is located about 9.5 ^{o} north of the equator and some 1000km west of Pohnpei.

A. Physical Environment

1) Climate

74. Yap and Chuuk both have a wet and dry season, the wet season extending from May through September, with frequent typhoon and heavy rain and wind conditions. Other times of the year are predominantly sunny with occasional rain and wind, and daytime temperatures a steady 28^{o}C. Typhoons normally developed within the FSM, particularly the eastern islands including Chuuk State, with server storms affecting Chuuk approximately every 5 years whilst Yap, which normally sits outside the path of these tropical systems, is

affected every two decades or so.

2) Air Quality and Noise

75. The project will need an oceanographic survey of the cable route and the placement of the cable, requiring the use of a large ocean-going vessels. Both of these diesel fuelled ships emit large volumes of SO_2, NOx, PM_{10} and $PM_{2.5}$. The survey vessel will likely be in operation for several weeks, whereas the cable ship will require about 300 days covering the distance between Yap and Guam (laying the segment of SEA-US in respect of which FSM will contract for capacity rights) and the Chuuk to the Guam-Pohnpei cable. Air quality in the open ocean is likely very good and at this time meets all international ambient air quality standards.

76. No doubt the operation of the large survey and cable laying vessels will generate noise, but given that the work will be conducted at sea as well as near barrier reefs the background noise level of the waves breaking on the reefs, will negate vessel noise, making it a non-issue.

77. Given that there will be no need for land-side excavation or use of heavy equipment, air quality and noise will be not be an issue.

3) Topography, Geology, Soils and Hydrology

78. **Yap State** consists of four volcanic islands plus 19 inhabited outer islands and 59 additional atolls, with a total land area of 120 Km^2 (46 $miles^2$). Yap State can be divided into two distinct spheres: "Yap Proper" and the "Outer Islands." Yap Proper is a cluster of relatively high islands with volcanic and continental rock, surrounded by a fairly wide reef platform. The Outer Islands are coral islands and atolls scattered over a wide area, with relatively low populations.

79. **Chuuk State** is made up of five island regions: Chuuk Lagoon (which includes the state capital of Weno), Mortlocks, Pattiw, Halls and Nomunweito islands. Chuuk Lagoon is the largest atoll in the FSM and serves as the population and political center of Chuuk State. Chuuk lagoon is made up of a number of high islands of volcanic origin located within the lagoon and coral islands located on the barrier reef. The Outer islands are all coral islands and atolls scattered over a wide area, with relatively low populations.

4) Seismology and Earthquakes

80. Earthquakes impact fibre optic cables when there significant geological plate movements that stress the cable and or when this movements cause deep sea landslide breaking the cables. Based on data from the website http://earthquaketrack.com/r/state-of-yap-micronesia/recent and http://earthquaketrack.com/r/state-of-yap-micronesia/recent, the area around Yap experiences considerable seismic activity, while Chuuk, much less.

81. **Yap**-Over the past two years the zone between Guam and Yap, along the Marianas Trench has had >30 tremors ranging between 4.6 and 6.6 on the Richter scale, These tremors have occurred mostly around the Marianas Islands and at great depth below sea level (9-160 Km).

82. **Chuuk –**Chuuk is a much less active area with only ten earthquakes recorded over the past 40 years, and also at depths of 10 to 330 Km below the sea surface.

5) Tides

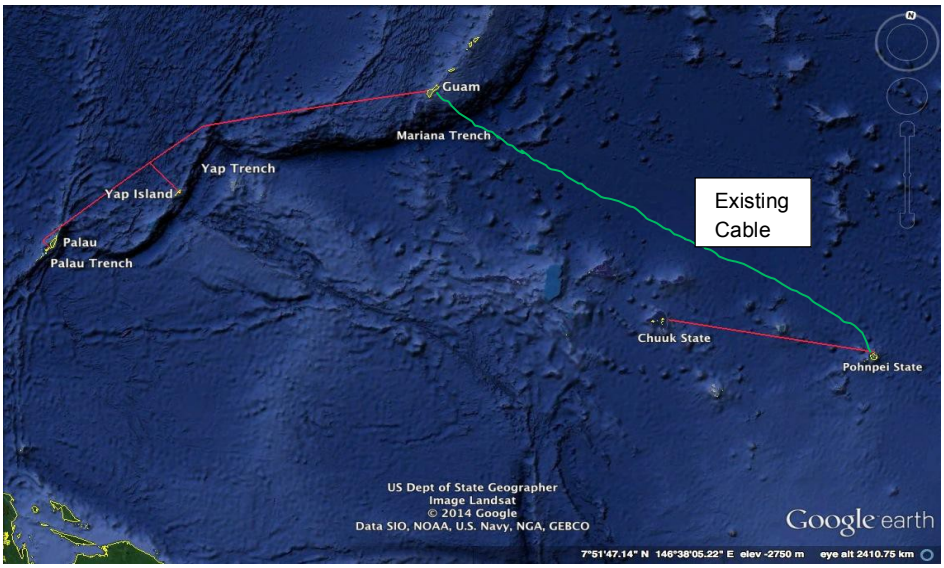
83. The basic tide parameters associated with Yap and Chuuk States include a maximum tidal variation of just over 1.5 meters (meso-tidal); they are semi-diurnal (2 tides a day) with a strong diurnal inequality with the twice daily tides showing considerable variability in amplitude (Wolanski and Furukawa, 2007). Small seasonal and daily tidal fluctuations have been recorded, which has been related to sea conditions associated with weather patterns existing at the time of the recording. Inclement weather systems e.g. storms, typhoons do have a marked impact on the tidal height and can cause increased coastal erosion if they coincide with high water periods.

6) Deep Sea

84. The deep sea bathymetry associated with the islands of the FSM is complex and includes deep ocean ridge, trench, seamounts and thermal vents. The main Island of Yap (called Yap Proper) is part of an arc-trench system between the Philippine and Pacific continental plates. Yap is located towards the northern end of a generalised ridge system called the Palau-Kyushu ridge which includes the Palau trench which continues in a north easterly direction passing to the south of Yap Proper terminating below the Guam islands and is called the Yap trench (Map 2).

85. The Yap trench has a maximum recorded depth of near 8000 metres with the majority of its length over 6000 m deep. The bathymetry surrounding Chuuk and the waters west of the Yap trench averages between 3500 – 5000 metres deep and includes an undulating benthic substrate. (The image also shows the relevant portion which will connect Palau although omits the wider SEA-US system).

Map 9. Bathymetry of Yap-Guam-Chuuk Area, Including the Deep Sea Trenches.



7) Hydrothermal Vents

86. There are very few studies and resulting information available detailing hydrothermal vents along the proposed (approximate) cable alignment corridor from Guam to the Yap spur and the Chuuk to Pohnpei link. Hydrothermal vents are present when volcanically heated water issues from cracks in the earth's crust. Typically, water issuing from these vents can exceed 300° C and is prevented from boiling only by the immense overlying hydrostatic pressure. However, within a few meters of the discharge, the water cools to around 2.5^{o}C. The water is also extremely acidic, thus corrosive, and is capable of leaching out minerals from the surrounding rock.

87. Individual vent structures are usually 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. Vents are also individually ephemeral and could occur at any site along the proposed cable alignment at any point in time, replacing sites that become dormant or are destroyed by volcanic activity9.

88. Deep sea thermal vents support unique ecosystems consisting of densely populated organisms occurring within a few hundred square metres of the vent. The communities prey almost exclusively 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 bathymodiolid mussels, "hairy" gastropod, vesicomyid clams, and shrimp (Llodra & Billet 2006). Deep sea vents can be located in varying locations, but generally near volcanic activity, and can range from as shallow as 500m to the deep ocean[10].

8) Seamounts

89. Seamounts generally originate as volcanoes and are generally associated with intraplate hotspots, mid ocean ridges or island arcs. They support unique ecosystems that have high biodiversity (endemism has been reported as being high) and act as important aggregations sites for pelagic and demersal fish resources, invertebrates and have been reported to act as important navigational "waypoints" for oceanic migratory species (Rodgers, 2012). Recent studies have shown that the pelagic biodiversity around seamounts is far greater than in areas of open ocean, and even in 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).

90. The main cause of this increased diversity is up-welling currents and oceanographic phenomena that drive primary productivity and create additional ecosystem niches that support more species associated with sea mounts.

91. Benthic areas not associated with hydrothermal vents, sea mounts and active spreading zones, such as the abyssal plains and ridges, also support a diverse albeit less dense populations composed mostly of nematodes, foraminifera, polychaete worms, small peracarid crustaceans, molluscs, nemerteans and a variety of marine worms (Llodra & Billet 2006).

92. Benthic organisms associated with the deep waters of FSM have no current national economic importance and are not harvested commercially. The technology to access deep

[9] The large-vessel bathymetric survey conducted prior to the final determination of the cable alignment should be able to detect any hydrothermal fields, and potentially establish a route around them.
[10] For more details see https://php.radford.edu/~swoodwar/biomes/?page_id=1027 and http://faculty.college-prep.org/~bernie/sciproject/project/HydroT/hydroint.html

parts of the ocean floor for large scale collection or any potential commercial use is still not developed. The same limitations restrict the better understanding of the deep sea area.

9) Unexploded Ordinance

93. Due diligence and careful consideration will be needed during all stages of cable deployment to be sure that the presence of unexploded WW II ammunition, that may be present in the substrate for both Yap and Chuuk States, FSM is assessed and if present removed. A detailed assessment of the cable alignment in both Yap and Chuuk will need to be undertaken during the survey assessment to ensure unexploded munitions are located and removed before the cable is deployed.

Yap- During the trust territory days (1970, Ms. M. Falanruw personal communication) the FSM government undertook an assessment and removal program of all unexploded ammunition within the Woneeday Channel and adjacent harbour areas of Yap Proper. At the Magachgil landing where there is very little or no history of shipping traffic, evidence from the marine survey is that no munitions were found in the landing zone.

94. **Chuuk** - In Chuuk state, and as a result of activities during WW II and the sinking of the Japanese fleet, considerable materials from these vessels are scattered throughout the Chuuk Lagoon. The majority of the larger vessels and machinery have been located, however it is acknowledged (anecdotal information from many stakeholders) that there would be items scattered throughout the lagoon yet to be identified. Therefore, due diligence will be needed when surveying the cable alignment to locate possible unexploded munitions. There are no known sunken ships or machinery in the main shipping channel. The wreck of the Katsuragisan Maru is located inside the northeast pass and to the north east of the channels entrance. The vessel is 87m long, 2,427 tons and sits on the sand in 70 metres of water. This vessel location is known and is not within the area of influence of the cable. Therefore for Chuuk, the UXO issue is likely marginal.

B. Ecological Environment

5) Mangroves

95. Mangrove forests are a significant coastal habitat that are associated with the coastal estuarine, foreshore and intertidal areas and play a significant role in coastal biological diversity, erosion control and are a natural barrier of protection for the islands. Mangroves forest are found in all four states of FSM and are best developed in the high island states of Pohnpei and Kosrae, however Yap state contains the highest diversity of mangrove species. Chuuk State due to the islands limited land and estuarine areas have only small isolated areas of mangroves however they are present throughout the state (Falanruw, 2001). Cole et al., (1999) estimated that for Chuuk state there was 306 hectares of mangrove forest (2 percent of the land within the State) and for Yap he estimated 1171 ha (10 percent of the land within the state).

2) Marine Ecosystem

96. **Inshore Marine Environments -** The FSM has an EEZ of 3,004,321 km^2, an estimated coastline for all states of 701 Km (SPC, 2013). **Yap State** consists of one island (Yap Proper) that is derived from volcanic and continental origins that is surrounded by a relatively extended reef flat and shallow lagoon whilst the remaining islands of the state are coral islands and/or atolls. **Chuuk State** is made of coral atolls and islands that include the Chuuk lagoon which possess both high island of volcanic origin within the lagoon and coral islands located on the barrier reef. All islands associated with both FSM states are surrounded by a coral reef in most cases a barrier reef, which is interrupted at intervals by deep water passes. Distinctive shallow water fringing reef systems are associated with the larger volcanic and continental islands located in both States.

97. All major types of coral reefs are found within Yap and Chuuk including barrier reefs, fringing reefs, atolls and submerged reefs. Common reef habitats include lagoon

reefs (pinnacle, patch), passes, channels, shallow reef flats, terraces, submerged reefs, slopes, reef holes, embayment's, quasi estuaries, seagrass beds, mangroves, mud and sand flats. Reef biodiversity is highest in the Indo-Western Pacific, which is also thought to have the world's highest overall marine biodiversity of which the FSM reefs are part of. Marine species biodiversity decreases from Yap to Chuuk. Chuuk lagoon is a major shipwreck site for WWII and incudes of at least 50 wrecks resting in its waters.

98. Coastal shallow water dredging for coral rubble and sand mining are undertaken throughout the FSM including both Yap and Chuuk states. These activities are regulated and managed (permit system) through state laws. Increased dredging activities especially in Chuuk state have increase localize sedimentation issues and have a negative impact on the surrounding marine ecosystems including the coral reef (EPA anecdotal information and Photo 1).

99. Destructive fishing methods are banned at the FSM and state legislative levels, however remain in use and include the small-scale use of poisons (both local plants and bleach) and dynamite. The use of these banned fishing techniques is especially relevant to Chuuk state with dynamite fishing prevalent in Chuuk lagoon and in areas within the vicinity of the cable alignment.

Photo 1. Dredging plumes associated with sand mining in Weno, Chuuk state.

100. **Seagrass** - Yap and Chuuk States both possesses extensive seagrass meadows directly associated with the majority of shallow water reef systems (both intertidal and subtidal) with most beds located adjacent to the land in the intertidal areas. They are a significant coastal habitat and contain high biodiversity value for the nation through the provision of habitat, protection and feeding opportunities. Sea grass habitats support complex food webs by virtue of their physical structure and primary production and are well known for their role as breeding grounds and nurseries for crustacean, finfish and shellfish species. Sea grass ranks with coral reefs and mangroves as one of the world's most productive coastal habitats. Edwards (2002) reported that 7 species from 5 different genera of sea grass have been reported for both Yap and Chuuk States and indicated that additional species are most likely present. These included: *Cymodocea serrulata*, *Cymodocea rotundata*, *Enhalis acoroides*, *Thalassia Hemprichii*, *Halophila minor*, *Halophila ovalis* and *Syringodium isoetifolium*.

101. **Oceanic Marine Habitats and Animals -** The marine environments associated with the deep waters surround the island of Yap and Chuuk and the marine flora and fauna associated with these dynamic ecosystems are poorly understood resulting, given the lack of biological knowledge associated with these environmental systems, especially the benthic systems. Information pertaining to movements of a number of highly migratory commercially targeted finfish species (e.g. tuna) is available at a large spatial scale

however information pertaining to the movement large iconic fauna groups such as the cetaceans (e.g. whales, dolphins) that are recorded to frequent these waters have little documented information.

102. Information pertaining to deep water benthic fauna and the environments that these organisms reside is all but absent and therefore information pertaining to the organisms and marine benthic habitats associated with the oceanic cable alignment is almost non-existent. Two distinct habitats have been recorded associated with the deep benthic waters of the FSM, however their biodiversity and ecosystem importance is unknown. These habitats include hydrothermal vents and seamounts.

103. **Reef systems –Yap-** The shallow reef systems located adjacent to the proposed cable alignment are healthy and in good condition with substantial live coral coverage and associated healthy and diverse populations of marine plants. Populations of invertebrates (e.g. mollusc, echinoderms, crustaceans, polychaetes) and vertebrates (e.g. fin fish) recorded low numbers, especially those species targeted for subsistence harvesting.

104. Flora and fauna found in the marine sediments in close proximity to the proposed cable alignment have a low diversity and low populations. Environments where sunlight is present, the benthic substrate may have marine algae, including cyanobacteria, and/or sea grass. Benthic coverage of these plants decrease as light penetration diminishes with water depth (e.g. 5-15 m) and become absent in deeper water. Hard coral populations in general are light limiting however require a stable and solid substrate to attach and survive. In areas of constant sediment movements, especially were light is limited, hard corals are absent.

105. Soft corals in the survey areas show a similar trend however there are a number of filter feeding genera that inhabit soft sediments with good water flow. These animals (e.g. sea pens, anemones) are present in the vicinity of the areas associated with the cable alignment. Sponges and other invertebrates will also be expected in these areas. In addition, there will be a wide variety of detritus feeding invertebrate organisms that will live on or beneath (e.g. burrows) the substrate. These include holothurians (e.g. sea cucumbers, sea urchins), marine worms, and shrimps. Predator invertebrates (e.g. star fish, sea urchins, mantis shrimps) and finfish species will also be present. In summary, the benthic profiles within the areas surveyed are all very similar possessing a hard and soft coral covered reef edge and steep reef slope and a relatively homogenously horizontally flat seabed that has been reported (Smith, 2003). The seabed was almost devoid of hard benthic structures. The seabed sediment characteristics are a result of tidal currents and water movements along the shoreline..

106. **Reef System -Chuuk-** The shallow reef systems located adjacent to the proposed cable alignment are healthy and are in good condition with substantial live coral coverage and associated healthy and diverse populations of marine plants, invertebrates (e.g. mollusc, echinoderms, crustaceans, polychaetes) and vertebrates (e.g. fin fish). During the field assessment, observed numbers of finfish and edible and/or commercial invertebrates were low. Subsequent discussions with staff at DMRD highlighted that the low numbers are a result if un-sustainable fishing pressure.

107. The barrier reef located at the entrance of the Northeast Passage showed a relatively high diversity of hard and soft coral species dominated by massive stony corals interspersed with smaller colonies of branching and crustose forms with an average of 25-30 percent coral coverage. The northern side of the channel entrance showed higher coral diversity and present coverage than the southern side of the channel whilst areas deeper than 20 meters showed a low percent live hard coral coverage. The deeper sections of the channel (25-35m) predominately consisted of remnant hard coral structures eroded due to wave action interspersed with coral reef sand. It is anticipated that the channel during inclement weather conditions receives considerable wave and current activity.

108. Inshore patch reefs are dominated by a wide size range of massive stony corals (e.g. Porities sp.,) branching and tabular (Acropora sp.) morphological forms interspersed

with a fine substrate derived from either or a combination of reef and teridgernous sediments depending on the location of the reef (Plates 17, 18, & 19, Annex 4). Hard coral percent coverage increases from the reef flat, edge and slope. The reef slope in steep and drops away to a sand substrate (13-18m).

109. Hard coral live percent coverage, species and morphological diversity in general was recorded highest on the patch reefs located within the Chuuk Lagoon (southern boarder of the main shipping channel) assessed. Invertebrate diversity mirrors this trend. Sea grass meadows are present in the intertidal areas associated with the islands located within the lagoon. The cable alignment is a considerable distance (5 plus Km) away from these meadows and therefore will have no impacts whatsoever on these biological systems. The shallow water sub tidal and intertidal locations at the southern end of the runway on Weno Island have been heavily dredged both for airport landfill and more recently building material. Therefore the natural marine habitats have been highly modified. There are small patches of remnant marine ecosystems that have not been dredged which contain small stands of massive and branching hard corals and isolated patches of sea grass and macro algae.

110. The reef systems boarding the channel and proposed cable alignment show very similar benthic profiles. Bathymetric data collected from nautical charts of Chuuk lagoon indicates that the sea floor associated with the cable area of influence follows a general pattern of steep sided reef slopes descending directly to the sea floor that is relatively homogeneous flat.

111. **Benthic Communities -Yap-** The reef systems around the proposed cable alignment show very similar benthic profiles. The sea floor follows a general pattern of steep sided reef slopes descending directly to the sea floor where the sea floor showed a homogenous and relatively flat seabed. In the tidelands along near shore landing area, the coral and rocks to the edge of the reef are exposed during low tide. Once outside the reef, the sea floor is hard bottom rubble and quickly becomes deep water.

112. The shallow water sea floor sediments assessed are composed of both reef and terrigenous derived substrate. There is minimal live coral in the area.

113. **Benthic Communities - Chuuk--** The reef systems boarding the channel and proposed cable alignment show very similar benthic profiles. Bathymetric data collected from nautical charts of Chuuk lagoon indicates that the sea floor associated with the cable area of influence follows a general pattern of steep sided reef slopes descending directly to the sea floor that is relatively homogeneous flat.

114. The sea floor between the outer barrier reef and the deeper water adjacent to Weno Island through the main shipping channels averages 60 meters depth. The entrance of the northeast channel is relatively shallow with maximum depths of 30 meters whilst the sub tidal and intertidal reef areas directly adjacent to the south eastern corner of the runway (Weno Island) decrease water depth as it enters this area.

115. The shallow water sea floor sediments assessed are composed of both reef and terrigenous derived substrate. The landward (inshore) reefs close to the island coasts are impacted by terrestrial run off from the land that discharges directly into the coastal waters. This is reflected in the higher proportion of terrestrial derived finer sediment and expansive shallow water reef flats located around the islands within the lagoon. Substrates located between the barrier reef and high islands of the lagoon associated with the main shipping pass are dominated by coral reef derived sediments (white fine calcium carbonate sand). It is expected that sediments located on the sea floor within the channel that are directly associated with the proposed cable alignment route would be derived from both reef and terrestrial sources.

116. **Other Marine Flora and fauna -Yap and Chuuk**- The field surveys on Yap and Chuuk found in the marine sediments along the shoreline a low diversity and low

populations of coral.. Hard corals are absent from areas of constant sediment movement and low light, which diminishes with water depth. Soft corals show a similar trend, however there are a number of filter feeding genera that inhabit soft sediments with good water flow. These animals (e.g. sea pens, anemones) may be present in areas associated with the cable alignment; but in deeper waters. Sponges and other invertebrates will also be expected in these areas. In addition there will be a wide variety of detritus feeding invertebrate organisms that will live on or beneath (e.g. burrows) the substrate. These include holothurians (e.g. sea cucumbers, sea urchins), marine worms, and shrimps. Predator invertebrates (e.g. star fish, sea urchins, mantis shrimps) and finfish species will also be present. The physical presence of these species was not confirmed.

117. In summary, the benthic profiles within the areas surveyed are all very similar possessing a hard and coral covered steep reef slope and a relatively homogenously horizontally flat seabed that was almost devoid of hard benthic structures. The seabed sediment characteristics are a result of tidal currents and water movements within the lagoon. Benthic profiles, as described by navigational charts, clearly indicate conditions similar to the descriptions reported during the field surveys for the inner and outer channel. Water depth and summary information for each transect is documented in Annex 4 Table

118. **Marine Flora, Fauna, Rare and Endangered Species, and Species Richness.** The FSM has a rich marine biota and diversity with a high diversity of hard and soft coral, with an estimated of 215 species recorded for Yap proper (Houk and Starmer, 2007), over 928 species of fin fish including 76 families and a diverse invertebrate's flora and fauna including marine turtles. Detail descriptions of the coral reef habitats and species assemblages associated with the proposed cable alignment are described in below in this report.

119. **Threatened and Protected Species-** As with other Pacific Nations, data associated with threaten and protected species is restricted in general, to larger well known and studied icon species that are of regional and/or global concern. Information pertaining to other species is limited or non-existent. The FSM continue to identify new marine and terrestrial species including species that are endemic to the nation's ecosystems. Therefore, at present there is no definitive Yap or Chuuk resource documenting all species that exist and/or are threatened within the states and indeed the nation.

120. The International Union for Conservation of Nature & Natural Resources (IUCN) undertakes a global assessment (Red List) to classify species at varying risk of global extinction using 3 categories (critically endangered, endangered or vulnerable) and includes a fourth when data is not available to allocate a category. The most up to date list for the FSM indicates that there are 5 mammal, 11 bird, 7 reptile, 0 amphibians, 21 fish, 4 mollusk, 11 other invertrebae, and 4 plant species for a total of 163 threatened species in the FSM. (IUCN Red List version 2015.4, last updated 19 November 2015). No impacts have been identified for any critically endangered species

121. Red listed species recorded for the inshore environments of the FSM include a large number of hard and soft corals, marine turtles and a number of finfish species. The species recorded for the oceanic environment of the FSM includes the 12 species of cetaceans (described below), a number of sharks of which two are considered endangered; Oceanic white tip *Carcharhinus longimanus*, and the silky shark *C. falciformis* and the shortfin mako (Isurus oxyrinchus) which is vulnerable. In addition, the whale shark *(Rhincodon typus)* and big eye tuna *(Thunnus obesus)* are also red listed as vulnerable.

122. **Cetaceans -** The EEZ of FSM has resident and transient or migratory populations of cetaceans (whales and dolphins). Miller (2009) stated that to date there has been no dedicated scientific survey undertaken to study to identify the marine mammal diversity within the waters of the FSM resulting in a paucity of information on the presence and population status of Cetacean within the nation nor if there area any seasonal migrations. However, Cetacean species are common and their habitat is usually associated with

expansive lagoonal systems, reef passes and opens ocean environments such as oceanic islands, oceanic fronts and upwelling, seamounts, canyons, deep-sea trenches and the water column itself. Miller (2009) on behalf of the Whale and Dolphin Conservation Society (WDCS) documented that there are 9 species in total with a confirmed presence in FSM, however, acknowledges that the literature on Cetaceans in the FSM is dominated by anecdotal reports and it is highly possible many more species should be added to this list and includes an additional 3 unconfirmed cetaceans species for FSM. The report does not include information pertaining to the presence of these species in the individual states of the nation. Table 1 lists the cetacean species of the FSM.

Table 1.Cetacean Species likely passing through the FSM waters

Species	Common Name	Status	IUCN Category
Balaenoptera sp.	Bryde's-like whale	Confirmed	-
Globicephala electra	Short-finned pilot whale	Confirmed	Dd
Lagenodlphis hosei	Fraser's dolphin	Confirmed	Lc
Peponcephala electra	Melon-headed whale	Confirmed	Dd
Stenella coeruleoalba	Striped dolphin	Confirmed	Dd
Stenella longirostris	Spinner dolphin	Confirmed	Dd
Tursiops sp	Bottlenose dolphin	Confirmed	Lc
Physeter macrocephalus	Sperm whale	Confirmed	Vu
Mesoplodon gingkodens	Gingko-toothed beaked whale	Confirmed	Dd
Ziphius cavirostris	Cuviers beaked whale	Unconfirmed	Lc
Orcinus orca	Orca	Unconfirmed	Dd
Stenella attenuate	Pantropical spotted dolphin	Unconfirmed	Lc

Source: Miller, 2009.

123. Of the species of cetaceans recorded from the EEZ of the FSM only the sperm whale is considered globally threatened by the IUCN Red List (version 2010.2). It has a vulnerable or Vu designation. For the remaining cetaceans there is either not enough information to make scientific 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 I. To date only dolphins have been observed in the shallow waters of Yap and inside the Chuuk Lagoon

124. **Marine Turtles** - Four species of sea turtles are known to live within the FSM (including both Yap and Chuuk states) waters are on the IUCN red list. This includes the hawksbill, (*Eretmochelys imbricata*) and the leatherback (*Dermochelys coriacea*), which are Critically Endangered, the green (*Chelonia mydas*) and the loggerhead (*Caretta caretta*), which are Endangered. The green and hawksbill turtles are protected under FSM and Yap and Chuuk State laws, although they are still fished for household consumption.

125. The hawksbill and green turtles are the most commonly seen species in FSM waters and are the only two species recorded to nest in the nation. All turtle species except the large oceanic leatherback have been reported to feed within the inshore marine habitats of both Yap and Chuuk States.

3) Terrestrial Flora

126. There are over 1239 species of ferns and flowering plants in the FSM. Approximately 782 species are native, including about 145 species of ferns, 267 species of monocots (e.g., palms, grasses and orchids), and 370 species of dicots (e.g. all woody

trees, acacia, citrus, cacao) reported in the checklists of Fosberg et al. (from Falanruw, 2001). Among these native species of plants there are many endemic species, found. nowhere else in the world but on one or more islands in the FSM. Over 457 species have been introduced to the islands by the first Micronesians and subsequent visitors and settlers. On Yap 242 plant species have been introduced and for Chuuk that number is 172 (Falanruw, 2001).

127. Yap has the most diverse mangroves and agroforests in the FSM and Chuuk is high in endemics and has some of the most endangered forests in the FSM (Table 2).

128. Fortunately none of these communities will be impacted by the Yap cable corridor. Mangroves were not found at the landing sites or in the corridor to the land-side facility. Once on land the preferred location for the facility is along an existing overgrown road and on a site with an existing structure.

Table 2. Types of plant communities and area in hectares found in Yap and Chuuk

Community Type	Yap-1976	Chuuk-1976
Mangrove Forest	1,171	306
Swamp Forest	155	
Upland Forest	2,556	677
Agroforest ***	2,538	2,378
Secondary vegetation	553	252
Grasslands	2,175	174
Marsh	165	234
Other nonforest	403	149
Total Area	9,716	4,170

From Falanruw, 2001, *** = palm trees (no native palm forests on either island)

129. The same holds true for Chuuk, since the cable landing site will likely be at the airport runway, which is all cleared land with planted grass. Should the governor`s office site be selected as the landside facility, the cable will be routed along an existing transmission line easement that has been cleared of vegetation.

4) Terrestrial Fauna

130. Historically, birds were hunted and habitat destroyed, resulting in extinctions on some of the FSM islands. In the past the population densities of Yap and Chuuk were much higher than today, resulting in great pressure in the island ecology. Some 119 species of birds have been reported in the FSM. These include 31 resident seabirds, 33 migratory shorebirds and 19 migratory land or wetland birds. Each State of the FSM has one or more endemic birds. They include the Caroline Islands ground-dove, the Truk greater white-eye and oceanic flycatcher on Chuuk and the Yap monarch and the Yap greater white-eye (Falanruw, 2001).

131. FSM has 27 species of lizards and one terrestrial snake, and of course a number of sea snakes. As on Palau, FSM hosts four sea turtle species (see above) as well as the occasional saltwater crocodile.

132. Yap and Chuuk both have only one endemic land mammal, the fruit bat; plus a number of invasive rodent (mostly mice and rats) that wreak havoc among the shore bird colonies, and damage home garden crops. The waters around both Yap and Chuuk have both whale and dolphin, including the blue and sperm whale as well as the several dolphin species. The dugong had been extirpated on both Yap and Chuuk by the 1970s.

C. Socio-Economic Environment

133. Yap State is comprised of the main islands and 78 islets and atolls, many sparsely inhabited. The distances are large and the islands/atolls have few residents, mostly subsistence fishers. Chuuk, the most heavily populated states of FSM, with a population of

around 60,000 people has a struggling economy highly dependent on fishing, grant funding and to a lesser extent tourism. In comparison to Yap or Pohnpei the state's tourism industry remains marginally developed, and yet the ecological environment is extraordinary.

134. For the fiscal year 2012, the real GDP by state was $42.1 million for Yap, $72.1 million for Chuuk and $114.8 million for Pohnpei, and per capita GDP was estimated to be $3,614 for Yap, $1,485 for Chuuk, $3,104 for Pohnpei.

135. The FSM's Millennium Development Goal report in 2010, recorded that Yap's poverty rates decreased modestly from 1998 to 2005,although the incidence of absolute poverty average at 2% versus 8% nationally, and the relative poverty is 11% versus 22% nationally. For Chuuk which is the most populated of the four main islands. The basic needs poverty line in Chuuk is 32.9%.

6) Coastal Industries

136. **Commercial Fisheries – Deep Sea Oceanic FSM EEZ -** The EEZ waters of the FSM support commercial purse seine and long line fishing activities that have both local and foreign ownership and operational involvement principally targeting species of tuna for many years. The commercial fishing fleet operates between State waters and outer boundary of the nation's EEZ.

137. The purse seine fishing fleet involves the deployment of a circulate net that is moved around a school of pelagic fish, closed at the bottom and removed, whilst the long line fleet as the name suggests runs a line at a certain depth with bait hooks attached to the surface by fishing floats and tracked by GPS. The local long line fleet is restricted in the distances they can travel (license requirements and market longevity of the fish), however will fish throughout the nation's EEZ, whilst the international pursine fishing fleet moves through international boundaries to access fish.

138. The commercially important and targeted tuna species are highly migratory and information pertaining to precise locations and or movements at any one time is difficult. However computer modelling based on past catch records and environmental parameters can provide reasonable information and accuracy pertaining to spatial and temporal locations of were fish stock should be located; however the spatial scale is within the range of 100 of kilometres.

139. There are no impacts on these fisheries arising from the deployment and operation of the telecommunication cable; however notification to all vessels in the area of the cable vessel and its path is required to avoid any issues.

140. **Commercial and Artisanal Fisheries – Inshore -** There is no large-scale commercial fishing operations in Yap or Chuuk associated with the inshore waters of the nation. However, both states do fish inshore reef finfish and some invertebrate species for direct export to Guam. Chuuk particularly, has had a substantial reef finfish export market to Guam that has impacted local finfish stocks within the Chuuk Lagoon (personal information DMRD, 2014).

141. Small scale commercial game fishing charters principally employing catch (tag in some cases) and release catering for local and tourist alike, utilising state and territorial waters where small scale reef fishing through national and state regulations and customary ownership rights is allowed. Much of the small-scale fishers capture fish principally for household consumption and secondarily as an additional income stream.

142. Small scale fishing is undertaken in the waters and associated reef systems adjacent to the cable alignment, however fishing directly in the cables area of influence except directly in the north east channel is expected to not occur due primarily to that fact that the cable will be position away from reef system (center of the channel) and fish habitats (especially benthic associated species). Fishing in and near the states' main shipping channel will be risky and fishers will likely not be willing to risk gear and accidents

in marginal fish habitat.

143. Similarly, small scale demonstration/research, artisanal and semi commercial aquaculture of marine and brackish water species are undertaken in both Yap and Chuuk, none of these activities are associated with the cable area of influence.

2) Conservation Areas /Marine Management Areas

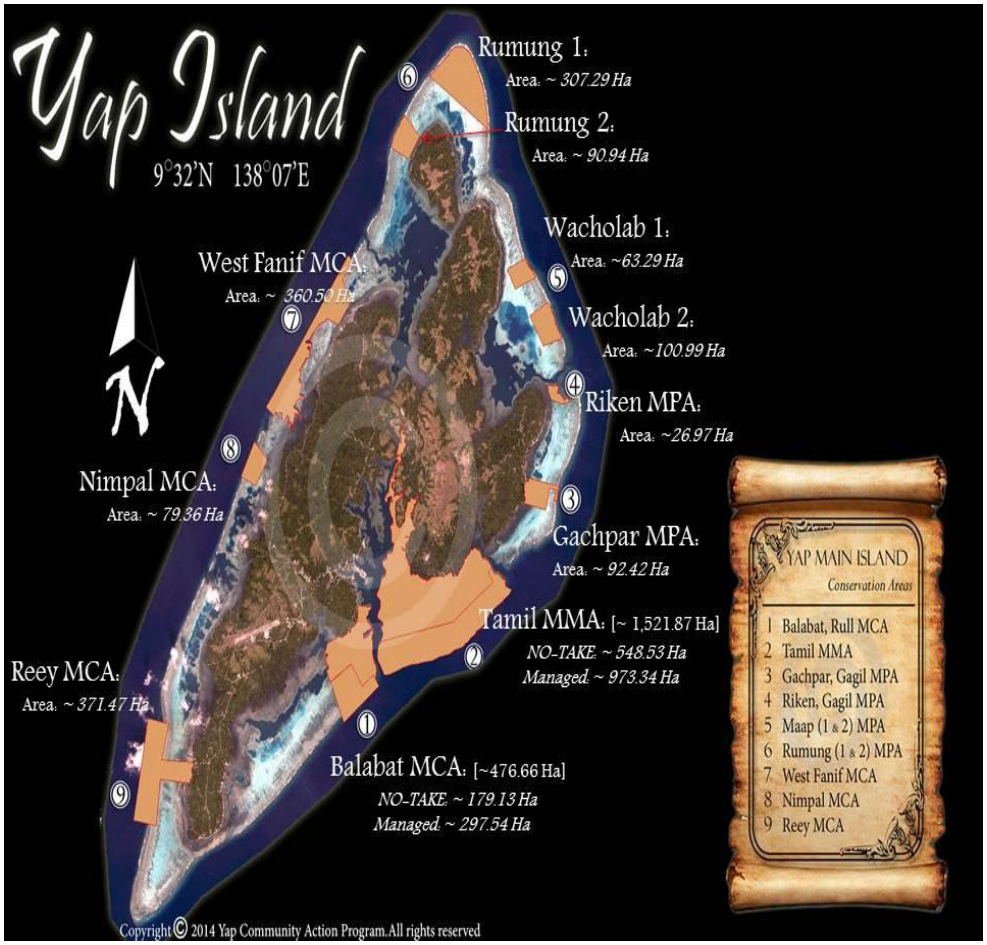
144. **Yap-** In Yap, almost all land and aquatic areas are owned or managed by individual estates and usage is subject to traditional control. In Chuuk State the majority of the land and aquatic areas are privately owned and acquired through inheritance, gift or, recently, by purchase. In all States, land cannot be sold to non-citizens of the FSM.

145. Yap State has nine designated Conservation Areas (CA) or Marine Management Areas (both terms are interchangeable within Yap, (Map 6 and Annex 4). The designation of a CA is at the municipal/community level and are developed through a consultative process with the respective communities, their chiefs, elected officials, landowners and have been assisted by State government agencies (e.g. Marine Resource Division) and/or NGO's (e.g. Yap CAP). Each CA is managed by the respective municipalities/communities and do include both State and national laws and regulations.

146. Each CA has been developed to manage and preserve specific marine, lagoonal and/or coastal environments including specific habitats and/or species (refer Annex 3) and are all currently at different levels of development with the majority of the CA still developing individual management plans. Currently all CA include general management strategies to ensure resource harvesting is sustainable and limit or prevent habitat destruction. Two CA have completed their management plans that include "no take zones" as part of their management system. These two CA's (Balabat Marine Conservation Area and Tamil Marine Management Area) are adjacent to the Woneeday Channel. None of the CAs are near the proposed cable alignment at Magachgil. Roughly 20 percent of all marine areas within Yap proper have some form of marine management. There are no CA's to date designated for marine areas outside of the 12 miles state boundaries.

147. **Chuuk-** Chuuk State does not have any legislated Marine Managed, Marine Protected or Conservation Areas within the Chuuk lagoon. There are however currently five proposed marine Conservation Areas all of which are under different stages of development. These include Sapwwuk CA, Parem CA, Uman CA, Wichukuno CA and Piaanu CA (Map 7). Piaanu CA has had a management plan developed in 2004, however issues pertaining to landowner disputes need to be finalised before this CA can be moved forward. Moreover, specific information pertaining to the CA boundaries and management issues and concerns are poorly documented for the majority of CA being developed. In general, all 5 proposed CA management strategies are to ensure resource harvesting is sustainable and/or restrictive limiting or banning resource extraction. Wichukuno CA has been specifically developed to manage and preserve the mangrove forest at this location whilst the Piaanu site is specifically developed to provide protection to the habitat and finfish aggregations spawning sites.

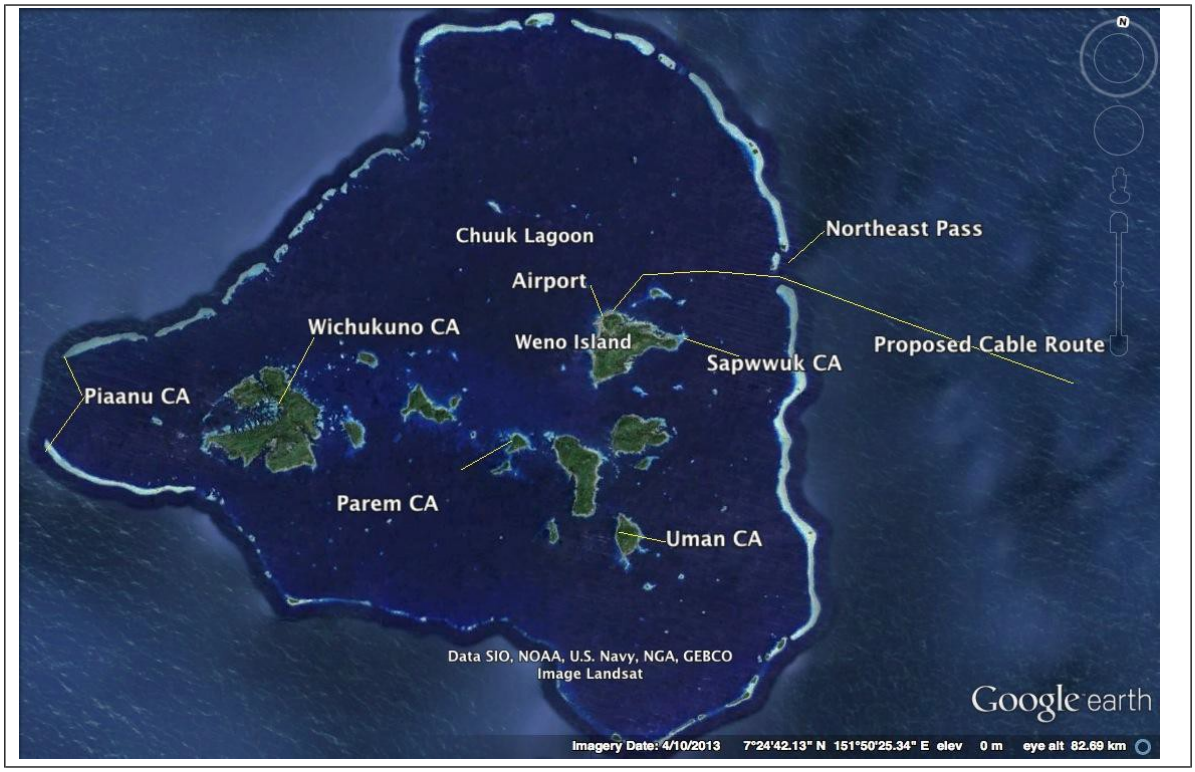
Map 10. Nine Municipal/Community Conservation Areas or Management Area of Yap Proper (sourced from YAP-CAP with permission)



148. The process required to designate a CA in Chuuk State is at the municipal/community level which are developed through a consultative process with the respective communities, their chiefs, elected officials, landowners and in all cases have been assisted in part by State government agencies (e.g. Marine Resource Division) and/or local NGO's (e.g. Chuuk Conservation Society). Each CA once designated and gazetted will be managed by the respective municipalities/communities with assistance from the government and possible NGO's. Due to the traditional ownership rights and laws of Chuuk, the State government fully acknowledges and supports the community's designation of Conservation Areas and their management.

149. Due to the traditional ownership rights and laws of Yap, the State government fully acknowledges and supports the community's designation of Conservation Areas and their management.

Map 11. Five proposed Municipal/Community Conservation Areas associated with the Chuuk Lagoon, Chuuk State, FSM (sourced from DMRD).



3) Transportation and Infrastructure

150. Yap has a small international airport and one paved island highway. There are many other earthen roads and paths, but are mostly privately owned and not accessible to the public at large. Chuuk has even less of an infrastructure, however does have an international airport. There is an intermittent bus service in Colonia, but no public transportation in Weno.

4) Relevant Tourism Industries

151. Yap and Chuuk States both have a small but active marine dive tourist sector utilising the majority of the nations' inshore marine reefs and islands. Yap state is globally renowned for diving with manta rays while Chuuk is renowned for its wreck diving. The cables area of influence will not impact the marine tourist sector as the marine environments associated with these areas are not used by the industry as dive sites.

5) Socioeconomic Profile

152. **Demography** -FSM has a total land area of 700 sq Km (270 square miles) scattered across 2.6 million Km or more than one million square miles of the western Pacific Ocean[11].

153. FSM's total population was recorded at 102,843 during 2010 Census. The economy of the country is based on natural resources exploitation, mostly fisheries,

[11] http://www.everyculture.com/Ma-Ni/Federated-States-of-Micronesia.html#ixzz3BGq0RbWP

tourism, and the transfers through United States Federal Government Compact of Free Association (COFA) grants and remittances from expatriate workers. Furthermore, it is dominated by a large public sector.

154. Based on the 2010 census, the FSM population is declining for the first time in recorded history from 107,000 in 2000 to 102,843 in April 2010. This indicates an average annual decline in the growth rate by -0.42%, as compared to 0.25% increase for period 1994-2000. In 2010 Census, Yap State recorded a modest growth rate of 0.12% while Chuuk contracted at -0.97%. The decline came from the decrease of the population size in both states the result of economic declines in the recent past. Despite the decline in Chuuk, it continues to be the highest population 48,651 persons, or 47% of the FSM population. Pohnpei's population represent 35% (36,195), Yap's population represents 11% (11,377) and Kosrae's population, the smallest, represent (6%) at 6,616 people.

155. The average household size declined from 7 persons in 2000 to 6 person in 2010. Similarly, average family size declined from 7 in 2000 to 4 in 2010, indicating a preference for smaller families by couples in FSM. This also reflects the decline in fertility as well as young people delaying first marriage.

Table 3. Demographic information for FSM

Feature	Project Location FSM	Yap State	Chuuk State
Land area (sq Km)	702 Km²	102 Km²	127.2 Km²
Land area (sq m)	271	45.6	49.2
Population	102,842	11,377	48,654
Growth Rate	-.42%	.12%	-0.97%
Population Density (sq Km)	152 persons	94 persons	420 persons
Median age	21.5 years		
Avg. Family Size	4		
Ave. Household Size	6		
No. of Households	17,767	2,311	7,024

Source: FSM 2010 Census Indicators, except population density-2000 Census data.

156. Comparing the two states, in 2010, Yap has the second largest population at 11,377 (5,635 males and 5,742 females)[12] while Chuuk is the most populated at 48,654 (24,835 males and 23,819 females).

Table 4. FSM population statistics for 2010

Location	Male	Female	Total
FSM	52,192	50,650	102,842
Yap	5,635	5,742	11,377
Chuuk	24,835	23,819	48,654
Pohnpei	18,370	17,825	36,195
Kosrae	3,352	3,264	6,616

Source: 2010 National Census

157. Yap is comprised of two regions: Yap Proper and the Outer Islands. Similar to Palau, the distribution of population in Yap varied considerably between rural and urban

[12] Office of Statistics, Budget and Economic Management, Overseas Development Assistance, and Compact Management

areas. In Yap Proper, the population is about twice that of the Outer Islands at 7,731 (65%) and 4,006 (35%) respectively. This is consistent with the proportion of population since 1935[13]. The population density in Yap State was about 94 persons per sq Km. In 2010, by age and sex, the population of Yap State is relatively young and comprised slightly of more females than males as indicated by overall median age of 22 years. Yap State has 2,311 households with 1,490 households (65%) in Yap Proper are connected to power while only 126 households (5%) are connected to power in the Outer Islands. In terms of communications, in 2010, a total of 1,184 households have telephones and 252 have wireless television connection. In addition, a total of 7,210 individuals have cellphones and only 294 have internet connection[14].

158. Five regions comprised Chuuk: (i) Northern Namoneas (ii) Southern Namoneas (iii) Faichuk (iv) Mortlocks and (v) Northwest Region; and in 2010 there were 23,819 females and 24,835 males making up 7,024 households.

159. **Household Members Abroad** - The 2010 census showed that of the total households recorded (16,767), 44.5% had immediate family members residing outside FSM. Chuuk and Pohnpei were the two states having more households with members residing abroad (43.5 percent and 34.1 percent respectively) compared to the other two states, Yap and Kosrae. This figure indicates demand for at least half of the population for efficient and affordable means to regularly communicate with family members overseas.

160. **Economics** - Paid employment, in government and private sector, is the most common income source for FSM with wages and salaries contributing $104 million (47%) to the total household income. Receipts from home-production activities contribute 18%. FSM households' expenditures on food, housing & related expenses, transportation & communications were the highest in the region. The combined contributions from these three groups made up 66% of the total national expenditures[15]. These data highlight the high cost of communications and the high priority afforded to it by households in their spending priority.

161. The estimated GDP (Table 5) for FSM in 2012 was $326.2 million with the largest contributors being the private sector ($67 million), households ($63 million) and state governments ($45 million). Yap State has a GDP of $57.5 million while Chuuk has a higher GDP at $ 90.5 million. The estimated nominal GDP per capita per year was $2,183.

Table 5. FSM GDP figures for 2012

GDP Estimates, Real (US$ Million) - 2012[16]	
FSM	326.2
Yap	57.5
Chuuk	90.5
Pohnpei	153.7
Kosrae	24.5

6) Public Health

162. There are no potential public health issues associated with this project since nearly all work will take place on the high seas, and construction on land will involve a 5-8 person, local construction crew. Therefore, no additional data on this topic were collected.

[13] Yap Statistical Yearbook, 2011
[14] Ibid
[15] 2005 Households and Income Expenditure Survey (HIES), Division of Statistics, FSM
[16] Source: SBOC Data, 2012

7) Recreational Resources and Development

163. Yap is actively promoting its tourism sector, most particularly the dive sites focusing on large marine animal viewing including the manta ray. Yap also has active recreation program in the areas of canoeing. There are no facilities such as modern pools, gymnasiums and outdoor sporting grounds. The project will not impact or deter such development and may in fact stimulate improvement by providing better social media communication.

164. Chuuk promotes its wreck diving industry but has little else it is promoting, despite having some staggeringly beautiful coral atolls and beaches.

165. No additional information was collected regarding this topic.

8) Cultural Values

166. FSM's states are unique and diverse in terms of culture and language. Prior to western contact, the development of unique traditions, customs and languages within each of the four main island groups occurred as a result of isolation and lack of frequent interaction. Today there are 15 languages spoken in FSM, not counting English. The 15 languages are grouped into five major categories: Kosraean, Pohnpeian, Chuukese, Yapese, and Kapinga-Nukuoro17.

167. The language of Kapingamarangi and Nukuoro islands are Polynesian in origin, and are closely related to the languages of Tokelau and Tuvalu. The traditional customs, performing arts, and arts and crafts of Kapingamarangi are also closer to those of Polynesia than they are to Micronesia. Because languages vary in each state, English has become the official language used in government and schools.18

168. All states have matrilineal clan systems in which lineage are passed on through the mother's line. Yap Island (not including the outlying atolls), however, is a more patrilineal society within a more structured caste system.19

169. One of the most significant physical cultural resources for FSM is the Yap stone money quarry site in Palau, listed as a UNESCO's World Heritage site. In addition to the quarry site in Palau, FSM also submitted to UNESCO the stone money dancing site in Yap State. The National Archives, Culture, and Historic Preservation Organisation presently continues to work on the submission of some of the most ancient ruins in FSM particularly Nan Madol ruins site and Lelu ruins site, and the Chuuk shipwrecks for nomination to UNESCO's World Heritage listing.

9) Human Settlement and Land Use

170. **Yap-** The landing at Magachgil Village is on uninhabited, undeveloped private land. It has not been developed in large part due to the occasional affects of extreme weather which sometimes cause the beach area up to public roadway to be flooded in a foot or more of water. From the beach man hole, the cable is aligned for 6.5 kilometers on the public road easement to the existing Telecom earth station where the cable landing station is proposed for an abandoned commercial building that may be refurbished. There are residences along the road easement but none are within 50 fifty feet of the road. Homes are set off from the road and accessible by driveways. The private landowner and community members were publicly consulted and have agreed to access for construction and maintenance.

171. During consultations with key government, private sector and non-government organizations, respondents were asked regarding among others expected benefits and

[17] M.M. Kim, Into the Deep: Launching Culture and Policy in the Federated States of Micronesia, Secretariat of the Pacific Community, 2011

[18] Ibid

[19] Ibid

potential concerns, if any, of faster internet. All reported that internet is very slow and could be expensive and frustrating to use. All stakeholders agreed that having a faster, reliable and cheaper internet is a priority for government, private sector, non-government organizations such as women groups, and youth and the public. One key respondent (Women's Interest Group) raised a concern regarding the negative effects of easier access to undesirable websites resulting to vulnerability of young people to human trafficking. Yap State is more prepared organizationally to deal with this concern with an existing inter-agency committee against human trafficking. Members include the Women's Interest Group, Department of Education, Chamber of Commerce and other government and civil society groups.

172. **Chuuk** - There are two identified options for the cable landing sites:

(i) North East of end of airport runway near the Kurassa Hotel ;and,
(ii) Southeast, or the opposite end of the airport runway, near the CPUC Waste Treatment Plant.

173. Both sites are on Iras Village (a part of Weno) in Weno Municipality. The land, part of the airport runway, is in the process of being fully paid for by the Chuuk State Government.

174. There are also two identified options for the cable station sites that include:

(i) FSM Telecommunications Corporation (FSMTC) compound across the airport in Iras Village, or
(ii) State government complex (old Lands Office) in Nantaku Village, also on Weno Municipality.

175. The State government complex is government land and the FSMTC compound considered a government land being a public corporation.

176. The FSMTC compound is closer to airport runway thus ideal location for the cable station if only on the basis of distance. The other option is to construct the cable station within the State government complex that is on a higher ground, but about 1.5 Km or more away from the cable landing site. Both sites will utilize existing government easements along the main road.

10) Archaeological and Historical Treasures

177. Meetings were held with government officials to establish if any archaeological or historically important sites could be impacted by the project. None of the proposed activities associated with this project will impact any of the national archaeological or historical sites/treasures located far from the cable route and landing site.

V. ANALYSIS OF ALTERNATIVES

A. Alternative Technologies

178. Both fibre optic cable and satellite connections were considered during the pre-approval period in feasibility studies by the World Bank.[20]. Satellite connections are currently utilized in both states and have provided a partial solution to long term needs, but do not currently pose a long term solution to connectivity needs due to limitations in available bandwidth, maintenance and deployment issues, and recurring costs. The fibre optic cable would allow for much broader bandwidth and sustainable, long term service. If feasible, satellite contracts can be redeployed for backup redundancy but should not remain the sole or primary connection to international bandwidth. It was therefore agreed that a fibre optic cable option for both Yap and Chuuk would be pursued.

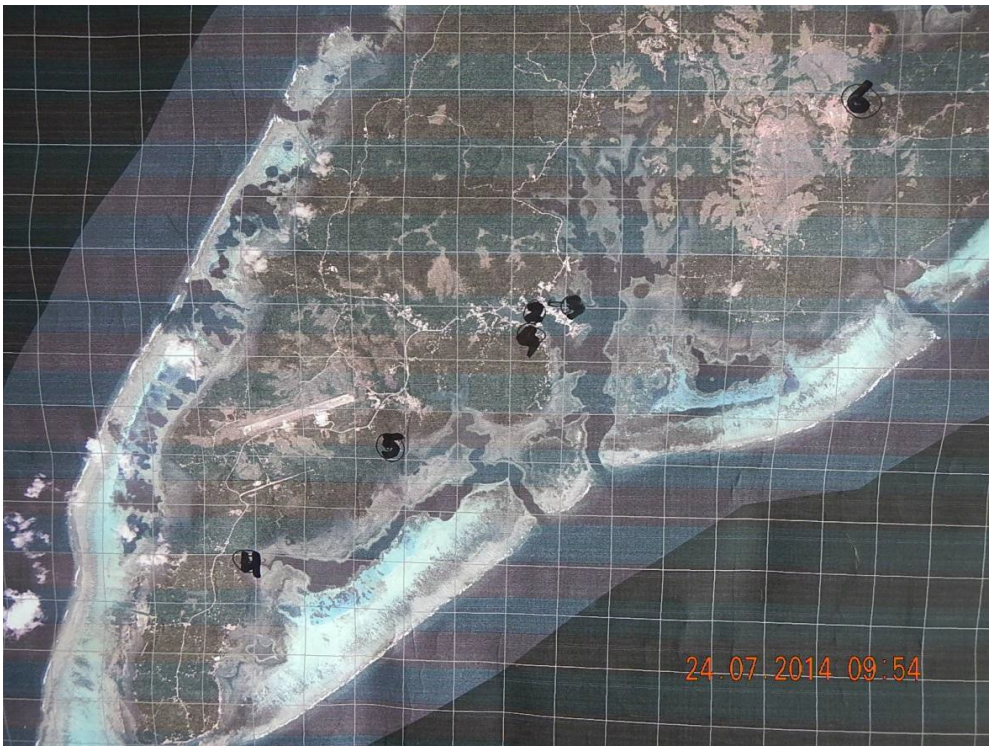
B. Alternative Alignments

7) Yap

179. Originally 6 optional alignments including specific landing sites were proposed by the state government. These were:

1. Petrocorp Tank farm area-via the main shipping channel-Colonia
2. Main shipping channel into Colonia, under bridge into Chamorro Bay and landing West of police and fire station
3. Marine Resources dock area and storage area
4. Rull Channel
5. Behind Yap Public High school using the sea approach
6. Gagil Sports facility area

Map 12. Location of the Original Six Alternative Alignment Landing Sites in Yap



[20] World Bank. 2014 . Financial Connectivity Study for Palau-FSM (PolyConseil Consultants):35pg

180. The original 6 alternatives were screened according to the following critera:

a) Least amount of encroachment on private lands;
b) Least amount of interference with marine protected areas;
c) Least effect on coastal and nearshore marine features;
d) Lowest interference with tourism activities and their operations;
e) Proximity to the existing telecom facilities.
f) Likely cost based on length from open ocean and the landing site

181. A basic matrix analysis was performed by state and national officials as well as the consultant, rating each alternative against the critia, using a scale of 1 being least desirable and 5 being the best (Table 6).

Table 6. Screening of Alternative Fibre Optic Cable alignments for Yap

Screening criteria	a	b	c	d	e	f	Total
Alternative Alignment-Yap							Score
1 Petrocorp Tank farm area-via the main shipping channel-Colonia	2	4	5	5	3	3	22
2 Main shipping channel into Colonia, under bridge into Chamorro Bay and landing West of police and fire station	5	4	5	5	5	5	29
3 Marine Resources dock area and storage area	4	4	5	5	4	3	25
4 Rull Channel	2	2	2	4	2	2	14
5 Behind Yap Public High school using the sea approach between	3	2	2	4	1	2	14
6 Gagil Sports facility area	3	2	2	2	1	1	11

1=least desirable, 5 is most desirable. Shaded alternative is preferred

182. In the initial IEE published in September 2014, of the six landings considered none were Magachgil. Heavy emphasis was placed on avoiding any impacts on the reef or the need to obtain private landowner access agreements. Kolonia Harbor was recommended as the landing station because it passed through a shipping lane in to the harbor and landed along a public easement up to FSM Telecom's main office complex thereby avoiding any impact on the reef or the need for any private landowner consents. Subsequently, the SEA-US Cable System supplier and MicroPal project manager reviewed the landing in the context of considering how to connect the Yap Spur from the SEA-US cable system main trunk. They identified Magachgil as the optimal landing point for the Yap Spur. This was because it provided the most direct landing for the cable relative to the SEA-US main trunk. Its topography was also such that its nearshore approach would be almost all in deep water away from any other shipping traffic. This was a technical consideration that had serious commercial consequences that were not considered in the initial assessment. Colonia Harbor would require a substantial amount of nearshore wet works in a shipping lane where the risks of disruption during construction and risk of damage to the cable were relatively high. The cable laying through the harbor would require a barge because the harbor is too shallow for the main cable laying ship. This added substantially to the cost of the nearshore work. By contrast, a Machagil landing eliminated the need for nearshore barge trench-work, thereby substantially reducing the costs of installation, reducing impact from installation in shallow areas, and avoiding laying the cable in a high traffic area. Due to the remoteness of the Magachgil landing, the risk of impacts on the cable from fishing and shipping traffic are virtually nonexistent. The impact on the reef area would also be minimal as the landing zone is in an area that had previously been dredged and the reef area at Magachgil is amongst the narrowest near shore sections in Yap. . Additional due diligence was completed to ensure that permission

would be granted by the private landowner at the landing point, and a new marine survey was conducted to identify any potential impacts. NEC prepared a desktop study (DTS) for the landing. Based on the DTS and marine survey and community consultations, the Magachgil landing did not appear to impact any state conservation areas, fish aggregation or traditional fishing areas, turtle nesting areas, designated dive areas, or historic preservation areas, the impacts on the reef and terrestrial areas were understood and accepted after public consultation, and the necessary permissions for land access were granted. .

2) Chuuk

183. The alternative alignments for Chuuk focused on a single corridor from the Guam-Pohnpei cable junction to the entrance to Chuuk Lagoon and from there landing sites and optional locations of the landside facility (Map 3 and Map 10). These options were examined (Table 7) and screened according to six criteria as shown in Table 7.

Table 7. Screening of Alternative Fibre Optic Cable alignments for Chuuk

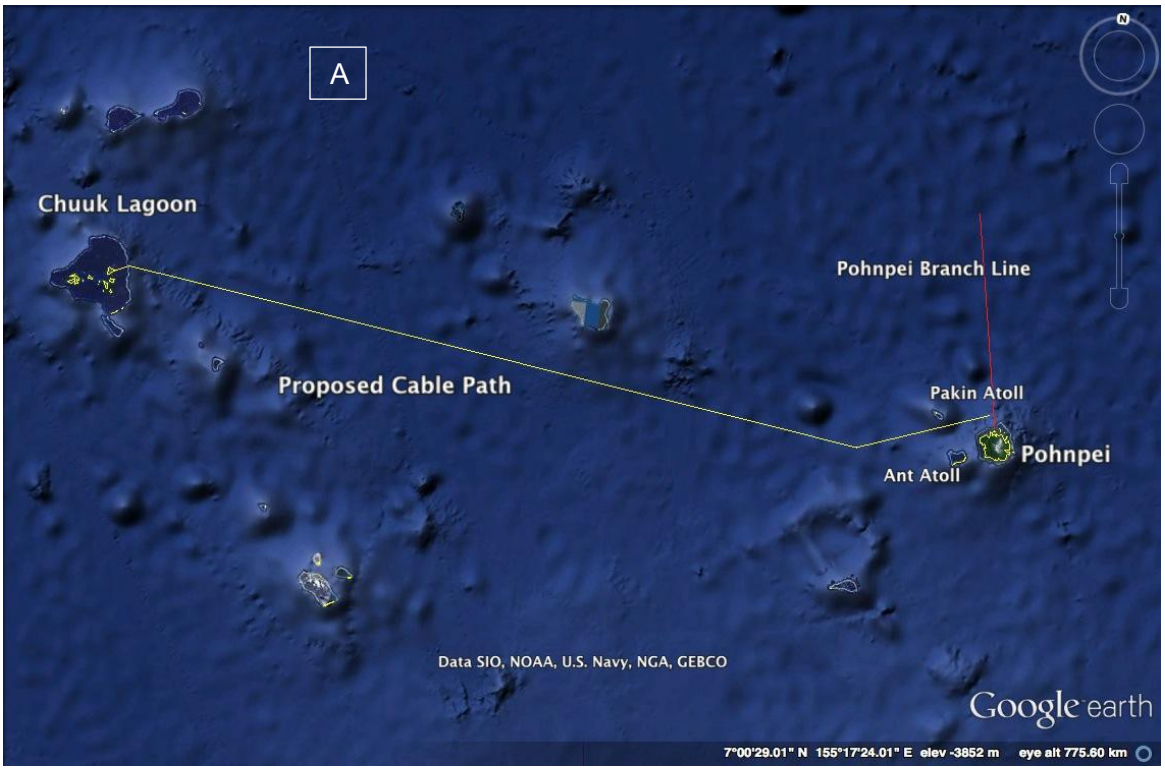
Screening Criteria	a	b	c	d	e	f	Score
1) NE Channel into Lagoon and to NE end or Weno Runway- Along inside of AP fence to across road in a conduit to FSMTC land	4	5	5	5	5	5	29
a) Along inside of Fence to 2nd crossing and to easement to government office	4	5	5	5	3	3	25
b) Along outside of fence and same as 1)	3	5	5	5	4	3	25
c) Along inside of fence, crossing as per a) and along easement to government property	4	5	5	5	3	3	25
2) SW end of runway past wastewater treatment plant, under the road to easement and up to government offices	3	5	5	5	4	3	25
3) Through the SE Channel into Chuuk Lagoon and NW to runway site	2	3	3	2	5	2	17

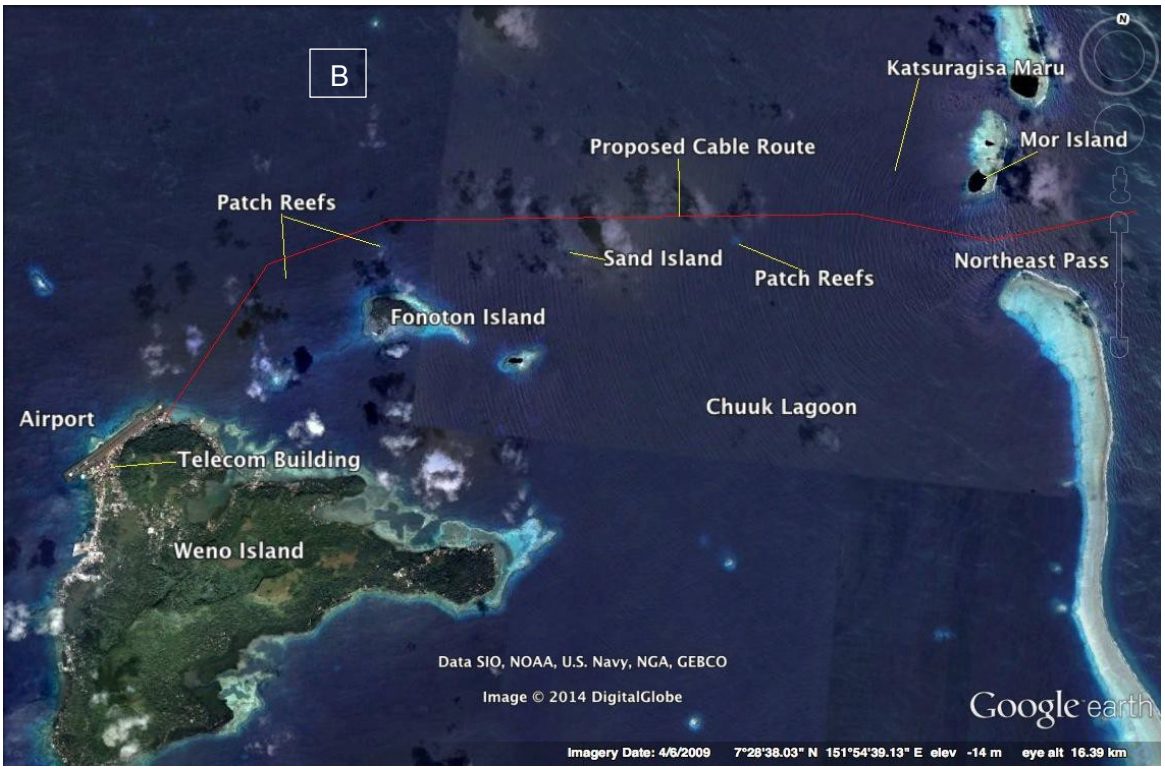
1=least desirable, 5= most desirable: Shaded alternative is preferred

184. Aside from the problem that the existing FSMTC land is near sea level and subject to flooding during a large storm surge, Alternative 1 is the least costly, requires minimal land (no private land) and is environmentally benign. Alternative No. 2 which is the same as No.1 but uses private land may lead to landuse issues, albeit these have already been unofficially cleared by the owners and the FSM government. Alternative 3 is unacceptable for many environmental, social and economic reasons. Therefore Alternative 1 was selected as the preferred alignment.

185. The cable will originate from an existing connector/junction placed along the cable about 12 nautical miles (22.2 Km) from Pohnpei on the Guam to Pohnpei cable (Map 10A). The Chuuk branch line will run directly from that junction to Weno, entering the Chuuk Lagoon through the northeast channel (Map 10B). The proposed cable route will pass through the two specific marine management zones (National EEZ and State waters) and enter and remain within the boundaries of Weno Island municipality.

Map 13. Approximate route of fibre optic cable from the Guam- Pohnpei junction(A) to Chuuk Lagoon and on to Weno (B)





C. Alternative Methods

186. Cable placement is done in one of three ways 1) simple placement on the seafloor,2) burial of the cable, or 3) a combination of the two. Burial is done via a trenching machine (Photo 2) which is either via a mechanical plough as shown on the photo or via a high pressure water jet. For either method the cable is laid into the trench and covered over in one movement as the device is pulled along. A second method used in the deep open ocean is to simply set the cable on the seafloor, sometimes with additional weights. In shallow sensitive areas, the cable is often floated into place and sunk with divers assisting with specific placement.

187. These options were assessed in relation to the sensitive habitats potentially affected, most importantly coral formations. Hydro-jet trenching in the nearshore zone was ruled out since it creates considerable sediment plumes, while the combination of plough-trenching and cable placement using divers was selected as it minimally disturbed the bottom and did not create sediment plumes. However, the final decision will be left with the cable laying crews, and any deviation from the recommended method will require an environmental evaluation to establish possible additional impacts and necessary mitigative actions.

VI. ANTICIPATED IMPACTS AND MITIGATIVE MEASURES[21]

A. Preconstruction Period

188. Preventing negative impacts resulting from the completion of this project is all about early planning and provision of specifications that avoid future problems. Fourteen preconstruction period mitigative measures were identified, all related to including contract specifications that define the boundaries the survey and cable placement contractor will be required to work within, in the bid documents. These 14 actions are summarized in the ESMP (Annex 1) and discussed in greater detail in the following section.

189. All preconstruction mitigative measures defined in the ESMP require that environmental clauses be formulated and added to the contract documents for both the oceanographic survey vessel(s) and the cable placement vessel(s). The key boundaries will be a) 2 Km distance from ocean seamounts, 1 Km distance from hydrothermal vents (at present none have been recorded in the project corridor) and a minimum distance of 75 m from any coral formations defined on maps to be provided to the cable placement contractor (see Section 2.0 of the ESMP).

190. The width and depth of the trench should be kept to a minimum and with the use of a submarine trenching machine[22] (Figure 1) can easily be achieved; including covering in of the trench as soon as the cable is placed on the seafloor. In order to avoid fishing gear snagging on the cable, burial in the nearshore waters and offshore fishing grounds (should the cable need to be place on the sea floor in these areas) will be essential. These boundaries and limits will be defined in the contract specifications during the preconstruction period.

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[21] Throughout this chapter each mitigative measure has a number included that is cross referenced to the ESMP.

[22] No coral reefs are crossed, therefore HDD methods were not considered, given the very high cost and other effects, such as the need to use drilling lubricants.

191. The second level of boundaries is related to timing and duration of the work. Both the survey and the cable placement contractor will have to be aware of the timing of the migration of species at risk, namely the whales and careful planning of operations to avoid or minimize interference with cetacean migrations, generally taking place between November and March will need to be observed. Briefing of the contractors by specialists prior to the start of construction will therefore be essential.

8) Physical Environment

192. **1.1 Air Quality** – Air pollutants released from all vessels involved in cable contract work, will be considerable since they burn low grade bunker fuel. To mitigate this effect contract specifications will require all ships used during the contract to submit emission certification for PM, SO2 and NOx to the Project Coordinator and MICROPAL. The results will need to meet emission standards for such vessels, based on the USEPA standards (http://www.epa.gov/otaq/marine.htm CFR-40 set of codes). A smoke density test will also be performed by the technical monitors, using the Canadian Department of Transport Smoke Chart set out in the schedule of the regulations (https://www.dieselnet.com/standards/ca/marine.php). For vessels with diesel engines a smoke density less than No. 1 is normally required with the exception that a smoke density of No. 2 for an aggregate of not more than 4 minutes in any 30-minute period is allowed.

193. **1.2 Substrate**- The use of foreign (allochthonous) materials when backfilling cable trenches could lead to unknown local area contamination. To avoid that cable-laying contractor's specification will indicate that:

- all backfill will have to be only original material.
- only inert/stable materials will be used in cable laying and anchoring.

194. **1.3. Unexploded ordnance**. During all preparation stages of cable deployment, due diligence and careful surveys will need to be undertaken to eliminate the risk of the presence of unexploded WW II munitions in the substrate, where trenching will take place.

195. **Yap** - During the trust territory days (Ms. M. Falanruw personal communication, 2014) the FSM government undertook an assessment and removal program of all unexploded ammunition within the Woneeday Channel and adjacent harbour areas of Yap Proper. No similar assessment was conducted at the Magachgil landing as it has not been an identified as an area where ordinance would likely to be found.

196. **Chuuk** - Discussions with local authorities suggested that no UXO is likely in the channel and entrance to the lagoon, however a UXO sweep is nevertheless recommended.

197. **1.4 Hydrothermal Vents**-Hydrothermal biological communities and their associated ecosystems are fragile in nature and are not subjected to anthropogenic disturbances. However these ecosystems and the communities they support are highly ephemeral in nature and are totally reliant on the lifespan of the vents themselves. The environment associated with an active vent is hostile and subsequently during the deployment of the cable these sites would be actively avoided. A 1-Km avoidance distance is suggested. If avoidance is achieved the impact on vent communities will be non-existent. However, it is likely that the proposed development will have no impact on the hydrothermal vent community associated with FSM waters as long as the cable is not laid upon an active vent.

198. **1.5 Sea Mounts**- Seamounts and associated bathymetric features are known to be biodiversity hotspots in the open ocean and subsequently are a target for commercial fishing. The topography of seamounts would increase the difficult of the cable deployment and therefore seamounts and associated bathymetric features should be avoided by the

cable route. A 2-Km avoidance distance is suggested. Should such avoidance be achieved, and then impacts on seamount and associated bathymetric features will be negligible.

199. The proposed development will have no impact on the seamount benthic community associated with FSM waters as long as the cable is not laid upon or in close proximity to these communities. Given the cables small environmental 'footprint', there will be no impacts associated with the motile benthic or pelagic marine resources associated with seamounts.

2) Ecological Environment

200. **1.6 Conservation Areas -** The cable alignments for Yap and Chuuk states do not enter any CA. In Chuuk State no proposed CA's are located anywhere near the cable alignment.

201. **1.7 Coastal and Deep Ocean Habitat**- Vessel operations in the deep ocean and especially in the waters inside the barrier reef, could result in accidental spills and leaks of hazardous materials or in coastal area vessel grounding, leading to habitat destruction. To minimize this risk FSM will require contractors to 1) provide specifications of the fuel and lubricant management equipment and storage on vessels used during the survey and cable laying operations, and certify that the installations in in compliance with national regulations and-or MARPOL specifications for fuel management. 2) Maintain a contingency plan to address spills and groundings due to storm events.

202. **1.8 Coral Communities**- The cable laying operations will avoid infringing on any live coral reefs. To that end the oceanographic survey team will receive instructions to align the cable to the extent practicable in avoidance of living reefs. This instruction will be provided in the contract document. In the nearshore area at the Magachgil landing some boring or trenching will be required, but this will be through mostly dead coral built up on the inner reef.

203. **1.9 Seagrass-** The cable could impact local seagrass meadows (albeit minimally, given that the cable is 3-7 cm in diameter). To avoid this, the cable`s placement will be confined to a narrow path (less than 0.4m (15") wide and 0.75m (29.5") deep, and these specifications will be included in contract documents, and avoiding seagrass meadows wherever possible. Seagrass meadow locations were identified and none found to be in the recommended cable- placement corridor, or anywhere near it.

204. **1.10 Species At Risk: Whales and Turtles –**Whales are known to migrate through the waters the cable alignment survey and cable laying activities will take place in. The work could have two impacts: 1) acoustic effect of ocean sonar survey on marine mammals, and 2) entanglement in cable by deep diving cetaceans such as the sperm whale. To reduce the risk of this occurring vessel and survey operators will be instructed, in contract documents to:

1) use best practices for operating vessels in proximity to marine mammals (Annex 4) to be incorporated in contract specification;
2) undertake seafloor survey outside whale presence/migration season, namely between May and October;
3) post a watch for whales and suspend activities when whales are within 1 Km of vessel;
4) use multi-beam and/or side-scan sonar only – No Air Guns; and.
5) 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.

205. Neither the Yap or Chuuk landing sites are turtle habitat or have been known to host breeding activities. Therefore the project will not affect turtles.

3) Social Environment

206. These measures will be implemented by the project coordinator. The coordinator will work with a contract specialist, state marine ecologists from Yap and Chuuk, and using the ESMP as a guide, to prepare specific clauses that will become a part of the legal contract between FSM and the contractor.

207. **1.11 Coastal Resource Users-Subsistence and artisanal fisheries**-The failure to define boundaries for the cable placement process and vessel operations could lead to damage to coastal fishing grounds and artisanal fisheries. The limits as defined in this IEE, and transferred to the contract specifications focusing on a narrow disturbance corridor and completion of the work quickly will avoid future problems

208. **1.12 ESMP Implementation Monitor**- During the installation work, the Project Coordinator will retain an ESMP implementation specialist who will be on site to lead the delivery of the ESMP tasks. The Project Coordinator will also retain a construction Project Manager to coordinate with, support, and provide supervision to the ESMP implementation specialist to ensure compliance with the ESMP.

209. **1.13 Community Information** – During the initial consultations it became very clear that the scale of the cable work was exceedingly exaggerated in that cable diameter was thought to be that of a pipeline and the cable contained toxic fluids or emitted electromagnetic radiation, damaging local marine food supplies. Recognizing this concern both the executing agency and PMUs in Yap and Chuuk will conduct at least one additional information session laying out these specification details and highlighting other concerns raised, such as costing and cable connection issues.

210. **1.14 Community Grievance-** Complaints and concerns can arise at any time, soon after the Project Coordinator is appointed and activity begins. The quickest way to build distrust and concern is to not have a quick complaints resolution process in place. The Project Coordinator will set in pace the grievance redress mechanism defined in Chapter VIII of this IEE and will assign the monitor to be available to process the complaints through the seven steps to getting resolution.

B. Construction Period

211. The 16 mitigative and monitoring tasks defined for the construction period reflect (listed in the ESMP) the time during the work when nearly all potential negative impacts could occur, nearly all being environmental as opposed to social. The details are described in the following section and a summary is presented in the ESMP (Annex 2).

1) Physical Environment

212. **2.1 Air Quality -** The contractor will be required to provide written evidence that vessels have up-to-date emission controls and that emissions have been tested and minimally meet manufacturer's specifications, but preferably the standards as listed in the references provided for Task 1.1. This action will be followed up by the Project Coordinator.

213. **2.2 Substrate**-The use of only autochthonous materials for any backfilling will be a defined in specification for the contractor to adhere to and will be enforced by the Project Coordinator.

214. **2.3 Hydrothermal Vents**- If hydrothermal vents exist anywhere along the alignment; and are detected during the oceanographic survey the 1 Km buffer zone requirement will need to be enforced. Any such features will be mapped by the survey vessel and avoidance as specified in the ESMP will be adhered to.

215. **2.4 Sea mounts**-The ocean corridor in which the cable is to be placed has not been mapped and therefore seamounts have not been identified. Discussions with officials in Pohnpei suggest that there are no seamounts in the Yap or Chuuk cable corridors. This however will be confirmed during the survey and if seamounts are detected, boundaries as defined in the ESMP, will be adhered to.

2) Ecological Environment

216. **2.5 Marine Coastal Conservation Areas-** The specific cable routes have not been defined as the oceanographic survey has yet to take place. However protection of two Yap CAs will be achieved since all vessel operations and cable placement will adhere to the minimum 75m safe-distance from active CA sites.

217. **2.6 Coastal and Deep Ocean Habitat-**The contractor will be required to 1) to adhere to contract specifications and FSM laws, storing all fuel, lubricants and transmission fluids in double walled tanks on vessels and if in drums, store below deck; and 2) maintain a contingency plan to address spills and storm events.

218. The trenching operations inside the barrier reef to bury the cable need to be done quickly and with the least amount of degradation of the benthic substrate the closer cable placement operations are to the shore. The general instruction to the contractor will be to have consultations with the national marine navigation agency responsible for shoreline maintenance to minimize impact. Given that the cable starting from the landing site out to deep water will need to be precisely placed, it will either require placement during low tide with the trencher towed out to deep water by the cable laying vessel (see Figure 1), or during high tide, with the cable floated out and guided to the bottom by divers. Either way the cable placement can be controlled with very precise limits.

219. In the deep ocean the cable placement will need to avoid rapid changes in elevations, i.e. undersea mountains or canyons, hydrothermal vent areas as well as seamounts which are fish congregating and fishing areas. These will be identified by the project proponent as well as during the oceanographic survey.

220. **2.7 Coral Communities-**The marine survey identified coral communities within approximately several hundred meters of the cable alignment in Yap. All or most damage can be avoided and no degradation of the reef is anticipated. Once the oceanographic survey is completed, especially the route inside the barrier reef, the contractor will be given a specific map with an exact alignment that will indicate no-go areas, including any coral areas discovered during the survey.

221. Similar conditions exist for Chuuk, in that corals are found from the top of the slopes of the shipping channel, and more distant from the cable. Adhering to the pre-defined work corridor within the shipping channel will almost guarantee that corals are not damaged. Of course the careful management of fuels and lubricants on board vessels will be an absolute requirement at all times.

222. **2.8 Seagrass -** As with corals, the proposed nearshore alignment for the cable will avoid all seagrass beds, however if during the detailed surveys sites are identified, the limits as defined in the ESMP Task 1.9 will be applied.

223. **2.9 and 2.10 Cetaceans (Whales and dolphins)-**Contractors installing the cables will need to control cable tension so that the placed cable conforms to contours of seabed as per cable laying specification and-or provide anchors if needed; in this way the cable will be as unobtrusive as possible and eliminate the risk of cable-whale interaction. As well, the ECOP contains specific instructions on minimally intrusive oceanographic survey methods, which the contractor will adhere to.

224. **Mangroves** have not been addressed since they are not interfered with along either the Yap or Chuuk alignments, and in fact do not occur within at least 500m of either

alignment, and are 25m from the Yap landing point and several Km from the Chuuk landing site.

3) Socio-Economic Environment

225. **2.10 Coastal Resource Users – subsistence and artisanal fisheries-**Any damage to coastal, artisanal fisheries will be avoided by contractors adhering to the specifications and confining the cable alignment to a narrow corridor and consulting with the Fisheries Department to assign the best dates for cable placement inside the barrier reef and to define any other avoidance measures. The Project Coordinator and contractor will discuss placement of temporary markers along the corridor where water depth is < 10m.

226. **2.11 Coastal Resource Users – Game fishers**- Once a new cable is placed the international agreement requires the owner to notify the International Cable Protection Committee, who then place the new cable on a map. In addition all navigation charts used by vessels travelling this route need to be updated to indicate the location of the new cable. This information will be passed on the licensed fisheries vessels operating inside the 200 nautical mile (370 Km) EEZ of FSM.

227. **2.12 Coastal shipping; Commercial Shipping and Ports-** The placement of the cables will mean potential short term danger to ship traffic in the seas. Therefore, the contract will be required to 1) ensure a shipping notice is issued warning of cable-laying, dates, and safe clearance for other activities to 2) Request port authorities to advise local shipping of laying activities and avoidance measures and 3) ensure that marine navigation lights and other national maritime measures are closely followed by the project vessels at all times.

228. **2.13 and 2.14 Landuse and Access**- the only impact possible could arise if contractors stray from the proposed alignment and encroach into communal resource harvesting areas. The cable route boundaries have been defined in the IEE and as such the contractor will be required to adhere to these conditions, and be permitted to deviate only after consultation with the Project Coordinator.

229. **2.15 Environmental Completion Reporting-** It is essential that as the construction period comes to a close the Project Coordinator instructs the contractors to prepare the environmental completion report as defined in this ESMP and the contract specifications. That summary report (one for each state) will define the mitigation & monitoring actions completed & what needs to be continued during the operating period.

230. **2.16 Contractor Awareness Raising**- It is likely that the contractor will not be aware of the environmental effects associated with vessel movement in the ocean or the urgency to avoid corals and plan the work to interfere minimally with other sensitive marine life such as whales. To address this gap the Project Coordinator will ensure delivery of a ½ day workshop on ESMP compliance and linkages between the cable project and marine systems effects.

C. Operating Period

1) Physical and Ecological Environment

231. **3.1 Mitigation Measures Completion Report** - Environmental mitigative and monitoring measures during this period are minimal and focus on making sure that the mitigative and monitoring action defined for the construction period are in fact implemented and a completion report filed with MICROPAL, the state governments and the national government. Secondly, the cable operator needs to provide information to subscribers about cable services access controls (such as internet site blocking) to help inform families and measures they can take.

232. **3.2 Oceanic habitat – Hydrothermal vents**-The environmental completion report prepared by the contractor will provide the details on the placement of the cable and proximity to sensitive areas such as hydrothermal vents and seamounts—if these features are identified a periodic check of any changes in the location of vents should be undertaken, particularly after any significant seismic events.

233. **3.3 Perceived Pollution when Cable installed**- Once the cable is in place it will be an inert, small diameter, glass, metal and plastic conduit buried about 0.75m (2.5ft) below the seafloor. In the deep ocean it will be a smaller diameter cable likely resting in the seafloor, which over time will become submerged in the deep sea sediment. If required the cable may also be anchored to the seafloor with special anchoring devices. It will be a passive structure, similar to a rock formation and are often quickly colonized by deep sea invertebrates (Photo 2).

Photo 2. Deep sea cable, shortly after placement on seafloor and growth of anemones and sea-pens (> 140m depth) on the hard substrate of the cable –taken by a ROV.
Source: ICPC/UNDP 2009. Submarine Cables and the Oceans: Connecting the World

2) Social Environment

234. **3.4 Impact assoc. with improved Internet-** Comments expressed principally in Chuuk at the consultation session that better internet access would allow for faster, easier and cheaper internet access, but at the same time increase in the access to socially less desirable sites, such as pornographic sites. They also expressed concern the human trafficking will be made easier. The project implementing agency, the FSM Open Access Entity (specifics have not been worked out) will inform each cable subscriber of the dangers and the methods available to block sites, but leaving decisions to the individual subscribers.

235. **3.5 Fishing Project-generated negative impacts to the communities along the marine protected areas -** Due to the small size of the fiber optic cable and the non-polluting materials, and the fact it will be buried and does not emit any noise or vibration, the project does not pose any threat to the livelihoods (food supply) of the communities near the cable alignment sites.

236. Ownership and/or decisions regarding access to the seabed where the cable will pass is vested by law with the state governments (governor and state legislatures). Consultations with the Yap and Chuuk governors' offices (which have already taken place during the consultant visits) and their full support will need to be reconfirmed to be sure that no last minute customary law issues arise over seafloor ownership.

D. Poverty and Gender Impact

237. **Poverty** - According to the 2005 FSM Household Income and Expenditure Survey (HIES), about 22.4% of households or 29.9% of the population in the FSM was living below the minimum cost of living or the Basic Needs Poverty Line (BNPL). Comparing to a similar analysis done in 1998, the proportion of households falling below the BNPL has increased, suggesting a slight worsening of overall poverty in the FSM.

238. Poverty in the FSM does not mean hunger or destitution in the traditional sense, but rather the struggle to meet daily or weekly expenses, especially those requiring cash payments[23].

239. In the Pacific, including FSM, people express their condition as 'being in hardship' rather than in poverty. Causes identified for their hardship include (i) low income, (ii) limited access to basic social services such as sanitation facilities and (iii) limited access to opportunities for gainful income.

240. **Vulnerable Population** - The poor households in the FSM are those headed by persons of low educational attainment, with no wage or salary from the private and public sectors. Poverty has a gender bias. While female-headed households constituted 20% of the household population in FSM, they constituted 39% of the total number of households in the lower three expenditure deciles. A 2004 Participatory Assessment of Hardship supported by ADB identified the poor households as those who are (i) unemployed and landless; (ii) uneducated youth who did not finish school; (iii) teenage couples with children; (iv) women (widows and single mothers) and men (widowers and elderly); (v) people who owned nothing and were without education or skills; (vi) large families and families without support from their extended families.

241. **Gender**- From the 2013 Millennium Development Goal Report for FSM, maternal deaths declining but were widely under-reported, and skilled birth attendants were in short supply in both states. Authorities recognize maternal mortality still a problem in FSM. COFA has helped since its grants prioritize spending on health by improving maternal health care missing in national plan.

242. There is low contraceptive use because of poor service delivery due to geography, lack of supplies and cultural/religious beliefs against contraception. Relatively high fertility rate for women above 35 years of age indicate a likely unmet need. Teen birth rates are down. Data on antenatal care are poor, but it is widely recognized as a major challenge. Professional advice on family planning is also weak. Better, cheaper and more reliable telecommunication services should significantly help improve these conditions.

243. The 2013 MDG Report on gender parity in education concluded that this had been achieved at all levels. However, there is the issue of low economic participation of women. Better access to education does not translated into increased participation by women in the formal sector. This is likely due to deeply entrenched beliefs in the traditional role of women, where their role is at home. Also, there is a general lack of job opportunities thus women are turning to subsistence lifestyles. FSM is among the few countries that does not have any women in parliament. Similar to some Pacific countries, the government is considering temporary special measures to reserve four seats in parliament for women.

[23] Analysis of the 2005 Household Income and Expenditure Survey: A report on the estimation of basic needs poverty lines, and the incidence and characteristics of poverty in the Federated States of Micronesia.

E. Land acquisition and Resettlement

244. Yap. Only the beach landing and reef area are on private property and consent has been given by the land/reef owner. The landowner has also agreed to a survey of the land so that an easement for the cable may be included on the deed for the property, once issued. The remainder of the terrestrial work is on existing government easements. The sites are free from residential and business structures. No crops, food plantations or productive trees will be affected and there will be no physical displacement of people.

245. **Chuuk** - The proposed cable landing sites in Chuuk will be located on the airport runway (Northeast or Southeast end of the runway), which the State government has purchased from the traditional landowners and currently still in the process of paying the full amount. Meanwhile, the two options for the cable station site are on government land. Option 1 is on the FSM Telecoms compound across the airport runway (Lot No. 007-A-07). Option 2 is on the State government headquarters in Nantaku Village, Weno Municipality, Chuuk (Lot No. 029-A-48).

246. The project will utilize existing government easements to bring the fiber optic cable to the cable station.

F. Cumulative Impacts and Mitigative Measures

1) Environmental

247. Given that the cable installation involves the placement of a 5-7.5 cm diameter solid cable (containing no liquids, and not needing transmission of electrical power[24]) in a narrow trench on the seabed and will be careful placed (via divers and/or a cable floated into place if needed) in Yap or Chuuk coastal waters over a relatively short period of time, no cumulative effects are foreseen. There are no other known activities occurring at the same time that the cable is to be placed on the seafloor. There may be other construction activities on land, but since both landing will only require the construction of a single room, which may be a simple addition to an existing structure, no cumulative effect will be triggered.

2) Socioeconomic

248. There are no expected irreversible and irretrievable cumulative social impacts resulting from the fibre optic cable project. Due to its small footprint, it is not expected to cause permanent loss of communal fishing grounds and local people's livelihoods.

G. Irreversible and Irretrievable Impacts

249. Given the very small disturbance to the environment from the cable installation and landside building (30-50 m^2 or 325-540 ft^2) construction, there will be no irreversible or irretrievable impacts due to the project. Implementation of the mitigative measures defined in the ESMP will ensure that no such impacts occur.

H. Environmental and Social Enhancements/Benefits

250. The fibre optic cable project, if properly prepared, will not only improve people's access to income and social services but may also enhance social networks particularly family relationships between Yapese and Chuukese, and their respective family members living abroad. Faster internet is also expected to facilitate regular and affordable connections among local and overseas-based groups, particularly women's organizations who rely on internet to be in-touch. A fibre optic system was installed on Pohnpei, FSM in 2010, and improvements in health care and educational services have been reported.

[24] If Palau decides to recover an existing cable, placed some years ago, it is likely that this cable will have a copper transmitter and will require constant power to the repeaters.

251. tter internet connections should also help with remote medical services and distance education.

VII. GRIEVANCE REDRESS MECHANISM

252. Although at this stage, there are no identified environmental and involuntary resettlement complaints associated with the proposed project, a grievance redress mechanism (GRM) is presented in the event that at the later stage there will be a need for one. For example, there could be a grievance filed as a result of fishing gear becoming snagged on the cable, presumed to be due to due to faulty cable placement.

253. The GRM is scaled to the risks and adverse impacts of the project. If promptly addresses the concerns and complaints of potentially affected people using an understandable and transparent process that is gender responsive, culturally appropriate, and at no costs and without retribution, will usually be resolved. The mechanism does not impede access to FSM national or state judicial or administrative procedures. The Project Coordinator will appropriately inform the affected people (AP) about this GRM before commencement of any civil works, as part of the consultation session where engineering details costs and feasibility will be tabled (see ESMP Task 1.13 and 1.14).

254. A grievance redress committee will be established to (i) record, categorize and prioritize the grievances; (ii) settle the grievances in consultation with complainant(s) and other stakeholders; (iii) inform the aggrieved parties about the solutions; and (vi) forward the unresolved cases to higher authorities.

255. The four-member committee will be comprised of one member of the executing agency, the Project Coordinator and such other members as appointed by the FSM Broadband Taskforce. The chair of that committee shall be agreed by the committee or named by the Broadband Taskforce.

A. Proposed Grievance Redress Mechanism

256. The following seven-step mechanism (Table 8) is proposed for grievance redress of social and environmental matters.

257. During implementation, the Project Coordinator as well as the contractor will be responsible for interacting with the GRM. The Project Coordinator will be the grievance focal point, and receive and address project related concerns. Concerns will be resolved first by the overall Project Coordinator and the responsible government authorities. Affected people will be made fully aware of their rights regarding land ownership and environmental degradation (Division of Lands and Environmental Protection Agency- EPA). During the construction period the contractor will be a key participant in the grievance redress process, and the Project Coordinator will need to confirm that the contractor has assigned a GRM coordinator.

258. Any complaint will be recorded and investigated by Project Coordinator and the contractor (as appropriate). A complaints register will be maintained, and will show the details and nature of the complaint, the complainant's name, the date and actions taken as a result of the investigation. It will also cross-reference any non-compliance report and/or corrective action report or other relevant documentation filed under that complaint.

259. When construction starts, a sign will be erected at all sites providing the public with updated project information and summarizing the grievance redress mechanism process including contact person details at the PMU. All corrective actions and complaints responses carried out on site will be reported back to the Project Coordinator. The Project Coordinator will include the complaints register and corrective actions/responses in its progress reports to the World Bank.

260. Throughout this process, Yap and Chuuk's State Courts and Environment

Protection Agencies will always be available to hear public complaints and provide advice if the complainant feels that Project Coordinator's responses are not satisfactory.

261. On receipt of a complaint in any form (in person, telephone, written) the Project Coordinator will log the details in a complaints register. The Project Coordinator will forward complaint to the Open Access Entity head within 48 hours. The Project Coordinator will respond within 1 week with advice on corrective actions to be taken. The Project Coordinator will review and find solution to the problem in consultation with village/island/state or traditional chief and relevant local agencies. Then the Project Coordinator will report back to the village/island/state /traditional chief and affected persons within another 7 days. If the complainant is dissatisfied with the outcome, or has not received advice in the allotted time period, he or she can take grievance to the national/state level. Village/State/National Committee will refer matter to the relevant state agencies (State Court and Environmental Protection Agency). The state authority will review the case and report back to the Project Coordinator who will discuss answers with the State Governor or traditional chief and the complainant about an outcome. If unresolved, or if at any time the complainant is not satisfied, he or she can take the matter through the courts. Both successfully addressed complaints and unresolved issues will be reported to the World Bank by the Project Coordinator .

Table 8. Grievance Redress Process

Step	Process	Duration
1	Affected Person (AP)/village elected or traditional chief takes grievance to Project Coordinator or Contractor	Any time
2	Proj. Coordinator reviews issue, and in consultation with village/island/state or traditional chief, relevant agencies and contractor (if appropriate), then records a solution to the problem.	2 weeks
3	Proj. Coordinator reports back to village/traditional chief/AP and gets clearance from complainant.	1 week
If unresolved		
4	AP/village or traditional chief take grievance to State Committee for resolution	Decision within 2 weeks
5	State Committee refers matter to relevant national agency (Department of Justice and Department of Transportation, Communication, and Communication)	2 weeks
6	State Committee can deliberate for up to four weeks	4 weeks
7	State Committee reports back to Governor /AP/village or traditional chief	1 week
If unresolved or if at any stage and AP is not satisfied with progress AP/village or traditional chief can take the matter to appropriate state or national court.		

Source: Consultant experience, previous process development & meetings with key stakeholders, July and August 2014 in Yap and Chuuk

VIII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Yap

1) September, 2014 IEE Consultations

262. When the IEE was first prepared, a public consultation session was held on July 29th 2014 between 09:00 and 1130, at the State conference center in Colonia, Yap State, FSM. 36 people attended the meeting, including key state and municipal government officials, NGOs, as well as fishing and tourism operators. Chiefs from the key municipalities were also in attendance (Annex 2).

263. The government/consultant presentations took one hour, followed by a question and answer period, separated by a short coffee/tea break. The meeting was adjourned around 13:30.

264. In addition to this formal session, the social sector specialist conducted at least three other focus groups, discussing the issues around the location of the facility, the landing site and the fact that none was private. The feedback from these meetings was a resounding yes, with completion of the work and provision of the service as soon as possible.

265. Opening remarks were delivered by the Governor of Yap, who also chaired the session and Infrastructure, followed by Mr. Jolden Jonnyboy, the designated national lead (although Mark DeOrio is taking over that role) for the project provided a slide show describing the administrative and financial details on how the project will be implemented and the timetable for completion of the major deliverables Thirdly Mr. G. Teleki, the consultant's team leader provide a detailed presentation on the project background, cable technology and installation options as well as environmental findings followed by social safeguard findings presented by the social sector specialist Ms. Carmine recorded during the field visits to Yap (two for Mr. Teleki and Ms. Carmine. Finally, Teleki presented the details of the preferred alignment, focusing on the corridor taken by the cable as it passed from the deep sea into the nearshore waters of Yap and Colonia (see Annex 2).

2) Questions and Answers

266. The comments by the participants focused on three areas:

- Misconceptions about the size and makeup of the cable, namely large diameter and containing hazardous materials and associated environmental impacts,
- Cost of the service to subscribers over and above the existing,
- The next step of provision of connections to households, and
- If Satawan included local MP wants Ulithi Island included.

267. **Misconceptions about the size and makeup of the cable**, namely large diameter and containing hazardous materials and associated environmental impacts- A lively discussion concern the diameter, components and option burial methods was conducted among the participants, the proponent, the consultant as well as the Minister or Transport and Infrastructure. Actual samples of the cable were passed around the room and details of into makeup and the fact that it did not contain any liquid or in fact any power supply was clarified.

268. The consultant described optional burial methods, namely towed trencher and hydro-trencher, seafloor placement using anchors, and nearshore floatation and diver directed placement.

269. Questions were asked about wide enough consultation and the social sector specialist responded by saying that various meeting with many stakeholder groups had been completed and quite a number of the people attending the meeting had been involved in these sessions.

270. Initial concerns raised during the first meeting, related to possible damage to the marine life particularly fish caught in nearby fishing grounds as well the permitting process for getting permission to cross the MPAs. These questions were discussed during the public consultations and assurances given (and actual cable sections provided) that even if the cable were broken, there would be no environmental threat since it is made up of inert metal and plastic; this included the repeaters.

271. **Cost of the service to subscribers over and above the existing rates**-The issue of how the cable was to be paid for and the cost to subscribers was another topic of discussion, most importantly the issue of not having a fibre optic cable on land so the cable from the sea would be connected to a copper wire connection, greatly reducing the the value of a fibre optic cable system. The response was that an landside cable system is being considered and will be a part of the bidding for the installation and operation of the system.

272. **The next step; namely the provision of connections to households-** The participants were assured that this step was being planned, but that such services will be provided by the telecommunications service provider and that once the cable was landed the issue of connection to subscribers would be addressed. Affordability would a top priority, and the implementing agency would hold consultations concerning this.

273. **Satawan Connection-** A local Member of Parliament indicated the Ulithi needed to be considered if Satawan was to be a part of the project. The response was that Satawan would not be a part of this project

3) Summary of the Consultation and of Reply by Government/ Consultant

274. The overwhelming opinion of all participants was full support for the project and an urgency to get this in place as quickly as possible. There was not a single negative comment. The presenter responded with thanks and underscored that the safeguard document once drafted would be available for review at the Governor's Office and Resource Planning Department in Colonia.

4) Use of Consultation Results

275. The points raised, particularly the first two have triggered the addition of further explanation during the future consultations to be delivered by the Project Coordinator, addressing the topics of cable make up, economic feasibility and costing.

5) Follow Up Program

276. The Governor's Office announced that while no further workshops were planned, people with concerns and complaints could bring these directly to the Governor's office for resolution.

277. The IEE report will be available for public review for a number for a number of days (details not specified), but does not require disclosure by World Bank, given that it is an IEE. It will however be placed on the World Bank's website for review at any time.

6) February 22, 2016 and March 8, 2016 IEE Public Consultations Regarding the Magachgil Landing and Routing to the Cable Landing Station at the Telecom Earth Station

278. On February 22, 2016 and March 8, 2016, the project team held additional

consultations with the Yap public specifically addressed to the Magachgil landing routing and alignment, including both wet and dry sections to the landing station. The attendance sheet of the February 22, 2016 meeting is included in Annex 2. After the meeting, Yap State officials confirmed that the alignment of the cable from the Magachgil landing to the cable landing station is on an existing state government road easement.

279. On March 8, 2016 another public hearing was held during which the Project Coordinator reviewed the World Bank Social and Safeguards requirements and current status of the project including the impacts of the cable landing and alignment. At the hearing the Project Coordinator reviewed the beach landing and beach manhole placement area and impacts from the landing. In the following days, two private adjacent landowners of the beach area at the landing site reviewed options for providing access. Multiple community (village) meetings were held to review the requirements and impacts for the cable access. Consultations were held amongst the landowners and their families and their village members. Ultimately one of the two adjacent landowners agreed to voluntarily donate the land on the proposed terms and conditions. In addition the landowner consent, the chiefs and community representatives of the affected communities signed an MOA memorializing their agreement and consent to the updated cable configuration and impacts it would have on the reef and beach landing area during construction, installation, and maintenance. The attendance sheet, presentation, meeting minutes, and press release regarding the March 8, 2016 meeting are included in Annex 2.

280. There is no recorded title or deed to the beach landing private property, which has not been surveyed. The private landowner agreed to a survey funded by the project after which an easement for the construction, alignment and maintenance for the life of the cable will be recorded on the official title and deed. The municipal Chief and a community representatives witnessed the private land owner's agreement to voluntarily donate the land.

- **Chuuk**

1) Consultation

281. The meeting was opened at 0915 by Mr. Johnnyboy of the FSM lead representative who discussed project administration, financial matters and timetable issues. This was followed by the presentation of the project, as well as environmental and social sector safeguard issues, mitigative measures and accompanying maps showing the location of the preferred alignment into the Chuuk Lagoon. Summary record of the meeting was prepared by the consultant and it plus the attendance sheet is included in Annex 2

282. There followed considerable discussion and it became clear that as with Yap, there was misconception about the scale of the impact from the cable, mostly because the cable was seen as a large conduit emitting electromagnetic radiation and with a hazardous substance inside acting as a kind of insulator. Photos of a cable section were presented and it was explained that the modern cable needs no power and has no liquid inside and were solid rubber, plastic and glass.

283. A new issue that emerged in Chuuk and which took up considerable time was the concern that the cable could be vandalizes and what action could be taken to prevent that. This was actually a serious consideration and the only solution proposed was that a monitoring-inspection committee be formed to regularly watch over the cable to be sure it not vandalized. The consultant reminded the participants that the cable would be buried 2.5-3 ft below the seafloor and only nautical charts would provide GPS coordinates.

284. The State officials indicated that an approach would be implemented to safeguard the cable,and that inside the lagoon it would have to be buried.

285. Concern over the misuse of high-speed internet to access socially undesirable sites as well as dangerous ones dealing with human trafficking was tabled. The consultant indicated that the service provider would need to include with every subscription warnings

and means to block access to these sites.

2) Questions and Answers

286. The following other issues were also discussed

i) concern over interaction of cable laying vessel with other commercial ship traffic entering through the Northeast Channel into the lagoon? Vessel will be modern and equipped with all navigation equipment including radar and sounders to avoid any problems.
ii) life span of the cable? 25-30 years.
iii) depth of the cable how it is positioned within the lagoon. Restated information already provided in presentation.
iv) concern about ongoing sand mining-dredging locations, these sites need to be identified so no impacts. We need a map to identify these sites. EPA regulates these activities-so they know exact locations.
v) ownership issue on land and water. Commercial issues for the laying the cable, Attorney General's office assured meeting that easement in the water will not be a problem? Having people to wave these issues. AG and deputy Governor of Chuuk State indicated it would be dealt with internally. It is a domestic issue. A letter of agreement will be developed.
vi) comments associated with Telecom ownership on land for the cable-, willingness by FSM to allow competition to use the cable. Sharing the service provider--. Sure for a user fee. The new law passed recently explains this. Internal State concern – needs more internal FSM national and State government discussions.
vii) Equal access basis. Joldon explained the law. Needs to be sorted out. FSM will take this lead in due time.
viii) some discussion based on FSM roles and States involvement in the operation of the new system – more awareness and understanding needed. This will come as promised by Jolden Jonnyboy; and
ix) identified the cost sharing conditions regarding the World Bank grant to FSM.

3) Summary of Consultation

287. The overwhelming opinion of all participants was full support for the project and an urgency to get this in place as quickly as possible. There was not a single negative comment. The presenter responded with thanks and underscored that the safeguard document once drafted would be available for review at the Governor's Office and Resource Planning Department in Weno.

4) Use of Consultation Results

288. The points raised, particularly the first two have triggered the addition of further explanation during the future consultations to be delivered by the State PMUs, addressing the topics of cable make up, economic feasibility and costing.

5) Follow Up Program

289. The IEE report as amended is available for public review at www.ict.fm, It is also published on the World Bank's website.

7) ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

290. The ESMP is organized into two cross-referenced tables, namely the environmental mitigation table (EmiT), and monitoring table (EmoT), and is provided in detail in Annex 1. These two tables list in details the mitigative measures and monitoring actions that the Executing Agency has committed to implement, from the planning through the operating period of the project. The ESMP table numbering is consistent such that reference can be made in the bid documentation or during any other monitoring activity and the correct mitigative and monitoring measure will always be found. The ESMP reference numbers are also included in the discussion in Chapter IV and VI of this IEE.

291. This approach makes for an ESMP that is practical and can be easily be used during bid document preparation as well as during project implementation. This type of ESMP is short, information rich, and with minimal text to wade through.

A. Preconstruction

292. For the preconstruction or detailed design/planning phase of the project, 14 environmental mitigative and monitoring measures were identified.

293. They focus on advising those who are preparing the bid documents on what and where to insert specifications defining geographic and timing limits of the work was designed to provide guidance on how to avoid negative effects during the construction period. In addition a UXO sweep of the cable corridor to whatever depth is advised by the appropriate authority, will be undertaken.

294. Monitoring actions during this stage will involve simple confirmation that bid documents reflect these requirements and also require bidders to have basic environmental safeguard management qualifications.

1) Physical Environment

295. **1.1 Air Quality**– Large volumes of air pollutants will be released from all vessels involved in cable contract. Contract specifications prepared by FSM will require all project vessels to submit emission certification confirming PM, SO2 and NO2 emissions, given that these ships generally burn low grade (dirty) bunker fuel. These certificates will be retained by the Project Coordinator. In addition, stack smoke density test results will also be required (see paragraph 221 for details)

296. **1.2 Substrate**- The use of foreign (from outside the project area) materials when backfilling cable trenches could lead to unknown local area contamination. To avoid that cable-laying contractor's specification should indicate that ;

- all backfill will have to be only autochthonous materials.
- only inert/stable materials will be used in cable laying and anchoring.

297. These mitigative measures will be monitored via periodic inspection by the Project Coordinator and progress reporting by the cable placement vessels.

298. **1.3. Unexploded ordnance**. During all preparation stages of cable deployment, due diligence and careful surveys will need to be undertaken to eliminate the risk of the presence of unexploded WWII munitions in the substrate where trenching will take place. Details of areas 'cleaned" in relation to the cable alignment need to be discussed between the contractor and each state agency before cable deployment commences.

299. **1.4 Hydrothermal Vents**- Although none are presently known to exist in the general alignment of the cable between Yap, Guam and Palau, and along the Chuuk cable

route, the oceanographic survey may turn up such a site. Physical damage to vents by the cable laying process is possible, as is damage to the cable from the 300^{o}C+ temperatures of the venting water. Therefore specification requiring the oceanographic survey team to identify a cable route that maintains a minimum clearance of 1 Km from active hydrothermal vents will be defined in the design specification.

300. **1.5 Sea Mounts**-Placing a cable across a seamount, which is an important fishing ground and fish gathering area can lead to habitat damage and conflict with fisher people. To avoid this, contract documentation will include the requirement for the survey team to identify a cable route that maintains a minimum clearance of 2 Km from the base of any seamount(s) if discovered, and specify this route in the design specification.

2) Ecological Environment

301. **1.6 Conservation Areas**- These areas managed by local communities for sustainable marine resources use and consumption need to be protected from any encroachment by the cable laying activity. These CAs are mapped and well known locally and will be collected by the Project Coordinator. Yap has two such areas in proximity to the cable alignment and the contractor will need to reconfirm that the route chosen is the least disruptive for these two sites. The contract specifications require a $\geq$ 75m distance from CA boundaries, i.e., all survey and cable laying vessels will maintain this distance at all times. Chuuk has no such issues, although several CAs are being proposed.

302. **1.7 Coastal and Deep Ocean Habitat**- Vessel operations in the deep ocean and especially in the waters inside the barrier reef, could result in accidental spills and leaks of hazardous materials or, in shallower coastal areas, vessel grounding, leading to habitat destruction. To minimize this risk the Yap and Chuuk EPAs will require contractors to 1) provide specifications of the fuel and lubricant management equipment and storage on vessels used during the survey and cable laying operations, and certify that the installations are in compliance with national regulations and-or MARPOL specifications for fuel management, 2) maintain a contingency plan to address spills and groundings due to storm events; and 3) have on board modern navigation equipment used to avoid vessel grounding.

303. **1.8 Coral Communities**- The cable laying operations will only encounter live coral as the operation moves into shallower waters, generally ≤ 35 m. The contractor should therefore avoid infringing on any live coral reefs or areas where coral is recovering from past degradation. To that end the oceanographic survey team will receive instructions to align the cable around living reefs. This instruction will be provided in the contract document.

304. **1.9 Seagrass**- No seagrass meadows were found in the proposed cable-placement corridor. In the event that a deviation during the detailed design period is required the following boundaries are defined. If not placed with care the cable could impact local seagrass meadows (albeit minimally, given that the cable`s size. To avoid this, the cable`s placement will be confined to a narrow path (less than 0.4m (15”) wide and 0.75m (29.5”) deep, and these specifications will be included in contract documents, and seagrass meadows will be avoided.

305. **1.10 Species At Risk** –Whales are known to migrate through the waters where the cable alignment survey and cable laying activities will take place in. The work could have two impacts: 1) acoustic and disorienting effect of ocean sonar survey on marine mammals.; and 2) entanglement of deep diving cetaceans such as the sperm whale in cable . To reduce the risk of this occurring, vessel and survey operators will be instructed to:

1) use best practices for operating vessels in proximity to marine mammal (Annex 4)areas;
2) undertake seafloor survey outside whale presence/migration season, namely not between June and September;
3) post a watch for whales and suspend activities when whales are within 1 Km of vessel;
4) use multi-beam and/or side-scan sonar only – No air guns; and,
5) lay cable segments in terrain that does not have sharp changes in relief requiring suspension between points and creating a real obstacle., Low relief routes will be sought out.

3) Social Environment

306. For the preconstruction or detailed design/planning phase of the project, four social-specific mitigative and monitoring measures were identified.

307. The project has the potential to generate misinformation about the cable and possible effects and possible social disruption of the work. A consultation was completed during the preconstruction stage to inform the public about the work and it very minor impacts, and FSM indicated that it would hold additional meetings.

308. Secondly, all public complaints and concerns need to be addressed and to that end a grievance redress mechanism (see Chap. VI) has been established and its procedure will be clearly defined during the information sessions held by the project PMU.

309. **1.11 Coastal Users and Subsistence and Artisanal Fisheries -** Damage to ecosystem integrity and fishery productivity through loss or damage to local fishing grounds. Using the data on design limits found in the IEE, prepare contract specifications defining trenching/cable laying activities to be limited to a narrow corridor and trenching to be followed by immediate burial.

310. **1.12 Technical Capacity to Implement the ESMP**-There is a lack of experience and technical understand by the executing agency concerning ESMP implementation. As a result the value of the ESMP could be compromised. To avoid this, the Project Coordinator retain as needed an environmental technician familiar with ESMP implementation for at least the two years (including detailed design and construction) to help implement and record the delivery of the ESMP in the two states.

311. **1.13 Community Information**- **–** Misconceptions regarding the project may raise people's fears regarding project footprint and potential damages to marine food supply. To address this at least one consultation targeting government, non-government and community consultations will be completed in each state prior to commencement of civil works, during construction and after project completion.

312. **1.14 Community Grievances**-Concerns about the details of the project, particularly the financial aspects as related to household connection charges and service provider rates, have already surfaced and will need to be addressed by the government. There may also be other, as yet unknown issues related to, e.g., fishing gear damage due to cable placement. Both Yap and Chuuk have indicated that at least one additional special meeting (as part of the same meetings proposed in Task 1.13) will be held to address the financial and costing issues. While the grievance redress mechanism has been established the committee composition is not yet fixed, but will be established by the Project coordinator. The use of the seabed and customary ownership is another issue where concerns will need to be addressed and local level memoranda of agreement are already in preparation.

B. Construction

313. There are 16 mitigation and monitoring actions and 12 of them define boundaries or limits on how, where and when cable placement and burial should take place. There are also actions needed to confirm the environmental compliance of equipment, such as the survey and cable laying vessels' fuel management and storage systems as well as their emission certification. Awareness raising of the contractor, via a briefing session is also an important task and will be undertaken shortly after the contract is awarded.

314. The Project Coordinator will be required to ensure that the details of the oceanographic survey will have been reported prior to the start of the cable laying operation; as a minimum preceding the cable placement. In this way any finds such as seamounts, hydrothermal vents and deep sea coral formations can be assessed and instructions to avoid reconfirmed with the contractor.

315. In addition to the safeguard requirements and processes specified in the ESMP, the Project Coordinator will update any requirements triggered by any new oceanographic survey results, and work to put these changes in place.

316. The monitoring table (Annex 1 EMoT) defines how the mitigative measures need to checked and records completed.

1) Physical Environment

317. **2.1 Air Quality**–as defined in Chapter V the Project Coordinator will ensure that the contractor vessels have been properly maintained and that the emissions are acceptable for the vessels and within FSM standards and those described in Task 1.1.

318. **2.2 Substrate**-The Project Coordinator will require assurance from the contractor that only local materials were used to backfill trenches.

319. **2.3 Hydrothermal Vents**- Hydrothermal vents require a 1 Km buffer zone, i.e. distance from any cable laying operation. This action is triggered only if vents are found along the alignment. This will be known after the detailed oceanographic survey takes place, at which time the Project Coordinator will need to implement this mitigative measure to be sure that these sites are not damaged or destroyed.

320. **2.4 Sea mounts**-Seamounts will require a 2 Km buffer zone, i.e., distance from cable laying operations (if possible). This action is triggered only if sea mounts are found along the alignment. This will be known only after the detailed oceanographic survey takes place, at which time the Project Coordinator will need to implement this mitigative measure to be sure that these sites are not damaged or destroyed

2) Ecological Environment

321. **2.5 Marine Coastal Conservation Areas-** The oceanographic survey will establish the exact route of the cable, but that design will be bounded by the location and limits of the CAs as defined in the IEE and as available in greater details from the executing agency. The Project Coordinator, working with the contractor will ensure that these boundaries are maintained and that any potential unavoidable encroachment be cleared in writing with the communities involved prior to cable placement taking place.

322. **2.6 Coastal and Deep Ocean Habitat-**vessel operations as part of the cable survey and placement task will pose a very low risk that these vessels will spill fuel, dump waste or run aground, this damaging habitat. Contractor vessels will be equipped with up-to-date navigation and sonar equipment and will be required to adhere to international standards regarding fuel storage and handling and on-board waste management. As part of the contractor confirmation exercise, the Project Coordinator will conduct an inspection of the vessels to ensure that the contractor has met basic requirements. Secondly, the route of the alignment must avoid interference with coastal marine habitat outside the immediate cable alignment.

323. **2.7 Coral Communities-**The contactor will comply with the requirement for the

maintenance of at least a 75m distance from coral communities while working in the nearshore waters by using the survey maps and bypassing any coral formation identified during the survey. Such finds are unlikely at least in the nearshore areas, given that there were no such formations found in the Yap approaches or the Chuuk NE entrance to the lagoon and shipping channel (See Annex 4).

324. **2.8 Seagrass-** Avoidance of encroachment onto seagrass meadow is a requirement and to date the cable alignment does not interfere with any seagrass bed. If previously undetected beds are found during the survey, the contractor and Project Coordinator will be required to realign the cable so that it interfered minimally and if possible avoids these sensitive areas altogether.

325. **2.9 and 1.10, Cetaceans –** Contractors will need to consult with Guam marine mammal authorities to establish which whales generally move through the work corridor waters, and plan the cable laying operation to take place during period of low or now whale movement (to the extent that this can be determined, given the lack of survey data). The contractor(s) will be required to keep a record of such consultation in the event that the Project Coordinator or WB requests it. The Environmental Code of Practice for Fiber Optic Cable projects, prepared as guiding framework for such projects, contains specific instructions concerning whales and cable laying operations, and which contracts are required to adhere to.

3) Social Environment

326. **2.10 Coastal Resource Users – subsistence and artisanal fisheries-**Contractors will be required to respond to issue arising due to incorrect cable placement of complaints about disruption of local fisheries. The best action will be to avoid encroachment, which should be relatively easy as the contractor will have consulted with authorities (Fisheries Dept. or the State Fisherman's Association) concerning the location of fishing areas.

327. **2.11 Coastal Resource Users – Game fishers –** Contractor(s) will be required to notify the Yap and Chuuk Marine Resources Departments and coastguard of the cable location and indicate any areas along the route that are near fishing ground. This will help avert cable-fishing gear issues

328. **2.12 Coastal shipping – commercial shipping and ports-** For this possible impact leading to vessel delays or accidents, the cable laying project will need to be well advertised with the shipping industry such the vessels operating in the waters are aware of the cable laying exercise. A ship to ship broadcast informing vessels of cable laying operation will also be considered, but keeping within any security conditions

329. **2.13 and 2.14 Landuse and Access**- Minimal land acquisition or access-related effects will arise since the cable corridors are primarily in either in the deep ocean, in the commercial shipping channel (in Chuuk), or on the government lands on shore. The only land access required is for the Magachgil landing in Yap where the landowner has voluntarily agreed to donate access on his private land, which is otherwise undeveloped and unused for any residential or commercial purpose.

330. **2.15 Environmental Completion Reporting**-The Project Coordinator will ensure that this report is completed at the end of the construction period.

331. **2.16 Contractor Awareness Raising-** Given the likely gap in the contractor's technical capacity in ESMP implementation and environmental awareness, a short workshop will be delivered by the Project Coordinator at the start of the construction period, covering ESMP implementation as well as working with sensitive marine features, habitats and species.

C. Operating Period

9) Physical and Ecological Environment

332. **3.1 Mitigation Measures Record-** During the operating period environmental issue arising will be mostly complaints about the cable interfering with fishing and landuse disputes plus possibly items related to the construction of the landside-fibre optic room. The implementing agency will keep ledger if actions taken and resolutions.

333. **3.2 Oceanic habitat – Hydrothermal Vents-** Should the detailed survey reveal the presence of hydrothermal vents, a design to bypass this area of seafloor will be prepared and measures implemented as defined in the ESMP.

334. **3.3 Perceived Marine Pollution** –Misinformation about the cable will persist and local communities will need reassurances that it is safe. To that end the grievance committed will remain active in each state and provide information and resolve complaints and concerns as they arise-This function will be transferred to the implementing agency as soon as there is adequate technical capacity.

2) Social Environment

335. **3.4 Impact assoc. with improved Internet**-To make all cable subscribers aware of the dangers of better internet access, a meeting with or letters to subscribers will be delivered by the service provider, informing them of potentially undesirable sites and the means to block access to these locations.

336. **3.5 Fishing-** There is a very low risk that the cable, once in place will results in snagging of fishing gear. Given that the cable is smooth, except for the repeaters, it sits on the bottom of the sea and is marked on navigation charts, fishers should have all the information needed to avoid such problems. Near shore, the cable will likely be buried 0.75m below the seafloor, eliminating any chances of damage to fishing gear.

D. Performance Indicators

337. Given that nearly all of the potential negative impacts would occur during the construction period, and that robust environmental contract clauses will be able to avoid all impacts. Key performance indicators will be:

i) confirmation that the 35 ESMP tasks are defined in as specific individual or grouped environmental and social clauses, in the contract bid documents.

ii) confirmation that environmental management criteria are included as part of the contractor selection process, including their experience preparing and implementing ESMPs, working in sensitive tropical locations such coral reefs, recognizing fish aggregation/spawning areas, seagrass meadows and seamounts;

iii) as needed a safeguards monitor-technician retained by the Project Coordinator or the national government, providing on-the-job assistance with information distribution, community consultation and compliance monitoring tasks;

iv) a written record of the briefing on safeguards and inspection of vessels, as they are defined in the ESMP and contract specification, completed with the survey and cable placement contractors, as soon as the contractors have been selected.

v) compliance monitoring checklists prepared and being used and due diligence notes, completed as defined in the ESMP, and making the notes

available in an easily accessible file for the contractor, Project Coordinator and others to use.

vi) a written mitigation and monitoring completion report, listing all mitigation and monitoring measures defined in the ESMP, their implementation timing, monitoring and any follow up actions; and,

vii) a written record of interviews with local fishers, examining any cable placement issues, vis-à-vis fishing gear damage.

E. Implementation Arrangements

338. The Project is overseen by the FSM Broadband Taskforce, DTCI and the Project Coordinator. Component 1 (cable connectivity for Yap and Chuuk; improved satellite connectivity for Kosrae) will be implemented by DTCI until such time as the Open Access Entity (OAE) is established and operationalized upon which the OAE will be the implementing entity. The national level working group in coordination with respective State leadership will be responsible for specific decisions such as any on land construction, building placement and details regarding landside cable connections and land acquisition issues (should any arise). DTCI will retain technical specialists as needed to assist with compliance with the ESMP mitigative and monitoring tasks.

339. Project implementation actions will work closely coordinated with the state governors' offices. The Project Coordinator will manage the day-to-day issues of the delivery of the project, but complete this in close collaboration with State governors' offices. The ESMP will be implemented by the Project Coordinator, starting with the preparation of environmental clauses in the bid documents, bid evaluation and contractor selection, the safeguards briefing of the contractors and the implementation of mitigative and monitoring actions during the construction and at the start of the operating period of the project.

340. As needed the Project Coordinator will work with the states to establish State steering committees. The proposed composition of this committee is as follows:

- State Governor's Executive Assistant or Dep. Governor, Chair
- Pollution Control person from EPA
- Representative of FSMTC
- Marine Resources person, and
- Resource and Development Planning person

341. Any necessary revisions to the 'ESMP due to detailed design findings will be led by the Project Coordinator. The Project Coordinator will administer the contractor at the national level until such time as the Open Access Entity is established and operationalized. The Project Coordinator will implement compliance monitoring of the construction period mitigation measures.

342. The ESMP implementation will require an approximate six month preconstruction period, a two year construction period, and a 1-year operating period compliance monitoring function. The main responsibility for implementation during the three periods will be DTCI.

F. Institutional Capacity

343. Both Yap and Chuuk have competent Environmental Protection Agencies, but these are under staffed and under equipped. Both have some experience with implementing international environmental assessment requirements. The cable supplier and installation contractor will be required to to have basic ESMP implementation skills. The DTCI will hire a Safeguards specialist to work with the Project Coordinator during implementation to ensure compliance with the ESMP.

G. Mitigation and Monitoring Costs

1) Environmental Mitigation and Monitoring Costs

344. The ESMP lists 14 preconstruction period, 16 construction period and 5 operating period mitigation and monitoring actions. During the construction period field monitoring will be required, weekly, when the cable placement is ongoing inside the barrier reef. The deep ocean work is expected to take about 300 days in total (rough estimate) with the oceanographic survey being completed several weeks ahead of the cable placement operation[25]. The Chuuk Lagoon is one of the largest in the world and Weno is about half way across this area and therefore the survey work will likely take 8-12 days. It is during these periods that inspection of vessel operations will need to be conducted.

345. Monitoring vessels and any equipment will be provided by the Marine Resources Division or Marine Navigation Division of the state governments, with the project paying for fuel. Once alignments have been surveyed and all construction tasks are fixed, and after the negotiations with the various government agencies have been completed during the detailed design period, the exact costs will be updated.

346. Deep sea corridor inspections are not anticipated, unless the project coordinator has such a requirement, in which case the monitor would go along and additional funds would be made available.

2) Social Development Programs and Resettlement Costs

347. Social mitigation and monitoring will involve at least five tasks (ESMP-Annex 2). Cost of community awareness activities such as community meetings/public consultations and information materials prior to construction, during and after construction is expected to be approximately $20,000.00, or about $ 10,000 in each State of Yap and Chuuk, for the complete development period.

348. There is no land acquisition required for the project. However, one of the proposed landing cable sites, inside the airport runway which should be DTCI land, has an outstanding amount to be paid by the government to the former private owner. This amount is still unknown and the issue remains active.

349. Another option is to install the cable immediately outside the airport fence and use the roadway easements and ROWs.

3) Total Cost

350. Combining both the environmental and social mitigation and monitoring cost the total estimate costs for each state will be around US$75,000 and will cover the entire project cycle.

4) Summary of Reporting and Monitoring Requirements

351. All reporting requirements are specified in the ESMP (see ESMP 2.15 and 3.1). At the end of the preconstruction period the Project Coordinator or any monitoring specialist will prepare a mitigation and monitoring completion report and submit this to the executing agency for submission to the WB. The contractor will be required to submit progress

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[25] Although not confirmed with the contractors, the survey ship will be able to transmit digital data to the cable laying contractor and a specific alignment mapped, without having to wait for the survey, taking upwards of 3 months to complete.

[26] A national instead of international specialist.

reports to the Project Coordinator, in addition to the oceanographic survey findings and a semi-annual summary of ESMP implementation. The semi-annual compliance monitoring summary report will be submitted by the Project Coordinator, and the construction period mitigation and monitoring completion report, once the facility is fully installed.

352. Monitoring requirements are specified in the ESMP monitoring table, the ESMoT.

5) The Environmental Code of Practice

353. This work required the preparation of an Environmental Code of Practice for corridor selection, placement of the cable, and siting of the landing stations. The Environmental Code of Practice listed many of the items defined in this ESMP and added further detail on boundaries and restriction to be adhered to by contractors conducting work in the marine environment and on shore. It has been prepared as a companion volume with this IEE.

8) CONCLUSIONS AND RECOMMENDATIONS

354. The project will impact a corridor of not more than 0.5 m wide on the sea floor, and in some locations up to 0.75 m beneath the sediment. The cable, 5-7.5cmm in diameter, will be either sitting on the seafloor in the deep ocean, then buried as enters the Yap and Chuuk nearshore zones. Burial of the cable will be done to reduce interference with coastal fishing gear and reduce the risk of damage from severe storms.

355. As it enters into the nearshore waters, the cable alignmentwill be in deep water which is essentially a coral rubble and sand seafloor. For the last 1 - 2 Km the cable will be buried at a depth of about 0.75m, using a special trenching device (Figure 1) which disturbs an area of about 0.4m wide x 0.7m deep, threads the cable into the trench and closes the trench as it is towed by the cable laying vessel or other heavy equipment, will be used. There is no other disturbance to the sea floor or the water column.

356. The distance of the cable from any potentially sensitive habitat such as corals and specific protected areas will be 75m-100m for both Yap and Chuuk, eliminating any chances that the work will negatively impact the marine environment.

357. The landing station site for Yap will be on government land at the FSM Telecom premises where there are already existing facilities. The same goes for Chuuk.

358. The preferred alignments for Yap the Chuuk will not interfere with any of the existing MPAs (Yap) or the proposed MPA (Chuuk) or any other protected areas; and will maintain a minimum 100m safe distance from these areas.

359. The ESMP defines a full set of working area boundaries, work restrictions and timing limits, which will be included in the construction contract specifications and which the contractor will have to comply with. Compliance will be monitored by the Project Coordinator and an ESMP monitor.

360. Given the small scale impact of the work, and the fact that nearly all of the work takes on board a vessel at sea with a specially trained crew, no negative social impacts are predicted during any stage of the project.

361. The operation of large ocean going vessels which burn low grade diesel fuel will result in large emissions of greenhouse gases. To begin to address this the contractor will be required to submit emission certificates for their vessels, and show that they meet international standards, most particularly the USEPA's diesel emission standards for PM, SO2 NOx and the visual-Black smoke test, as defined in the ESMP.

362. The construction of the cable facility on land will require a small crew of local works, likely a local contractor.

363. In order to effectively implement the mitigation and monitoring tasks defined in the ESMP, the Project Coordinator will hire as needed an environmental monitor in each state for a period of 2 years. That monitor will assist with implementation and enforcement of the ESMP, primarily during the construction period of the project.

364. In order to insure no significant environmental and social impact occur, DTCI and the Project Coordinator will be fully committed to implementing the ESMP. They will meet all the reporting requirements in a timely manner and consistently monitor the contractor, then provide regular feedback and immediately address any non-compliance issues and public complaints.

365. For the social sector specifically, post installation awareness raising among new subscribers on methods for controlling access to some socially undesirable sites and what to do about them, will be a mandatory requirement for whoever becomes the service provider. The two state governments will be responsible for enforcing this requirement.

366. With these actions, it is recommended that no additional environmental or social sector studies are needed, and that this project can move to detailed design and construction.

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