

Terms of Reference (TOR)
FSM Prioritized Road Investment and Management Enhancements Project

Design & Supervision of Urgent Climate Resilience Improvement Works for Identified Road Network Assets

1. Background

The largest nation in the Micronesian sub-region, the Federated States of Micronesia (FSM), is made up of four semi-autonomous states (Kosrae, Pohnpei, Chuuk, Yap) located between Palau and the Philippines to the west and the Republic of the Marshall Islands (RMI) to the east. Although its land area covers just 700 square kilometers, FSM consists of more than 600 islands scattered over an area of about 2.6 million square kilometers, including its Exclusive Economic Zone.¹

As with other small island nations in the region, FSM faces significant challenges related to its small size, remoteness, geographical dispersion, environmental fragility and sensitivity to external shocks.² In particular, frequent natural disasters and climate change impose high costs and may even threaten the physical viability of some areas of both the main islands and more remote outer islands. Droughts, typhoons, storm waves, flooding and landslides all affect FSM. The climate in FSM varies considerably from year to year due to the El Niño Southern Oscillation (ENSO). In Pohnpei, El Niño tends to bring drier conditions during the dry season, but higher than average rainfall during the wet season, and La Niña tends to bring above average rainfall in the dry season. The West Pacific Monsoon affects the western states of Chuuk and especially Yap more than the eastern states of Pohnpei and Kosrae, tending to be farther east during El Niño resulting in more rainfall, and in a more western position during La Niña resulting in less rainfall.

FSM is particularly vulnerable to the impacts of climate change and is likely to suffer serious adverse environmental, social and economic losses as a result of climate change induced hazards.^{3, 4} For example, in 2015, Typhoon Maysak wiped out 90 percent of key agricultural crops in Chuuk and Yap, affecting 29,000 people and causing US\$8.5 million in damages. Many people live within the coastal zone and are therefore vulnerable to climate related changes in precipitation, sea level, storms and coastal erosion. The negative impacts of climate change are already evident in FSM, for instance, saltwater intrusion from rising sea levels that damage crops and contaminate freshwater supplies and increasing extreme weather events such as typhoons. In addition, as drought and sea level rise are amplified by regional ENSO processes, formerly sustainable atoll communities now rely on imported food and water during times of stress. Exacerbated by sea level rise, extreme spring tides, known in FSM as 'King tides', are causing

¹ An Exclusive Economic Zone is a sea zone prescribed by the United Nations Convention on the Law of the Sea (UNCLOS) over which a state has special rights regarding the exploration and use of marine resources, including energy production from water and wind.

² Systematic Country Diagnostic, Report No. 102803, World Bank, January 20, 2016.

³ In acknowledging that a variety of definitions may be used for the terms risk, hazard, vulnerability and exposure, the following definitions are used for this ToR. Risk refers to the likelihood that a bad outcome occurs to an exposed asset (e.g., bridge failure) within a specified period because of the effects of natural effects (e.g., tropical cyclone induced storm surge). Hazard refers to when the effects of the natural events reach or exceed specified levels at a certain location within a period (e.g., storm surge exceeding 1 meter). Vulnerability refers to the propensity of an asset to be damaged by the effects of an event. Exposure refers to when assets are in harm's way.

⁴ FSM Country Profile. World Bank Group Climate Change Knowledge Portal. 2018.

intense marine inundation that damages taro beds, soil, agro-forestry resources, and critical infrastructure along the coast, especially on low atoll islets.⁵

Projections under all global greenhouse gas (GHG) emission scenarios indicate that annual average air temperature and sea surface temperature will increase in the future. Based on the widely used Coupled Model Intercomparison Project, Phase 5 (CMIP5) models (included in the Intergovernmental Panel on Climate Change (IPCC's) Fifth Assessment Report), by 2050 the average temperature in FSM is expected to increase by 1.3°C in the high emission pathway, or by 0.78°C in the low emission pathway. In both scenarios, the intensity and frequency of days of extreme heat are projected to increase throughout the decades up to 2100. In addition, model projections show extreme rainfall days are likely to occur more frequently. The majority of the simulations estimate an increase of rainfall of greater than 5 percent by 2090 under the high emissions scenario.⁶ In addition, sea levels near FSM have risen and will continue to rise throughout this century, with a projected rise in sea level in the range of 3 – 15 cm by 2030 under a high emissions scenario. This sea level rise combined with natural year-to-year changes will accentuate the impact of storm surges and coastal flooding.⁷

Similar to other Small Island Developing States, FSM is vitally dependent on access to well-functioning and reliable transportation systems. FSM's road network is of critical importance to the country's economic development. It provides for the day-to-day well-being of its people by increasing their access to economic activities and social services. It is estimated that around 75 percent of the population lives within one km of the coast, and critical infrastructure - such as hospitals, schools, places of employment, tourist infrastructure, port facilities, airports, and roads—is located primarily in the coastal zone. The country's road network and users already suffer regular temporary – sometimes only for hours, but occasionally longer - breaks of serviceability as vulnerable links or locations can be frequently rendered impassible and journeys disrupted by flooding, debris deposit, culvert, bridge and/or pavement damage. Expected climate change effects - the combination of rising sea level and more intense typhoons – will place these coastal assets and communities at a higher level of risk.

2. FSM Prioritized Road Investment and Management Enhancements Project

The FSM road network faces a range of vulnerability issues, in particular: (i) coastal exposure to sea-level rise, storm surge, wave action during very high tides and typhoons; (ii) inland flooding and landslips during extreme rainfall events; and (iii) accelerated pavement deterioration due to extreme weather and rising water tables in some locations. The Government of FSM (GoFSM) plans to prepare a detailed assessment of vulnerabilities in road transport and develop a strategy for enhancing the climate resilience of the overall network for the same timeframe. GoFSM is working with donors to support its climate change initiatives and has requested the World Bank's assistance through the FSM Prioritized Road Investment and Management Enhancements Project (FSM PRIME).

3. Objectives

- **Project Development Objective (PDO):** The FSMPRIME development objective is to improve the climate resilience of FSM's road network and in the event of an Eligible Crisis or Emergency, to provide an immediate response to the Eligible Crisis or Emergency.

⁵ Climate Change in the FSM – Food and water security, climate risk management, and adaptive strategies. University of Hawaii. 2010.

⁶ FSM's Second National Communication to UNFCCC on adaptation

⁷ Current and future climate of the Federated States of Micronesia. Pacific Climate Change Science Program. 2011.

- **Assignment objective:** The specific objective of this assignment is to sustain the connectivity of road networks on the principal islands in each of FSM’s four states through careful investigation, assessment of options, design and construction supervision of urgent improvements to priority identified road network assets in poor condition. These improvements will complement the activities resulting from the upcoming Vulnerability Assessment (VA) and Climate Resilient Road Strategy (CRRS).

4. *Scope of Activities*

The scope of this consulting assignment will involve undertaking field investigations and surveys, options analysis, preparing designs and procurement documentation, and providing procurement assistance and construction supervision of improvements to identified road network assets in each of the four states – Pohnpei, Chuuk, Yap and Kosrae. The identified improvements are as follows (see annexed satellite images):

- **Kosrae: improving the Lelu causeway.** Lelu is the most populated area in Kosrae but is an island whose only land link to the main island is the causeway. The causeway was constructed 50 years ago, is very narrow, is low level, has insufficient drainage, and is suffering from erosion and scouring from tidal action. The causeway has also had a long-term significant negative impact on the environment in this area and improvements should provide for significantly increased natural water flow dynamics – large culverts or bridges need to be included.
- **Pohnpei: replacing Awak bridge.** Outlying communities around the Pohnpei island are vulnerable to any cut in the circumferential road as there is no alternative route except to go right around the island. Awak bridge is a 12-meter-long concrete bridge already considered to be in an unsafe condition, and urgently needs to be replaced.
- **Chuuk: improving airport to Pou Bay bridge road.** This 2.5-kilometer length of road is in extremely poor condition and is barely passable due to its waterlogged potholes; however, the road forms the primary access between Weno town and the communities and facilities at Sapuk. The road urgently needs to be upgraded e.g., to a concrete surface, similar to the town roads.
- **Yap: replacing ‘Manta Ray’ (Donoch and Tagaaniyal) bridges⁸.** Two short-span (6-meter-long) steel and concrete composite bridges in Colonia, located right on the shoreline, are considered to be in an unsafe condition – the primary and secondary support steel I-beams have completely rusted, and the underside of the concrete bridge decks has spalled, revealing corroded reinforcement. Both bridges urgently need to be replaced before they collapse. Weight limits and possible closure should be considered as a matter of urgency as an interim precaution.

The services to be provided by the Consultant will be undertaken in a 2-stage approach as follows:

Stage 1 – Field investigations, surveys, preliminary and detailed design, procurement documentation & procurement assistance

- 1.1: field assessments, surveys and site investigations, consultation, concept designs and costs of feasible improvement options;

⁸ Note: these bridges have been the subject of previous technical design inputs. See ‘Yap 3 bridges Preliminary Engineering Report’, Lizama & Associates, 2003 and ‘Yap Bridges – Concept Design Report’, Beca International Consultants Ltd, 2009

- 1.2: preliminary engineering design
- 1.3: detailed design and procurement documentation
- 1.4: provision of assistance to state authorities during the procurement process

Stage 2 –Construction supervision and works contract(s) administration

- 2.1: supervision of construction and administration of contract(s)
- 2.2: defects liability / notification period and finalization of works contract(s)

5. STAGE 1 Tasks

Stage 1.1 – Field assessments, surveys and site investigations, consultation, concept designs & options

Site investigation: The Consultant shall carry out a visual inspection of all four sites to assess the type, characteristics, dimensions and condition of existing road, causeway and/or bridge assets, and their surrounding environment.

Topographic Survey: The Consultant shall carry out a detailed topographic survey of the existing road, causeway and bridge reserve corridors and adjoining properties, encroachment into the road reserve (structures, trees and crops), and detailed site survey of the existing bridge sites. The survey should be sufficiently thorough for detailed engineering design purposes, and should clearly identify all structures, fences, hedges, trees and crops for the purpose of possible future compensation negotiations. The survey area will be extended beyond the bridge corridor as required for upstream and downstream river hydraulic modelling and coastal / riverbank protection design purposes.

Tidal survey: As all the sites are either on or immediately adjacent to the shoreline, surveys should establish the mean sea level and normal tidal range relative to existing road levels at the site of the improvements

Cadastral Survey: The Consultant shall also carry out research at the appropriate authority in each State to determine the status of all land within the surveyed corridor and prepare a cadastral plan showing land ownership that may be affected by the proposed works.

Geotechnical Survey and Testing: The Consultant shall be fully responsible for all geotechnical and materials survey, sampling and laboratory testing required for detailed design purposes. The Consultant shall also make use of available geotechnical information from FSM national and/or state authorities and shall be responsible for these geotechnical studies to provide competent foundation designs for structures and pavement designs for roads, including factoring loading from wind and seismic action, scour, differential settlement and potential landslips.

Construction Materials: The Consultant shall carry out a materials search to ensure that an adequate quantity of suitable and economically viable construction materials conforming to likely design specifications will be available for construction of bridge and road works. This search should include an investigation into availability and suitability of materials from all known quarries as well as possible sources close to the works site.

Utility Services: The Consultant will liaise with the service authorities to obtain all available information on the type, location and level of all existing overhead and underground services (including proposals) which will need to be accommodated and /or may cause a potential conflict with the proposed construction activities. Where any uncertainty exists, the Consultant shall arrange for underground services to be proved by dipping.

Hydraulic and Hydrology, Tidal Fieldwork & Research: The Consultant will be responsible for accurate determination of the catchment area, catchment hydrology, and hydrography, waterway gradient, velocities, design flood flows at the proposed structure for various recurrence interval storm events. As all the sites are located on or close to the shoreline, the analysis will also include the effects of king tides and storm surges.

Consultations with key stakeholders and key informants: a critical activity at this stage will be for the consultant to hold discussions with the National and State institutions responsible for road asset management in the four states, to ascertain the historical background of the four assets to be improved, assessment of current values and/or trends in traffic volume, classification, loading etc, local road asset construction and maintenance capacity and capabilities within each state, existing and/or anticipated geometric standards etc. The consultant will also hold formal discussions with all likely interested parties, including but not limited to national and state-level utility entities, environmental departments, survey departments, legal departments etc.

Consultations with adjacent property owners and community leaders: consultations with local communities and land users adjacent to the proposed works will commence early in the concept design stage. These consultations will present various design options along with expected associated impacts. Feedback from the consultations will assist to inform the project design and associated mitigation measures acceptable to affected persons and will demonstrate consent for the preferred design approach. In undertaking these consultations, the consultant will be guided by the *participatory design approach* for the project as described in the Resettlement Policy Framework prepared for the project. Consultations will need to be undertaken with those in the immediate vicinity of the project to inform them of the works to be undertaken, including needs of the works, concept design options, indicative timeframe, benefits to the community as well as anticipated disturbances or losses and overview of mitigation measures. The consultations are expected to follow on from consultations undertaken by the E&S Consultants to prepare initial environment and social documents, should be undertaken together with key project stakeholders at the state level, and be in line with the Stakeholder Engagement Plan prepared for the project.

Road Safety Audit (RSA): a baseline road safety audit will be undertaken of the existing road assets and their approaches at all four sites as a separate consultancy prior to the commencement of this assignment, and the four reports will form an essential reference for all stages of the design of improvements, including all concept designs. The consultant is to factor the RSA recommendations for each site into its design, or in an exceptional case, provide clear, evidence-based arguments why certain recommendations should be omitted or modified in the design.

Initial scoping and options analysis: on the basis of the above investigations, surveys, site inspections and consultations, the consultant should consider, develop and analyse two or three possible alternative improvement options for each of the sites, and prepare concept / scope designs and cost estimates and timelines for each of the options. A simple comparative socio-economic cost / benefit

analysis should be undertaken to compare the options for each of the four sites. The analysis should consider both the immediate development cost and whole-life cost scenarios.

Concept design and options report: The consultant will prepare and submit a Concept Designs and Options Report summarising the activities, analysis of data collected, selection of options and setting out the findings of this sub-stage, including feedback from local communities and affected land users.

Stage 1.2 – Preliminary engineering design

Preliminary Design and Documentation

- For the preferred option at each site, and based on the detailed field investigations, laboratory tests, survey data etc., prepare preliminary design and drawings using agreed design standards and parameters (see below), and prepare an estimate of quantities and a cost estimate for physical works to a level of accuracy +/- 20%.
- Review and determine appropriate engineering standards in consultation with DoTC&I and state authorities. Consideration shall include, but not be limited to, the following:
 - Appropriate design standards (consider national and international design standards, criteria and parameters currently adopted by FSM)
 - The Project Environmental and Social Management Framework and Environmental and Social Management Plan and Land Access Procedures and / or Resettlement Plans being prepared under a separate consultancy, including the need to minimize impacts on adjacent property and land use as well as results of preliminary consultations with adjacent landowners and community leaders.
 - Road pavement design (including the subgrade)
 - Appropriate formation and sealed widths
 - Appropriate side slopes where cutting into embankments is required
 - Drainage concepts and improvements to natural water flow dynamics, if required
 - Access to neighboring properties, if required
 - Lighting if required
 - Road and bridge furniture
 - Pedestrian and cyclist use
 - Utility services relocation, if required, and future needs
 - Safety considerations
- Prepare draft objectives and scope of services for the detailed design services for DoTC&I to consider for approval. The scope shall include (but not be limited to) the following:
 - enhance and promote safety as a priority
 - appropriate designs considering all road users, and whole-life costing
 - sub-structure & superstructure elements (for bridges & culverts) and pavements, surfacing and drainage elements (for roads) that are resilient, durable, accessible and maintainable
 - promote environmentally friendly detailed design
 - provide a template in managing potential environmental impacts, to minimize or avoid before, during and after construction works for relevant organizations
 - close liaison with utility services providers in identifying and preparing plans for service relocation, if required.

Stage 1.3 - Detailed design and procurement documentation

The consultant shall undertake the detailed engineering design of the road, causeway and bridge works at each site as applicable, including drainage and ancillary works. This will follow review of the preliminary design and report by relevant stakeholders and accommodating any comments/revisions to the scope that may arise following this review. In carrying out the detailed design the consultant will utilize data obtained from site investigations, data collected from surveys, materials testing and consultations.

Where significant gaps in data are identified from earlier site investigations, such as uncertainty in ground conditions at particular locations, then additional work may be required (such as additional geotechnical investigations, for example). Any such additional work shall be discussed with and approved by DoTC&I.

In addition to paper and transparency copies of survey data and design plans, the slope stabilisation design and topographic survey data collected should be submitted to DoTC&I in a digital form which is suitable for direct input to Civilcad, and/or Autocad, using such format as mutually acceptable to both parties.

Design and Documentation

The Consultant must follow an acceptable design approach by which all the identified stages outlined in this ToR are reviewed for full incorporation into the final design and should encompass the following:

- Engineering designs of all elements at all the sites will need to be cognisant of the remote locations affecting the logistical arrangements for carrying out the works, the high vulnerability to natural hazards – seismic, tsunami, typhoons, tidal and riverine flooding etc, and the hot, wet, highly corrosive environment that will impact the durability of all construction materials
- The design and construction requirements of the Environmental and Social Management Plan for the urgent works and Land Access Procedures and / or Resettlement Plans, which will be prepared under a separate consultancy.
- If required, carry out additional site investigations and tests to ensure the adequacy of the slope stabilization designs and to confirm that technical specifications are suited to the properties of local materials. Reinstate any disturbed or damaged areas during site investigations to the satisfaction of the client and state authority and in compliance with the Environmental and Social Management Plans for urgent works.
- Ensure that the proposed structures will marry into the existing road in accordance with specified standards and good practice to promote safety for all road users.
- Investigate and develop detailed slope stability and hydrostatic analyses including any modeling required.
- Allow for independent road safety audits of all preliminary and final designs.
- Include the preparation of safety audit reports, draft and final procurement documentation for the works including engineering drawings, detailed Engineer's estimates and technical specifications. Standard DoTC&I and/or state authority formats and specifications are to be used where appropriate.

Design standards and parameters

The design shall be carried out using applicable design standards used in FSM or internationally as appropriate. Standards and applicable design parameters covering every aspect of the design at each site shall be agreed with the client prior to commencement of the detailed design stage.

Bridge Structural Design: structural design and loadings for all bridge structures shall conform to the requirements of the applicable standard. Design loadings shall be compatible with the existing and expected future vehicle fleet in FSM, with an appropriate allowance for vehicle overloading and impact. Note that the bridge superstructure and substructure design should also allow for impact of massive floating or submerged debris during severe floods.

Road Pavement Design: The pavement design for areas of road repairs shall be undertaken based on forecast traffic volumes over a 20-year period and an analysis of existing and extra layer thicknesses for pavement strengths and conditions as determined by the geotechnical / materials investigation and testing program to be proposed by the Consultant. The final road pavement must be suitable for the local climate and drainage conditions, which could cause saturation of the subgrade or pavement materials. Provide details of sub-surface drains and porous drainage layers required for the control of pavement drainage.

Geometric design: As all the improvements will be constructed on existing roads, the road cross-section, vertical and horizontal geometry will largely be dictated by the existing road and bridge alignments. Where there is scope for local improvement, however, the consultant should make recommendations for possible road widening, provision of shoulders or sidewalks, improvement in site lines etc., but also make clear any social or environmental safeguard impacts (land acquisition etc).

Longitudinal Road Drainage: Design where necessary any table drains, kerb and gutter, pipe drains or channels, subsoil drainage pipes as appropriate to drain the carriageway and to intercept upstream catchment runoff and prevent it from causing a safety or nuisance problem for road users. The minimum design standard for such longitudinal drainage shall be the 1 in 10-year ARI rainfall event with the added criteria that the central 3m of the road formation shall remain un-submerged by any excessive longitudinal flow during or after the 10-year ARI rainfall event. Design the road drainage system to prevent ponding on the pavement at sag curves greater than 250mm. There shall be no ponding (i.e. still water) on any part of the road pavement, including the table drains or shoulders 30 minutes after the cessation of rain.

Access Culverts: Design access culvert pipes located in table drains to provide access to private property to match the capacity of the longitudinal drain. The minimum accepted standard shall generally accommodate the 5-year runoff event. In no case shall a minor crossing be designed such that overflowing water spills - or is diverted - onto the carriageway.

Cross Culverts: The following standards shall apply:

- Design cross culverts at waterway crossings for the 20-year runoff event.
- Design scours protection for all cross culverts as necessary to stabilize the inlets and outlets. Except in the case of blockage, the road pavement at cross culverts should remain open to through traffic during and after the 20-year runoff event.
- Closure of major roads due to flooding during and after rare flood events will be acceptable, provided delays are kept to a minimum. Where closure due to inundation is likely to cause the

road to be impassable for longer than 1 hours and an alternative route is not available, a larger culvert or a bridge structure should be considered.

- Where an alternative route is available, longer delays may be acceptable.

Bridge & major culvert hydraulic design: Using survey outputs from the field investigations, the consultant will undertake a detailed drainage assessment for each road crossing to determine the hydraulic adequacy of existing and new bridge and major culvert structures. In reviewing and determining the design flows for each crossing, the consultant should review the hydrology (storm intensity, frequency and return periods) of the associated catchment area and derive and apply appropriate design factors to meet the need to increase the resilience of the drainage against future climate change over the design life of any bridge replacements (100 years) and road improvements (25 years). All drainage design should be in accordance with agreed standards and codes of practice.

Tidal lagoon drainage design: three of the four sites involve roads passing over waterways that are within or close to tidal lagoons, and the tidal flow patterns of these waterways will need to be carefully analyzed in the design to ensure that the hydraulic opening provided in the improved crossings will not interfere with the natural water flow under all expected tidal conditions. The Lelu causeway is a particular case where the existing inadequate hydraulic opening is perceived to have restricted the natural tidal flows within the lagoon, which will need to be rectified by provision of larger culverts in strategic locations along the causeway.

Scour Protection: riverbank and bed protection both upstream and downstream of bridge sites and protection of road embankments at river crossing and close to shorelines, will be essential design features, to protect:

- Government's investment in the bridge and road infrastructure;
- The environment from the danger of accelerated erosion and sedimentation processes in the vicinity of bridge abutments;

In all cases, the road pavement adjacent to the bridge should remain in a trafficable condition with only minor maintenance requirements after either the 20-year discharge or the applicable design storm. Some scouring and/or damage from rarer runoff events can be tolerated. However, for extreme events, damage should be confined to the road embankment/approaches, if significant asset damage is unavoidable, rather than severe damage to, or loss of, the structure asset. Consideration should be given to armouring approach embankments to prevent washout in extreme events.

It is generally uneconomic to provide scour protection for conditions rarer than the 20-year ARI flood event. Minor damage requiring repair to upstream and downstream scour protection works can be tolerated. However, care should be taken to ensure that the failure of downstream / shoreline scour protection does not accelerate the failure of the road structure, which is required to remain trafficable.

Slopes and Batters: The cross falls of any road shoulders and batters to side drains should be consistent with the function of the road, drainage requirements, and safety and land availability. Any sealed shoulders should have a minimum cross fall of between four and six percent.

Cut slopes should be shaped and benched to form a stable self-draining formation which does not pose a safety risk due to fretting, slippage, landslide or rock-fall. Suitable protective measures should be incorporated to provide the long-term stability of cut batters. Fencing, benching, cut off drainage

and/or retention structures should be designed and detailed in areas where there is a history of slope instability.

Fill slopes should be as flat as possible for safety and maintenance reasons depending on embankment height and land requirements. Batter slopes steeper than 4h: 1v pose a safety risk and may cause overturning if a vehicle leaves the road, and slopes steeper than 3h: 1v may require special treatment to prevent scour before re-vegetation occurs. Proposals for batter slopes steeper than 2h: 1v should be referred to the client, supported by a geotechnical report on the likely stability of the batter, for approval.

Slope Stability Design: Slope stability design and loadings shall conform to the requirements of the agreed relevant and applicable design standards, manuals or codes of practice to suit local prevailing geological, geotechnical, seismic and hydrological conditions. It is expected that a range of solutions will be required, some of which may be rigid or flexible, structural or non-structural to suit the local conditions at individual sites.

Construction Materials: As far as is practical, materials readily available in each state from licensed or permitted facilities should be used in the bridge and approach roads construction. The design should consider the availability of local construction materials, methods of construction, and the suitability of imported materials to the project. The use of local and / or imported materials must be consistent with the Project Environmental and Social Management Framework and the Environmental and Social Management Plans for the urgent works. Whenever possible, without compromising applicable design standards, innovation, quality of workmanship or maintenance requirements, consideration should be given to locally fabricated products or materials, particularly where high maintenance costs may result from the use of imported products

Property Access: The work should be designed so that access to adjacent property and intersecting roads is maintained in so far as is possible at all times. Where the proposal involves restricting the existing road width during construction, allowance for a temporary bypass should be considered as part of the design, unless an alternative route is available.

Utility Services: All information on type, line and level of existing services shall be shown on the construction drawings. Standards are to meet the utility authorities' requirements in all cases.

Street Lighting: The Consultant shall make recommendations for any street lighting that is considered necessary in liaison with the power utility authority in each state.

Road Furniture: Road markings and traffic signs will be designed in accordance with the applicable (US) standards. All road furniture should be located and installed such that the furniture itself does not pose a safety risk or impede the safe and free movement of vehicles or pedestrians.

Road Safety: In all aspects of the road design the Consultant shall carefully consider the safety of all road users through the road safety audits (being carried out through a separate consulting assignment). Where feasible, incorporate mitigation measures into the works to maximize road safety. Recommendations of the proposed ECR Road Safety Audit should be used as a template for measures on this assignment.

Climate Resilience Assessment: A Vulnerability Assessment and Climate Resilience Strategy of the entire primary road network of FSM is to be undertaken as part of FSM PRIME, but the current

assignment will precede that study. As part of the detailed design the consultant should therefore include an assessment of how vulnerable the completed improvements will be to natural disasters during their design life, particularly resulting from the effects of internationally accepted likely climate change scenarios (e.g. increased intensity and frequency of rainfall in general and typhoons in particular, and their effects on river hydrology/ hydraulics, sea level rise, storm surge, landslips etc) and include increasing the assets' resilience to natural hazards. The consultant will make use of the best available data and climate change projections. The firm will select one of the two higher emission pathways: either Representative Concentration Pathway (RCP) 6.0 or 8.5 to inform the design work. The selection between the two, will either be informed by the Vulnerability Assessment or agreed with Government and World Bank prior to finalization of the Inception Report.

Access Audit

- Carry out an access audit to ensure that designs are inclusive of the needs of persons with disabilities, and that features of accessibility, such as ramps and signage are considered during the design phase of bridge and its access roads and prior to construction.
- Organize and conduct a workshop during the early stages of design activities to increase awareness and train key stakeholders in compliance with access guidelines.

Road Safety Audit (RSA): As stated above, all detailed designs should incorporate all the recommendations of the baseline road safety audit unless exceptional circumstances warrant a different approach. All designs will be reviewed by the Road Safety Auditor to ensure compliance with the recommendations.

Procurement Documents: In addition to the detailed design, the Consultant will prepare all necessary Procurement documents including Technical Specifications and Performance Requirements, engineering design drawings, Bills/Schedules of Quantities, engineer's detailed estimate, works implementation program, and other documentation as required (see *Reporting Requirements* below).

The consultant will ensure that procurement documents clearly outline relevant environmental, social, health and safety (ESHS) requirements in the Environmental and Social Management Plans for urgent works, Labour Management Procedures, Land Access Processes and / or Resettlement Plans. This includes a) outlining required 'Contractor's Environmental and Social Management Plan to manage risks; b) outlining key ESHS personnel required; c) outlining ESHS Works Requirements and related payment for meeting these requirements (i.e. provisional sums); advising DoTC&I on the potential use of an ESHS performance security.

Packaging of Works Contracts: The consultant is to make recommendations to the client on possible packaging of the construction works contract(s), taking into consideration the type of construction, time for construction, the geographical spread of the works, the likely disruption to road users and neighbourhoods, opportunities for local contractors, and the budget available for works. One option might be two packages; a) Chuuk road & Kosrae Causeway, b) Bridges on Pohnpei and Yap.

Temporary Traffic Accommodation: the consultant will make consider the need for and make recommendations for temporary river crossings to enable the demolition and construction of new bridges and culverts.

Contractor's Environmental and Social Management Plan: The procurement documents will require the Contractor to prepare a Contractor's Environmental and Social Management Plan to document

and detail how they will comply with the Environmental and Social Management Plans for priority works, Labor Management Procedures and any other relevant environmental and social management instrument prepared under the Project. The approval of the Plan by the Engineer / Project Manager is to be a necessary condition for possession of site and the Works contract must contain a Special Condition that allows the suspension of the Works if the Plan is not adhered to during construction.

Worksite Traffic Management: The Consultant shall prepare construction documents that draw attention to the location and type details for regulatory signs, permanent and temporary, and the location of any temporary traffic-management devices, required during construction. Traffic management and facilities shall comply with recognized international standards and the Environmental and Social Management Plans for urgent works. The procurement documents shall also require the Bidder to submit an appropriate Traffic Management Plan (as part of the Contractor's Environmental and Social Management Plan) and nominate traffic-controllers who have participated in an accredited course in Basic Traffic Management. The approval of the Plan by the Engineer / Project Manager is to be a necessary condition for possession of site and the Works contract must contain a Special Condition that allows the suspension of the Works if the Plan is not adhered to during construction.

Stage 1.4 – Procurement assistance

Following acceptance / approval of the Design Completion Report and Procurement Documents, and the Client's decision to proceed with the works contract(s) bidding, the consultant shall assist DoTC&I with procurement of the works contractor(s), during and after the bidding period.

Assistance will include but not be limited to:

- Assisting with the preparation of invitation for bids;
- Attending and acting as technical assistant at the pre-bid meeting or any meetings with bidders as required;
- Assisting with responses to bidders' written queries and preparation of addenda to the Procurement documents, if required
- Assisting with the detailed bid evaluation and preparation of a Bid Evaluation Report (BER) all in full accordance with the World Bank Procurement Regulations
- Assistance with preparation of contract documents and contractor mobilization.

6. STAGE 2 Tasks

Stage 2.1 – Construction Supervision & Contract Administration

General

The consultant will be fully responsible to the client for construction supervision and administration of the works contract(s). The consultant will be required to monitor, audit and perform independent testing of materials and systems put in place by the works contractor to verify their compliance with the required standards in accordance with the specifications.

The consultant will be required to monitor implementation of ESHS management requirements stipulated in the approved Contractor's Environmental and Social Management Plan. The Consultant will liaise with/be supported by the Project Management Unit within DoTC&I and counterparts in each state and the Central Implementation Unit within the Department of Finance and Administration (DOFA)

environmental and social specialists. These CIU specialists will also conduct technical review of the Consultants deliverables.

The consultant's roles and responsibilities will include the following:

- Provision of a suitably qualified and experienced engineer who is capable of carrying out the duties of the Employer's "Engineer" or "Project Manager" as defined in the World Bank Standard Procurement Documents for Works and Small Works respectively;
- Provision of a suitably qualified and experienced Environmental and Social Specialist who is capable of monitoring and facilitating ESHS compliance;
- Ensuring that the contractor is at all times in possession of all data required for it to meet the contractual works program, through the timely issuing of contract documents, initial, updated and revised construction drawings as required;
- Review the Contractor's Environmental and Social Management Plan and liaise with DoTC&I, state authorities, CIU and Contractor to ensure that it adequately addresses the requirements outlined in the Environmental and Social Management Plans for urgent works, Labor Management Procedures and any other environmental and social management instruments and Procurement documents.
- Familiarization with the contract documents, and the Contractor's methodology with attention to the slope stabilization construction methodology. Seek additional information on methodology, as may become necessary during the execution of the works;
- Establishment of a positive and amicable liaison with the Contractor;
- Regular site visits and overview of progress, with attention to ensuring contractors' adherence to the design and construction drawings and Specifications. Maintain daily records of the activities on the site, site conditions and Contractor's resources;
- Regular meetings with community leader during site visits to ascertain any issues of concern from the local communities.
- Review and comment upon the Contractor's Works Program;
- Visits as required to any off-site works compounds (e.g. quarries, pre-casting yards, fabrication workshop etc.), to ensure all matters relating to off-site fabrication and materials handling and storage etc., are in accordance with best industry practice, the Environmental and Social Management Plan, Labor Management Procedures, the design and construction drawings and specifications;
- Random (but at least fortnightly), review of the contractors' daily records, material-testing results, batch records, setout survey records etc. and report to the Client;
- Random independent sampling and testing of Contractor's materials to ensure compliance with the Specifications. The consultant can make use of the Client's Lab facilities at no cost, but test equipment that is considered necessary but not available from the Client will have to be provided by the consultant;
- Conduct regular (but at least fortnightly) site inspections to ensure contractor's adherence to the approved C-ESMP, and more regularly or as-needed in response to incidents and supervise improvements to conformance;
- Advise the Client, and state authorities as appropriate, of matters of concern;
- Prepare monthly supervision reports (including ESHS supervision) with support photos for state authorities on behalf of the Client. Review and make recommendations on any claims submitted by the Contractor for additional payments and extensions of time;
- Conduct formal Site Meetings with the Contractor and keep Minutes of matters of concern;
- Guide the contractor on critical elements of construction, including but not limited to:
 - Interpretation of drawings and technical specifications;

- Matters relating to sediment and erosion control, worksite safety, traffic management and community consultation;
- Construction methodology;
- Measure the actual quantities of work carried out and agree these with the Contractor. Keep appropriate records of measured work;
- Receipt and checking of contractor's Monthly Statements, preparation of Interim Payment Certificates in the format prescribed in the contract and forwarding to DoTC&I in a timely manner for due payment etc.;
- Confirm that substantial completion has been reached, and advise the client in writing accordingly;
- Prepare cost estimates and designs to accommodate any variations that may arise out of this contract.

If any action is required under any of these clauses the Engineer / Project Manager will provide a written report to the client describing the situation that has arisen and the circumstances that led to it with recommendations for the action that the client should approve for implementation.

Supervision Staff Organisation: it is envisaged that the consultant's construction supervision staffing will be organised as follows:

- Supervision Engineer / Team Leader – a professional engineer will act as Engineer / Project Manager on the client's behalf and will provide part-time input remotely and make regular monthly visits to each site
- Senior Site Inspectors – graduate engineers or technicians who will be full-time on one site for the full construction period and will report to the Supervision Engineer
- Technical Specialists – any specialists of the design team who may need to provide specialist technical advice during construction
- Safeguards Specialists – regular quarterly site visits by the environmental / social safeguards specialist and otherwise part time supervision from their home office / site office. The mobilization schedule will need to accommodate the needs for consultations with communities and affected land users.

Operations: the consultant's staff will operate from the respective site offices, in which the works contractor will provide office furniture and other facilities as necessary, provide all supplementary facilities and equipment necessary for the services, including:

- Measuring equipment
- Basic field survey equipment, including dumpy level, staff and theodolite (may be available ex-Contractor)
- PC and peripherals
- Word-processing, copying and report-binding resources
- Telecom including e-mail
- Photographic (preferably digital) equipment
- Personal safety apparel and equipment

The consultant must be able to provide a continuity of services outside normal hours when necessary, and over a protracted period, as necessary, to cover critical, on-site operations and therefore provide a fully

effective supervision service. The consultant will be expected to provide back-up supervision services from an office within FSM or in the region.

Stage 2.2 - Defects Notification / Liability Period (DNP/DLP)

The Consultant is required to carry out periodic inspections on a quarterly basis for the duration of the DNP/DLP stipulated in the construction contract. The following should be the responsibility of the Consultant:

- Provide reports to DoTC&I on outcomes of these quarterly inspections
- Ensure that any defects arising out of poor workmanship are remedied in accordance with stipulated technical specifications
- Draft reports to the Client as necessary, depending on the size and effects of the defect including remedial actions taken and follow up actions if necessary

7. Reporting Requirements /and Time Schedule for Deliverables

Inception Report

Within *three (3) weeks* after the effective date of the assignment the Consultant shall submit four (4) copies of the Inception Report confirming the detailed methodology for the provision of the services and including a detailed programme, manning schedule, Consultant's organization chart and channels of communication for the project team. The report should also clarify any ambiguities or agreed amendments to the Terms of Reference and identify any perceived risks or potential constraints to the timely delivery of the services. It should include an agreed schedule for project progress meetings between DoTC&I, the Consultant and other relevant parties.

Concept Design & Options Report

The report should contain a systematic hazard and risk assessment and evaluation of all possible alternative approaches available for achieving the project objectives to figure out which options appear to be most effective and providing the best solution for the project. The report shall describe the locations, existing conditions with sketch plans, elevations and sufficient details to describe the scope of proposed works.

The report should also contain a simple comparative cost / benefit analysis of the options and proposed design solution for each site, with brief discussions on likely social and environmental impacts (based on the assessments completed under a separate consultancy), which should include an account of consultations undertaken with affected stakeholders during the field investigations.

The outcomes of these options analyses shall be clearly described and well documented with its recommendations to the Government to take a final decision to determine the most appropriate methodologies and scope of works.

This report should be submitted within *two (2) months* after the effective date of the assignment.

Design Progress Reports

The Consultant shall provide copies of brief progress reports as requested by the client. Such reports will normally be given verbally at project meetings (physical or virtual) with DoTC&I, but shall be followed up

with signed-off, summary hard copies within *one week* of relevant meetings or if so, requested by the client. Project meetings may also be called, ad hoc, by DoTC&I (or Consultant) for critical, emerging issues.

Preliminary Design Report

The Consultant shall submit within *three (3) months* after the effective date of the assignment, four (4) copies of the *Preliminary Design Report* including a plan of the existing features including cadastral, existing roads and/or bridges overlaid with the proposed layout. The Report shall include, but not be limited to, addressing the following areas:

- Design commentary setting out the design standards used, design parameters and criteria selected, design methods utilised etc;
- Presentation of the preliminary plans, profiles and sections of the proposed roads and bridges;
- Geotechnical investigations (including soil bioengineering) and findings;
- Hydrological, tidal and hydraulic analyses for drainage studies;
- Topographic / cadastral survey outputs and findings;
- Output of climate resilience analysis;
- Compliance with road safety baseline audit recommendations;
- Results of consultations, including consultation minutes incorporating consultations with local communities and affected land users covering concept design options and support for proposed designs.
- Compliance with Environmental and Social Management Plans for urgent works, Land Access Procedures and / or Resettlement Plans, Labor Management Procedures and any other relevant environmental and social management instruments;
- Draft procurement Documentation;
- Draft Standard Contract Documentation;
- Constructability assessment of each option at each location (materials and equipment)
- The likelihood (risks) of encountering underground services;
- Anticipated Engineer's Cost Estimate of all project options considered; and
- Anticipated Time Program for Construction

Design Completion Report

Submit four (4) copies of the Design Completion Report within *six (6) months* after the effective date of the assignment, to DoTC&I. The Design Completion Report (which is expected to be a more detailed extension of the Preliminary Design report) will mark the completion of the Stage 1.3 of the services.

The Design Completion Report shall address the following aspects:

- Problems encountered (if any) and how they were overcome
- Comments on the design standards adopted, with details of any area where they could not be met, with reasons
- Technical matters concerning the design
- Comments on the design approach and methodology adopted, and justification of the rationale behind any decisions
- A schedule of Construction Quantities for the proposed slope stabilisation methods and ancillary works
- An estimate of construction costs, including preliminaries, and provisional sums
- An estimate of the time required to construct the works

- A discussion of the preferred construction methodologies for the proposed slope stabilisation measures
- Details of any discussions with free-hold and customary landowners likely to be affected by the works
- A copy of all design calculations
- A copy of safety audit final report
- A copy each of the Certificate of Design
- A copy of the Certificate of Design Review/Check
- A copy of all survey data and any relevant reports prepared by the Consultant or by any third party as a result of the commission.

Design Drawings

Design drawings for construction will form part of the:

- Preliminary Design Report and Design Completion Reports (A3 / A4 size to suit legibility)
- Draft and final Procurement Documents (a bound set of A3 construction drawings should form a separate volume of the documents)
- Works construction contract(s) (A0 / A1 to suit)

As they may bear on the design and construction, the following details shall be included in the drawings:

- Full sets of working drawings for bridge and large culvert structures including plans, sections, elevations and details of foundations, sub-structures, superstructures, ancillary works
- Road boundaries of road reserves, pathways, public reserves, lots and easements, private land that may be required for the project
- Limits of work
- Encroachment of structures, properties, plants on Government road reserve
- Existing site features such as watercourses, swamps, dams, bathing-pools, and structures etc.
- Location and type of utility services
- Survey lines and sections, benchmarks, datum and ties to existing boundaries and survey control marks
- Setting-out data
- Site plans of proposed interventions
- Elevations and sections of existing and proposed slope / face profiles as appropriate
- Storm water drainage – existing and proposed with catch pit / manhole schedules
- Schedule and details of subsoil drainage lines if applicable
- Notation regarding provision of guideposts and guard rails
- Pavement detail, surfacing detail, pipe types and classes, drainage structure types, kerb types, concrete strengths, pipe bedding types
- Road furniture (e.g. street signs, regulatory signs, guideposts, guard-rail etc.)
- General specifications for construction
- Scales of plans and sections to suit
- Key reference points

NOTE: Measurement System for drawings & documentation. FSM currently uses the US system of measurement based on the Imperial units of length, weight and volume. Prior to the commencement of design, the consultant will consult and reach agreement with DoTC&I on whether the drawings, specifications, Bills of Quantities etc will use Imperial or metric (SI) units of measurement.

Technical Specifications for Construction

The Consultant shall submit four copies of the technical construction specification (including bound sets of drawings) and digital storage devices containing the construction specification in a format suitable to both parties, or transmit in e-format, as may be agreed.

The Consultant will prepare and include detailed general, special and project technical specifications as part of the draft and final Procurement Documents (the specifications may form a separate volume of the documents)

The technical specifications should comprise two parts; a Standardized Specifications for Road works, Bridgework and Drainage structures, and 'Project Specific Requirements' detailing and/or clarifying the specific requirements of the works to be undertaken.

The Consultant should ensure that any project-specific requirements not covered in the general and special conditions of contract and/or the Standard Specification are noted on the drawings or in the Section entitled, "Project Specific Requirements" and do not conflict with the written specification.

Bills of Quantities

The Consultant will prepare and include detailed Bills of Quantities (BOQ) in general accordance with the standard method of measurement for civil engineering quantities, as part of the Engineer's Estimate, Procurement documents and works contract documents.

The Format shall be agreed with DoTC&I but should contain separate Bills or Schedules for the following categories.

- General and Preliminaries
- Drainage
- Earthworks
- Pavement
- Bituminous Surfacing
- Major Structures
- Ancillary Works
- Road Furniture and Line Markings and Road Furniture
- Landscaping and environmental mitigation measures

The BOQ will include day works schedules for nominal quantities of materials, labour and equipment likely to be used in the works, to be included in the total cost.

The general and preliminaries Bill should include all fixed and time-based costs relating to the contractor's overheads including mobilization and establishment costs, demobilization, insurances, compliance with the requirements of the C-ESMP (including traffic management plan, environmental mitigation plan, health and safety plan, labour management procedures), quality management plan, inspection test plan etc. This Bill should also include any provisional sums for unforeseen and contingency for works items which are unable to be measured at the time of issuing Procurement documents.

Pay items should be cross-referenced to clauses in the Technical Specification describing how items will be measured and paid.

Engineer's Estimate

As part of the Design Completion Report the consultant will prepare and provide an Engineer's Estimate for individual components for the whole of the works. This estimate shall be prepared by entering a unit rate against each item in the detailed Bills of Quantities. Unit rates should be based either on recent bid prices for similar work, current ruling contract rates for major works items, or built up from individual current prices of material, plant, fuel and labour that make up the Bill item. This estimate should also include any provisional sums for unforeseen and contingency for works items which are unable to be measured at the time of issuing Procurement documents.

Project Risk Analysis

The consultant shall undertake a basic Risk Analysis in accordance with AS/NZS 4360 – 1999: *Risk Management*, which is to include, but not be limited to, an evaluation of the following risks/issues likely to arise during the works phase:

- Supply of materials
- Capabilities (skills and resources), of local civil contractors
- Land-use and/or acquisition issues
- Environmental risks
- Establishment of plant nurseries for soil bioengineering works
- Climatic influences
- Material haulage to and from the site
- Time over-runs
- Cost blow-out
- Damage to services
- Un-located services

The Risk Analysis Report shall be included as part of the Design Completion Report.

Final Design Completion Report shall be submitted to DoTC&I, incorporating comments on the *Design Completion Report from LTA* and other authorized personnel, within *one (1) month* after receiving such comments.

Draft Procurement Documents

The Consultant shall submit within *ten (10) months* after the effective date of the assignment, three (3) copies of the *Draft Procurement Document* to DoTC&I. The Procurement Documents shall include, but not be limited to the following:

- Invitation to Bids
- Part I, Bidding Procedure-including Instructions to Bidders and bill of quantities
- Part II, Works' Requirements - Requirements including technical specification general and specific
- Part II, Conditions of Contract and contract forms: WB SPD for Works or Small Works, December 2019 version.
- Drawings
- Engineer's cost estimate, including unit rates analysis

Final Procurement Documents for the Design approved by DoTC&I shall be submitted to DoTC&I, incorporating comments on the *Draft Procurement Documents from DoTC&I, the DOFA CIU*, and other authorized personnel within *two (2) weeks* after receiving such comments.

Construction Supervision / Contract Administration Outputs: the consultant is required to provide the following deliverables during the construction period on each site:

- Daily Site Records (copies to be safely stored in the Engineer / Project Manager’s Office)
- Inspection Reports (copies to be safely stored in the Engineer / Project Manager’s Office)
- Issues Reports
- Site Meeting Minutes/Reports
- All outputs including interim payment certificates, notices etc. required as part of the duties of Engineer / Project Manager as delegated by the client, in accordance with the conditions of contract

Monthly Supervision Progress Reports shall be submitted to DoTC&I by the 15th of the following month. The reports should be concise but provide a clear record of:

- actual physical and financial progress achieved against that programmed;
- major events occurring during the month;
- compliance with the C-ESMP;
- any technical, contractual, financial, and safeguards issues arising during the month, with actual or proposed resolution of those issues, and
- a summary work plan for the forthcoming quarter.

The reports should include photographs, site meetings records, test results etc as annexes where appropriate

Quarterly DNP/DLP reports should briefly record the consultant’s quarterly DLP inspections and any issues arising therefrom

Project Completion Report

Within one month of issuing the Final Certificate, the consultant will submit a Project Completion Report summarising the main inputs, outputs, milestones, achievements, major problems encountered, lessons learned etc from both the design and construction supervision stages. The report should cover all technical, financial and safeguards aspects of the assignment.

Table of Deliverables

The Consultant shall prepare and physically submit all reports listed below in four hard copies (A4 / A3 size), and one electronic format (the latter in commonly available software).

No.	Description	Target Date
1	<i>Inception Report</i>	<i>Three (3) weeks after the effective date of the assignment</i>
2	<i>Options Report</i>	<i>Within one and half (1.5) months after the effective date of the assignment</i>
3	<i>Design Progress Reports</i>	<i>Monthly, one week after meetings</i>
4	<i>Preliminary Design Report</i>	<i>Within six (6) months after the effective date of the assignment</i>
5	<i>Design Completion Report</i>	<i>Within nine (9) months after the effective date of the assignment</i>

6	<i>Final Design Completion Report</i>	<i>Within one month after receiving comments on Design Completion Report</i>
7	<i>Draft Procurement Documents (DBD)</i>	<i>Within ten (10) months after the effective date of the assignment</i>
8	<i>Final Procurement Documents</i>	<i>Within one week after receiving comments on the DBD</i>
9	<i>Supervision Progress Reports</i>	<i>Monthly during the term of the works contract</i>
10	<i>Defects Liability Period reports</i>	<i>Quarterly during DLP</i>
11	<i>Final Project Report</i>	<i>One month after Final Certificate</i>

Hold Points

The following Hold Points will apply:

- **First:** At submission of alternative slope stabilisation options including recommendations for preferred option and optimal design solution, allow fifteen (15) working days for client review, and approval.
- **Second:** At submission of the Preliminary Design Report allow fifteen (15) working days for client and IDA review.
- **Third:** At submission of Design Completion Report and Procurement Documents allow a period of four (4) weeks for formal client and IDA review and safeguards clearance
- **Fourth:** After submission of Final Draft Procurement Documents allow a two (2) weeks period for client and IDA review and no objection letter.

8. Duration and Level of Effort

The estimated duration and indicative level of effort for each stage of the assignment is as follows:

Stage of the Assignment	Duration (months)	Key staff input (months)	Support staff (months)
Stage 1.1 – Field investigations, surveys and concept designs / options, Client review and approval	2.5	6	6
Stage 1.2 – Preliminary designs, and drawings, Client review and approval	3.5	4	2
Stage 1.3 – Prepare detailed design, construction drawings, specifications, Procurement documents for construction works, Client review and approval	5	8	8
Stage 1.4 – Procurement assistance during and after the bidding process	6	1	2
Stage 2.1 – Construction supervision and contract administration	12	6	40
Stage 2.2 – Services provided during Defects Liability	12	2	2
Total	41	27	60

9. Team Composition & Qualification Requirements for the Key Experts

Consulting firms are encouraged to develop their own methodology as well as the staffing plan, level of effort and work approach to accomplish the ToR. This design and supervision assignment will require the firm to have an appropriate mix of highly qualified international and local staff that includes but is not necessarily limited to the six key experts noted below. Where key experts proposed by firms do not have experience in Pacific or small island countries, it is expected that they would be assisted by non-key experts with such experience.

It is up to the firm to propose which of the staff on its team is Design Team Leader from either the Senior Bridge Engineer or Senior Road Engineer positions. That individual will have overall responsibility for the direction, technical excellence and successful completion of the project and must have at least 15 years of Project Management experience having leadership qualities in addition to the requisite qualifications of one of those two key staff positions.

Key Staff	Qualifications	Experience
K-1: Senior Bridge Engineer	1 st degree in civil / structural engineering with post-graduate studies / qualification bridge engineering-related discipline. Full membership of international or national professional institution	15 years' experience in road and river bridge design, preparation of Procurement documents, specifications and bill of quantities, cost estimation, report writing, and management or leadership of comparable projects, preferably 5 years of experience in tropical climates like the Pacific Region. Some CCA and/or DRM-related project experience preferred
K-2: Senior Road Engineer	1 st degree in civil engineering, with post-graduate qualification in roads-related discipline. Full membership of national or international professional institution	15 years or more experience in the field of road engineering, out of which minimum 7 years post-graduate experience in roads and drainage design in small island states, preferably in the pacific region would be an advantage. Some CCA and/or DRM-related project experience preferred
K-3: Geotechnical / Materials Engineer	1st degree in civil engineering with post-graduate qualification in geotechnical-related discipline	Minimum 10 years proven experience of recent 8 years in geotechnical investigations and materials testing for roads and bridge projects, preferably 3 years of experience similar to the Pacific Region.
K-4: Engineering Hydrologist / Drainage Engineer	Bachelor's degree in Hydrology, Physical Geography, Earth Science, Engineering, or Environmental Science required with a strong	At least 7 years' relevant experience in engineering hydrology including 3 years of experience of hydrodynamic analyses and modelling, flood risk assessment with hydrologic modelling software. Some CCA

	focus on hydrology. Preferably a Master's degree.	and/or DRM-related project experience preferred
K-5: Supervision Team Leader	1st degree in civil engineering	At least 12 years' experience in supervising construction of civil and structural road assets, both as resident engineer and remotely with oversight of resident junior supervision staff. Min 3 years' experience working in small island developing states
K-6: Environmental & Social Safeguards Specialist (Supervision)	1 st degree in Environmental Sciences, Biology, Sociology, Anthropology or related discipline. Master's degree in safeguards related topic	At least 8 years proven experience in environmental and social assessment and OHS risk assessment, taking into consideration direct and indirect impacts during pre-construction, construction and operation, and identifying costs of mitigation measures and implementation of a monitoring plan and report preparation. 3 years recent experience in location similar to the Pacific Region preferred.

10. Administrative Personnel and other Technical Staff

The Consultant shall provide its own temporary office accommodation and local field staff in each state to assist in the Stage 1 activities. The staff provided shall be experienced and be capable of performing their allotted duties. In particular for:

- office administration and clerical personnel; and
- field assistants for team members in carrying out field work, etc.

11. Client's Input

Data to be made available to the Consultant by GoFSM through DoTC&I will include, if and where available:

- Relevant previous reports and outputs relating to the road networks and road assets in each state
- Specific drawings, details, reports or other technical data relating to the assets to be improved
- Rainfall records and other available hydrological data
- Topographic and geological data as available
- State EPA laws and regulations
- Available traffic data
- Road Safety Baseline Audit Report(s)
- All relevant Land Transport Acts and regulations as well as climate change focused infrastructure strategies
- All relevant Project environmental and social assessments and risk management instruments (Environmental and Social Management Framework, Environmental and Social Management Plans, Labor Management Procedures, Stakeholder Engagement Plan etc.).

The Client will provide unimpeded access to relevant information that it may hold to assist the Consultant in this project on “as available” basis.

12. Consultancy Contracts and Schedules of Payments

DoTC&I proposes that two separate consulting services contracts will be signed between the parties to cover this assignment; a lump-sum contract to cover the full Stage 1 services as described above, and a separate time-based contract to cover the full Stage 2 services. The first contract will be undertaken during the preparation phase of the project. The second contract will commence during project implementation (i.e. after PRIME becomes effective). Both contracts will be based on the contract forms included in the World Bank Standard Request for Proposals (SRFP) – Selection of Consultants (October 2017). Templates of both contract forms are provided for information in Section 8 of the SRFP.

For the lump-sum Stage 1 contract, technical and financial proposals are expected to include all anticipated staffing and related costs required to cover the activities described and/or required during Stages 1.1 – 1.4 to successfully fulfil the assignment objectives, irrespective of the chosen design options for each site.

Similarly, for the time-based Stage 2 contract, the proposals will be expected to include all the consultant’s costs associated with executing the procurement and supervision duties described for Stages 2.1 - 2.3 above.

Schedule of Payments

- Stage 1 and Stage 2 payments will be made in accordance with Section F “Payment to the Consultant” of the General Conditions of Contract for lump-sum and time-based contracts respectively.
- Payments due to the Consultant shall be withheld if the Consultant’s stipulated reporting obligations (*Deliverables*) are not met, unless revised timelines have been agreed with the Client through a Contract Amendment.

13. Counterpart Facilities

Counterpart personnel: DoTC&I will provide a local liaison officer, who will liaise with local communities and vulnerable persons on matters concerning the project field work and related matters. The DOFA CIU will provide environmental and social safeguards specialists.

Office accommodation and logistics: The consultant shall be responsible for providing all accommodation, computing, and drafting equipment and software *etc.* The consultant will be responsible for all land transportation arrangements during the project.

ANNEX – SATELLITE IMAGES OF URGENT WORKS SITES

Awak Bridge, Pohnpei



Lelu Causeway, Kosrae



Manta Ray bridges, Colonia, Yap



Airport / Pou Bay Road, Weno, Chuuk

