

# APPENDIX-XII

TOR AND PERSON-MONTH FOR  
YEN LOAN PROJECT CONSULTANT

**APPENDIXES XII: TOR AND PERSON-MONTH FOR YEN LOAN PROJECT  
CONSULTANT**

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## APPENDIX XII TOR AND PERSON-MONTH FOR YEN LOAN PROJECT CONSULTANT

# Terms of Reference (TOR) for Consulting Services under Agriculture Income Improvement Project

## Chapter 1 Background

### 1.1 Background

The Ministry of Agriculture, Livestock and Irrigation (MOALI), the Republic of the Union of Myanmar, desires to carry out the Agriculture Income Improvement Project in the Thapanzeik dam irrigation area and its surrounding areas in Sagaing Region by implementing the following components:

- 1) Irrigation and Drainage Improvement
- 2) Distribution Infrastructure Improvement
- 3) Land Consolidation
- 4) Agriculture Development and Extension Strengthening
- 5) Agriculture Mechanization Strengthening

The MOALI considers that the Project will irrigate total 493,887 acre of farm lands both for monsoon season and summer season<sup>1</sup> and enhance crop production, facilitate agriculture products distribution, accelerate agriculture mechanization, and spear-head land consolidation. Thus, the Project will bring about direct benefit to about 67,000 farm households.

In order to achieve the aforementioned development and bring about the fruit to the beneficiary farmers, the MOALI and the Government of Myanmar (GOM) have made arrangements to receive a Japanese ODA Loan and to use a part of it for eligible payments for consulting services, for which this TOR elaborates:

### 1.2 Components of the Project

The Project consists of the following components and sub-components:

**Table 1.1 Components and Sub-component of the Project**

No.	Component	Sub-component	Department
1	Irrigation and Drainage Improvement	1. Irrigation and drainage rehabilitation 2. Water management and flood monitoring system 3. Procurement of maintenance machineries	IWUMD
2	Distribution Infrastructure Improvement	1. Rural road improvement 2. Rural bridge improvement 3. Canal inspection road improvement	DRD DRD IWUMD

<sup>1</sup> For the summer cropping intensity of 100%, alternative crops to summer paddy shall be introduced which consumes less amount of irrigation water than paddy. For example, if pulses and sesame are introduced to about one-third area, the whole remaining area can be planted with summer paddy.

No.	Component	Sub-component	Department
3	Land Consolidation	1. Farm road and tertiary canal construction 2. Land leveling and consolidation 3. Cadastral map update & registration of consolidated farmland	IWUMD AMD DALMS
4	Agriculture Development and Extension Strengthening	1. Capacity building for DAO extension staff 2. Agriculture extension and marketing strengthening 3. Improvement of camp & TS offices 4. Establishment of seed center (PPP)	DOA
5	Agriculture Mechanization Strengthening	1. Maintenance workshop establishment 2. Agriculture machineries testing center (Mandalay) 3. Capacity building for AMD staff and operators	AMD

Note: DOA (Department of Agriculture), AMD (Agriculture Mechanization Department), IWUMD (Irrigation and Water Utilization Management Department), DRD (Department of Rural Development)

### 1.3 Procurement Package and Procedure

#### 1.3.1 Procurement Package

The Project will be divided into the following draft packages taking into account the implementation modality such as Direct Force account (DFA), Local Competitive Bidding (LCB), International Competitive Bidding (ICB). In addition, some of the LCB package such as rural road improvement and rural bridge improvement will be further divided into some contract packages based on the construction amount.

**Table 1.2 Expected Procurement Package and Implementation Modality**

Package No	Package component	Modality	
IWUMD	1-1	Irrigation and Drainage Rehabilitation	DFA
	1-2	Water management and flood monitoring system (equipment procurement)	ICB
	1-3	Procurement of maintenance machineries	ICB
	1-4	Canal inspection road improvement, utilized as farm-to-market road	LCB
	1-5	Farm road and tertiary canal construction (land co consolid' n, 5,000 ac), with AMD	DFA
DRD	2-1	Rural road improvement	LCB
	2-2	Rural Bridge improvement	LCB
AMD	3-1	Maintenance workshop (equipment procurement, 4 places)	ICB
	3-2	Maintenance workshop (building construction, 4 places)	LCB
	3-3	Agriculture Machineries Testing Centre (equipment procurement)	ICB
	3-4	Agriculture Machineries Testing Centre (building construction)	LCB
	3-5	Capacity building for AMD staff & operators	DFA
	3-6	Land leveling & consolidation (procurement of LC machineries, tractor, etc.)	ICB
	3-7	Land leveling & consolidation (LC construction), with IWUMD	DFA
DOA	4-1	Capacity building for DOA extension staff (trainings, manuals, etc.)	DFA
	4-2	Agriculture extension and marketing strengthening (demo farms, logistics, etc.)	DFA
	4-3	Improvement of camp and TS offices (52 camps + 9 TSs)	LCB
	4-4	Improvement of cam & TS offices (procurement of office equipment.)	LCB
	4-5	Establishment of seed center (equipment procurement), PPP	ICB
	4-6	Establishment of seed center (building and storage construction), PPP	LCB
DALMS	5-1	Cadastral map update & registration of consolidated farmland	DFA

Note: DOA (Department of Agriculture), AMD (Agriculture Mechanization Department), IWUMD (Irrigation and Water Utilization Management Department), DRD (Department of Rural Development)

DFR (Direct Force account), LCB (Local Competitive Bidding), ICB (International Competitive Bidding)

### **1.3.2 Procurement Procedure**

With respect to DFA and LCB components, the Project will procure eligible materials, items, services, equipment, and works under the ODA loan such as fuel and lubricant, cement, reinforcement bars, labors, office equipment, machineries spare parts, experts & lecturers, local contractors, etc. through Local Competitive Bids (LCB) in accordance with the biddings set forth in the JICA Sample Bidding Documents under Japanese ODA Loans for Procurement of Goods issued in May 2013 and/or for Procurement of Works issued in October 2012.

While, ICB components will be procured respectively through International Competitive Bidding (ICB) based on Single-Stage Two-Envelope Bidding Procedure with, in principle, pre-qualification procedure in accordance with the JICA's Procurement Guideline (Section 2.03, Part II). Also, LIB (limited International Bidding) may be applied according the MOALI's intention.

### **1.4 Funding Source**

GOM has received a Japanese ODA Loan to finance the Project. GOM intends to use a part of the proceeds of the Japanese ODA Loan for eligible payments for consulting services, for which this TOR is prepared.

### **1.5 Completion of the Project**

The Project is expected to be completed by the 31th day of December 2024.

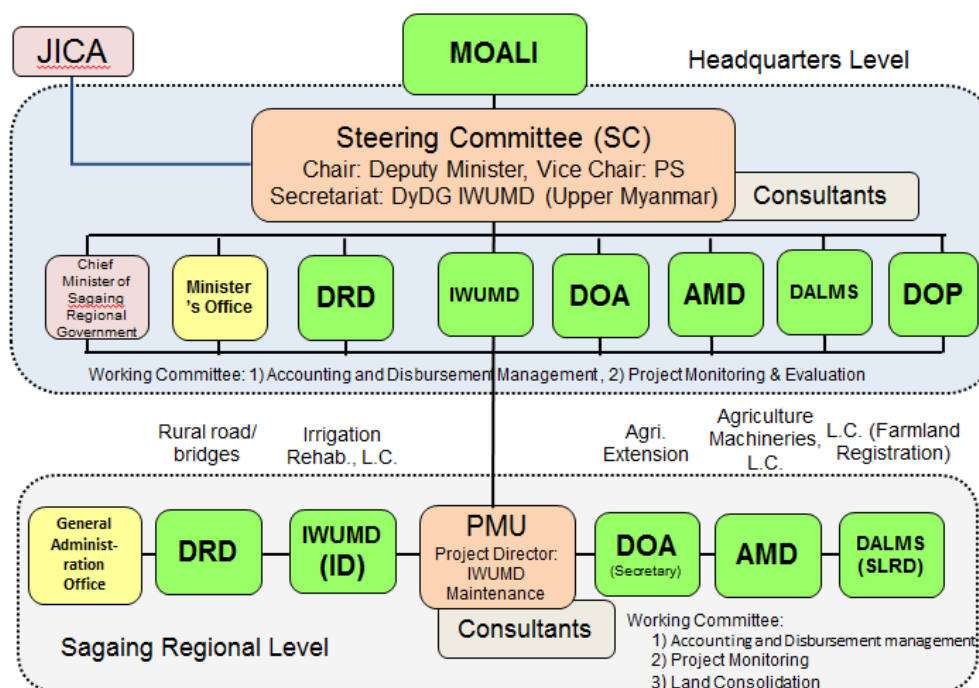
### **1.6 Location of the Project**

The Project area, composed mainly of the Thapanzeik dam irrigable area and relevant agro-produces distribution network, is located in a vast paddy area along Mu river in Sagaing region. The irrigable area lies in north latitude from 23 degree 13 minutes to 22 degree 15 minutes and east longitude from 95 degree 48 minutes to 95 degree 12 minutes, approximately 120 km from north to south and 60 km from east to west. The elevation ranges approximately from 160 m at its northern upstream side to as low as 100 m at its most southern downstream part (see Attachment-1).

Administratively, the major Project area irrigated by the Thapanzeik dam extends over total 10 townships of 4 districts such as Shwebo district, Kanbalu district, Monywa district and Sagaing district. Note that Kanbalu district was separated from Shwebo district in 2016. Of them, most of the irrigable area lies in such 7 townships as; 6 townships of Shwebo district and one township of Kanbalu district. They are Khin-U, Shwebo, Wetlet, Taze, Ye-U and Tabayin, which are all under Shwebo district, and Kanbalu township of Kanbalu district.

### **1.7 Executing Agency**

The Executing Agency of the Project is the MOALI, under which Project Steering Committee (SC) and Project Management Unit (PMU) will be installed as follows; SC at the headquarters level in Nay Pyi Taw while PMU at the regional level in Monywa: The Consultants engaged in this TOR shall work for the sake of the SC and PMU.



**Figure 1.1 Implementation Structure of the Project**

## 1.8 Technical Information

The final report on the “Preparatory Survey on Agriculture Income Improvement Project” as well as relevant appendixes are available at the Deputy Director General Office of IWUMD (the Secretariat of the Steering Committee).

## Chapter 2 Objectives of Consulting Services

The consulting services shall be provided by an international consulting firm (hereinafter referred to as "the Consultants") in association with national consultants in compliance with Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012). The objective of the consulting services is to achieve the efficient and proper preparation and implementation of the Project through the following categorized service works:

- Consulting Service-A: Project Overall Management
- Consulting Service-B: Irrigation and Drainage Improvement
- Consulting Service-C: Distribution Infrastructure Improvement
- Consulting Service-D: Agriculture Mechanization Strengthening

Other Two (2) components which are Land Consolidation and Agriculture Development & Extension Strengthening will be implemented by the concerned government organizations without consulting services set forth herewith. The consulting services, A, B, C, and D, are composed of the following:

- 1) Consulting Service-A: Project Management
  - (a) Project overall management, and coordination with relevant offices and stakeholders,
  - (b) Assistance on overall fund-flow and disbursement management, and
  - (c) Assistance on implementation of social and environmental consideration.
- 2) Consulting Service-B: Irrigation and Drainage Improvement



- (a) Detail design,
  - (b) Tender Assistance,
  - (c) Construction Supervision, and
  - (d) Water Management Improvement.
- 3) Consulting Service-C: Distribution Infrastructure Improvement
- (a) Detail design,
  - (b) Tender Assistance, and
  - (c) Construction Supervision.
- 4) Consulting Service-D: Agriculture Mechanization Strengthening
- (a) Support on Capacity Building for Agricultural Mechanization Strengthening,
  - (b) Construction Supervision of Maintenance Workshops and Agricultural Machineries Testing Center,
  - (c) Assisting Services for Maintenance Workshops and Agricultural Machineries procured for Land Consolidation Works, and
  - (d) Assisting Services for Agricultural Machineries Testing Center.

### **Chapter 3 Consulting Service-A: Project Overall Management**

#### **3.1 Terms of Reference for Consulting Services**

The consulting services under 'A. Project Overall Management' are composed of the following:

- 1) Project overall management, and coordination with relevant offices and stakeholders,
- 2) Assistance on overall fund-flow and disbursement management, and
- 3) Assistance on implementation of social and environmental consideration.

#### **3.2 Project Overall Management, and Coordination with Relevant Offices and Stakeholders**

The Consultants shall assist the SC and PMU in conducting overall management and coordination with relevant offices and stakeholders through the following:

- 1) monitor and confirm the status (schedule, progress, input, output, payment, disbursement, problem, issue, challenge, modification of the component item from original plan and design, and etc.) of each project component,
- 2) if an issue(s) will be found in each project component, report to the concerning clientele department responsible staff/ officers and/or raise the issue in SC/PMU meeting,
- 3) assist SC/PMU chairman to proceed the regular PMU meeting and to make records of meetings and delivery to all representatives of clientele departments under SC/PMU,
- 4) prepare recommendations against the issues in view point of technical and JICA loan rules, and assist SC/PMU to judge and direct properly, and
- 5) assist the concerning clientele department responsible staff/ officers to prepare for the project status report which shall be submitted to JICA every three (3) months.

#### **3.3 Assistance on Overall Fund-flow and Disbursement Management**

The Consultant shall assist the clientele departments in processing payment and disbursement to the contractors by carrying out the following works:

- 1) confirm the work schedule and disbursement schedule according to the on-going situation,
- 2) confirm the work area to be carried out according to the design and construction plan not only on drawings but also at the site,
- 3) confirm the monthly progress of the works based on the plan and site situation,
- 4) check necessary documents including contractor's invoices or requests for payment, and if corrections needed, advise the responsible clientele staff/ officers or the contractors to rectify them,
- 5) assist the clientele department responsible staff/ officers to prepare requests for disbursement from JICA, and
- 6) assist the clientele department responsible staff/ officers in reporting to JICA on financial status of the Project at such interval as required.
- 7) Assist in preparing material/documents for auditing including internal audit by Executing Agencies and external audit by the Auditor General's Office.

### **3.4 Assistance on Implementation of Social and Environmental Consideration**

At the time of the project feasibility study in 2016/17, the environmental and social impacts that may be arising from the implementation of the Project were examined in accordance with JICA Guidelines for Environmental and Social Consideration, April 2010. Accordingly, an environmental management plan (EMP) and environmental monitoring plan were prepared. As a result, the Project is categorized as Category B. The Consultant, under Assistance Concept, shall conduct the following:

- 1) review and update the EMP, if necessary, and prepare a detailed Environmental Monitoring Plan (including mitigation measures and monitoring procedures) that incorporates guidelines indicated in the EMP in accordance with JICA's Guidelines for Environment and Social Consideration and all relevant laws, regulations and directives pertaining to environmental monitoring,
- 2) work with other experts to ensure that all mitigation measures and recommendations given in the EMP are suitably reflected and incorporated in detailed design, bidding documents and contracts for construction works to minimize adverse impacts during construction or thereafter,
- 3) Assist environment responsible staff of the relevant clientele departments in monitoring environmental and social impacts which may be caused by the construction works,
- 4) Examine if negative environmental impacts have been reported to relevant authorities and check if they were well handled and settled, and if not settled, assist the clientele staff/ officers to mitigate such impacts,
- 5) Review environmental monitoring reports prepared by the clientele environment responsible staff at such interval as required and submit them to the relevant headquarters offices and Project Steering Committee, and,
- 6) Conduct workshops and field trainings to strengthen the capacity of the environment responsible staff concerned for the clientele departments and local authorities to carry out the impact identification, evaluation and mitigation measures as needed.

### 3.5 Expected Time Schedule

The total duration of consulting service-A will be ■■■ months. The implementation schedule expected is presented in following table:

**Table 3.1 Implementation Schedule Expected**

Key Activities	Date	Duration in Months
Commencement of Consulting Services	1 December 2018	
Period of Consultant service	1 December 2018 to 31 July 2024	
Final Contract Administration	1 August 2024 to 31 October 2024	
Completion of Consulting Services	31 October 2024	

### 3.6 Staffing (Expertise Required)

Total ■■■ Professional (A) consultants (Foreign Persons) and ■■■ Professional (B) consultants (Local Persons) will be engaged, over the duration of consulting service-A, for a total of ■■■ person-months for Professional consultants (A) and ■■■ person-months for Professional consultants (B). Total consulting input is thus estimated at ■■■ person-months.

#### 3.6.1 Consulting Input for the Respective Modules

The Consultant services on project management will be performed by following consultant personnel together with supporting staff. The allocation of person-month for the consulting service-A, excluding national supporting staff, is shown in Table 3.2:

**Table 3.2 Allocation of Person-Month on Project Overall Management**

Nr.	Designation	No.	Total
	<b>Professional (A): International Specialist</b>		
1	Project Team Leader		
2	Procurement/ Bid Document		
3	Disbursement Management		
4	EIA Monitoring		
	<b>Professional (B): National Specialist</b>		
5	Deputy Project Team Leader		
6	Project monitoring expert		
7	Procurement Expert/ Bid Document		
8	Disbursement Management		
9	EIA Monitoring		

#### 3.6.2 Qualification of Key Team Members

The qualifications of Key Team Members of Professional (A) and Professional (A) are shown below:

**Table 3.3 Qualification of Key Team Members**

Designation	Qualification
<b>Professional (A) International Specialist</b>	
Project Team Leader	<ul style="list-style-type: none"> <li>✓ Should have at least 25 years' experience in rural development project and its related projects, e.g. irrigation and drainage and rural roads improvement/ construction,</li> <li>✓ Should have handled at least five comprehensive rural development projects involving planning, design, and tender assistance and construction supervision, of which at least three projects should have been attended as team/section leader,</li> <li>✓ Should have an experience(s) engaged in rural development related projects carried out in Southeast Asia or South Asia, and</li> <li>✓ Should have an experience(s) in managing direct force account development projects</li> </ul>
<b>Professional (B) National Specialist</b>	
Deputy Project Team Leader	<ul style="list-style-type: none"> <li>✓ Should have at least 20 years' experience in consultant services for rural development project and its related project, e.g. irrigation and drainage and rural roads improvement/ construction,</li> <li>✓ Should have handled at least three comprehensive rural development projects involving planning, design, and tender assistance and construction supervision,</li> <li>✓ Should have an experience(s) engaged in rural development related projects carried out in Southeast Asia or South Asia, and</li> <li>✓ Should have an experience(s) in managing direct force account development projects.</li> </ul>

Consultant may propose other experts and supporting staff required to accomplish the tasks outlined in this TOR. It is the Consultant's responsibility to select the optimum team and to propose the professionals, which he/she believes best meets to the needs for the project management.

#### 3.6.4 Scope of Works for the Respective Personnel

Detailed information on the major tasks and duties to be performed by the members of the detailed engineering design team and the construction supervision team is shown in Table 3.4:

**Table 3.4 Major Tasks and Duties of Team Members**

Designation	Major Tasks and Duties
<b>Professional (A) (International Specialist)</b>	
Project Team Leader	<ul style="list-style-type: none"> <li>✓ Project overall management, and coordination with relevant offices and stakeholders,</li> <li>✓ Assistance on overall fund-flow and disbursement management,</li> <li>✓ Assistance on implementation of social and environmental consideration,</li> <li>✓ General coordination and supervision of the whole team during the project,</li> <li>✓ Assumes direct responsibility for day-to-day consulting services during the project,</li> <li>✓ Represents the whole team in all matters relating to the performance of services during the project, and</li> <li>✓ Direct the section leaders and other project staff on the overall implementation of the project.</li> </ul>
Procurement/ Bid Document	<ul style="list-style-type: none"> <li>✓ Preparation of the bid document for the procurement of contractor/supplier for implementation of the project component in cooperation with section leader and staff of each section, and</li> <li>✓ Assist the clientele department responsible staff/ officers for conducting prequalification and tender including evaluation and technical support for contract negotiation.</li> </ul>
Disbursement Management	<ul style="list-style-type: none"> <li>✓ Check necessary documents including contractor's invoices or request for payment, and if corrections needed, advise the responsible clientele staff/ officers or the contractors to rectify them,</li> <li>✓ Assist the clientele department responsible staff/ officers to prepare requests for disbursement from JICA, and</li> <li>✓ Assist the clientele department responsible staff/ officers in reporting to JICA on financial status of the Project at such interval as required.</li> </ul>

Designation	Major Tasks and Duties
	<ul style="list-style-type: none"> <li>✓ Assist in preparing material/documents for auditing including internal audit by Executing Agencies and external audit by the Auditor General's Office</li> </ul>
EIA Monitoring	<ul style="list-style-type: none"> <li>✓ Review and update the EMP, when necessary,</li> <li>✓ Prepare a detailed Environmental Monitoring Plan (including mitigation measures and monitoring procedures) that incorporates guidelines indicated in the EMP,</li> <li>✓ Work with other experts to ensure that all mitigation measures and recommendations given in the EMP,</li> <li>✓ Assist environmental responsible staff of the relevant clientele department in monitoring environmental and social impacts,</li> <li>✓ Examine if negative environmental impacts have been reported to relevant authorities and check if they were well handled and settled, and if not settled, assist the clientele staff/ officers to mitigate such impacts,</li> <li>✓ Review environmental monitoring reports prepared by the environment responsible staff at such interval as required, and</li> <li>✓ Conduct workshops and field trainings to strengthen the capacity of the environment responsible staff concerned for the clientele departments and local authorities to carry out the impact identification, evaluation and mitigation measures if needed.</li> </ul>
<b>Professional (B) (National Specialist)</b>	
Deputy Project Team Leader	<ul style="list-style-type: none"> <li>✓ Assist the Project Team Leader in carrying out all tasks and duties of the Project Team Leader,</li> <li>✓ Represent the Consultants team during absence of the Project Team Leader, and</li> <li>✓ Perform specific issues/aspects delegated by the Project Team Leader.</li> </ul>
Project monitoring expert	<ul style="list-style-type: none"> <li>✓ Monitor the progress of the each project component in cooperation with section leaders and clientele department responsible staff/ officers, and</li> <li>✓ Assist clientele department responsible staff/ officers for preparation of the project status report which shall be submitted to JICA.</li> </ul>
Procurement Expert/ Bid Document	<ul style="list-style-type: none"> <li>✓ Assist a Procurement/ Bid Document (international) and Project Team Leader and Deputy Project Team Leader in the works concerning preparation of the bid document and tender assistance.</li> </ul>
Disbursement Management	<ul style="list-style-type: none"> <li>✓ Assist a Disbursement Management (international) and Project Team Leader and Deputy Project Team Leader in the works concerning management of disbursement.</li> </ul>
EIA Monitoring	<ul style="list-style-type: none"> <li>✓ Assist the EIA Monitoring and (international) and Project Team Leader and Deputy Project Team Leader in the works concerning assistance on implementation of social and environmental consideration.</li> </ul>

## Chapter 4 Consulting Service-B: Irrigation and Drainage Improvement

### 4.1 Terms of Reference for Consulting Services

The consulting services under 'B. Irrigation and Drainage Improvement' are composed of the following:

- 1) Detail design,
- 2) Tender Assistance,
- 3) Construction Supervision, and
- 4) Water Management and System Operation.

#### 4.1.1 Detailed Design (Task Responsibility)

The Consultant, under Task Responsibility, shall carry out the following works:

- 1) Review and verify all available primary and secondary data;
- 2) Prepare for TORs, specifications, and quantities for the required surveys and investigations such as topographical survey, hydrological survey, geotechnical survey, material availability

survey and others required for preparing detailed design, as applicable to the concerned project components. Note that the surveys and investigations will be conducted by the Client;

- 3) Prepare detailed work plan, progress reports and implementation schedule for the Component to ensure effective monitoring and timely project outputs, and regularly update the same;
- 4) Prepare the detailed design of the Component (see Attachment-4 for the design required) in sufficient detail to ensure clarity and understanding by the IWUMD, contractors and other relevant stakeholders; All the design must be in conformity with the Myanmar Standards when available or with the appropriate international standards. The detailed design shall, as a minimum, include i) drawings for all facilities, ii) detailed cost estimates, and iii) necessary calculations to determine and justify the engineering details for the Component, associated documentation including detailed specifications, bill of quantities (BOQ), implementation schedule for the Component. Such detailed specifications will contain those in relation to i) quality control of materials and workmanship, ii) safety, and iii) protection of the environment. The detailed design shall be prepared in close consultation with, and to meet the requirements of the IWUMD, and shall be incorporated into the detailed design report to be submitted for approval of the IWUMD; and
- 5) Prepare Detailed Specifications, Bill of Quantities (BOQ) and Tender Drawings/Documents to be incorporated into Bidding Documents in such cases of biddings being necessary. Such Detailed Specifications shall contain those in relation to; i) quality control of materials and workmanship, ii) safety, and iii) protection of the environment.

#### **4.1.2 Tender Assistance (Assistance to the Client)**

##### **1) Assistance in Pre-Qualification (PQ) of Bidders undertaking Good Supply and Construction Works**

For the procurement and installation of water monitoring and flood monitoring system, the Consultant, under Assistance Concept, shall:

- a) Define PQ criteria in terms of technical and financial requirements, capacity and/or experience taking into consideration the technical requirements of the sub-component;
- b) Prepare PQ documents in accordance with the latest version of Standard Prequalification Documents under Japanese ODA Loans;
- c) Assist the IWUMD in PQ announcement, addendum/corrigendum, and clarifications to the applicants' queries;
- d) Evaluate PQ applications in accordance with the criteria set forth; and
- e) Prepare a PQ evaluation report for approval of the PQ evaluation committee.

##### **2) Assistance in the Bidding for Award of Contractor(s) undertaking Good Supply and Construction Works**

The Consultant, under Assistance Concept, shall:

- a) Prepare bidding documents in accordance with the latest version of Standard Bidding Documents under Japanese ODA Loans for Procurement of Works together with all relevant specifications, drawings and other documents and/or Procurement of Goods together with all

relevant specifications, drawings and other necessary documents in respect of individual items to be procured;

- b) Assist the IWUMD in issuing bid invitation, conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries;
- c) Evaluate bids in accordance with the criteria set forth in the bidding documents. In such evaluation, the Consultants shall carefully confirm that bidders' submissions in their technical proposal including, but not limited to, site organization, mobilization schedule, method statement, supply and construction schedule, safety plan, have been prepared in harmony each other and will meet such requirements set forth in applicable laws and regulations, specifications and other parts of the bidding documents;
- d) Prepare a bid evaluation report for approval of the IWUMD;
- e) Assist the IWUMD in contract negotiation by preparing agenda and facilitating negotiations including preparation of minutes of negotiation meeting; and
- f) Prepare a draft and final contract agreement.

#### **4.1.3 Construction Supervision (Assistance to the Client)**

The Consultant, under Assistance Concept, shall perform his duties during the construction period in accordance with the construction schedule of the IWUMD. It should be noted that Construction Division (4) and Maintenance Divisions of Shwebo and Ye-U will be at the quite similar position with contractor. Therefore, it can be considered the head office of the IWUMD shall act as the Employer, while the Construction Division (4) and Maintenance Divisions will act as such a Contractor. FIDIC MDB Harmonized Edition (2010) complemented with the Specific Provisions as included in the Standard Bidding Documents under Japanese ODA Loans for Procurement of Works will be applied to the civil works of the Component. In this context, the Consultant shall:

- 1) Act as the Engineer to execute construction supervision and contract administration services in accordance with the power and authority delegated by the head office of IWUMD;
- 2) Provide assistances to the Employer concerning variations and claims which are to be ordered/issued at the initiative of the head office of the IWUMD;
- 3) Issue the commencement order to the Contractors, which are the Construction Division (4) and Maintenance Divisions of Shwebo and Ye-U;
- 4) Provide recommendations to the IWUMD for acceptance of the Contractor's performance security, advance payment security and required insurances in case of such contractor(s) other than Construction Division (4) and Maintenance Divisions of Shwebo and Ye-U being employed;
- 5) Review and approve the proposals submitted by the contractors and/or Construction Division (4) and Maintenance Divisions of Shwebo and Ye-U, which include work program, method statements, material sources, manpower and equipment deployment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012), the Consultant shall pay attention, in particular, to whether such proposals will meet the safety requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract;
- 6) Explain and/or adjust ambiguities and/or discrepancies in the contract documents and issue any necessary clarifications or instructions when contract-out works are to be made;

- 7) Review, verify and further detail the design of the works, approve the contractors' and/or Construction Division (4)'s and Maintenance Divisions' working drawings and, if necessary, issue further drawings and/or give instructions to the contractor and/or Construction Division (4) and Maintenance Divisions of Shwebo and Ye-U;
- 8) Carry out field inspections on the contractor's and/or Construction Division (4)'s and Maintenance Divisions' setting out to ensure that the works are carried out in accordance with drawings and other design details;
- 9) Regularly monitor physical and financial progress against the milestones as per the contract and/or construction schedule so as to ensure completion of the works in time;
- 10) Supervise the works so that all the work requirements will be met by the contractors and/or Construction Division (4) and Maintenance Divisions, including those in relation to; i) quality of the works, ii) safety and iii) protection of the environment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012), the Consultant shall confirm that an accident prevention officer proposed by contractor and/or Construction Division (4) and Maintenance Divisions is duly assigned at the work site(s) and that construction works are carried out according to the requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract;
- 11) Supervise field tests, sampling and laboratory test to be carried out by the contractors and/or Construction Division (4) and Maintenance Divisions;
- 12) Inspect the construction method, equipment to be used, workmanship at the site, and, when required, attend shop inspection and manufacturing tests in accordance with the specifications;
- 13) Survey and measure the work output performed by the contractors and/or Construction Division (4) and Maintenance Divisions and issue work completion certificates and/or payment certificates in case of contract-out works such as interim payment certificates and final payment certificate as specified in the contract if it is necessary;
- 14) Coordinate the works among different organizations working for the Component;
- 15) Modify the designs, technical specifications and drawings, relevant calculations and cost estimates as may be necessary in accordance with the actual site conditions, and issue variation orders as needed;
- 16) Carry out timely reporting to the IWUMD for any inconsistency in executing the works and suggesting appropriate corrective measures to be applied;
- 17) Inspect, verify and determine claims issued by the IWUMD and also by contractors being in case employed in accordance with the technical specifications of civil works in Myanmar or other related international specifications;
- 18) Perform the inspection of the works and issue certificates such as the work performance and/or completion certificates, or otherwise taking-over certificate in case of contract-out works as specified in the contract if they are necessary;
- 19) Supervise testing and commissioning in case of goods, equipment and machineries procured and installed;
- 20) Provide, in case of contract-out works, periodical and/or continuous inspection services during defects liability period (Defect Notification Period defined in FIDIC Conditions of



Contract) and if any defects are noted, instruct the contractors to rectify where they are necessary; the Client has a responsibility on the above after the period of consulting service and

- 21) Check and certify as-built drawings submitted by the contractors and/or Construction Division (4) and Maintenance Divisions; and prepare and submit reports to the IWUMD, which are detailed in Reports in relation to the implementation of the Component.
- 22) Ensure safety measures as follows:

In consideration of “the Guidance for the Management of Safety for Construction Works in Japanese ODA Projects of JICA”, when preparing or reviewing bidding documents for procurement of works and those for procurement of supply and installation of systems/facilities/stations/etc. (including direct force account), the consultants shall ensure safety measures. The consultants shall review the safety plans submitted by the bidders and the method statements of safety submitted by the contractor. During the supervision of the construction work, the consultants shall confirm that accident prevention officer proposed by the contractor (in the case of direct force account, IWUMD) is duly assigned at the project site and that the construction work is carried out according to the safety requirements stipulated in the contract. If consultants recognize any questionable issues regarding the safety measures including the ones mentioned above, the consultants shall require the contractors (in the case of direct force account, IWUMD) to take appropriate remedies.

#### **4.1.4 Water Management Improvement (Assistance to the Client)**

The Consultant, under Assistance Concept, shall conduct the following works:

- 1) Review the present situation and practice of water management in terms of dam reservoir operation, weir operation, intake operation, operation of the check gates installed along the main canals, distribution at the entrance of all the distributaries canals, and man-power allocation for gate operation, etc.;
- 2) Review the farmers organization engaged in irrigation water management, and examine the collection of irrigation service fee, and explore the reason of the low collection ratio;
- 3) Estimate irrigation water requirements at each distributary canal level, and summate the requirements at the main canal level with reference to the proposed cropping patterns;
- 4) Revise, when necessary, operation of dam discharge, weir and canal rules based on probability of inflow volume, rainfall, and water requirement estimated based on the recommended cropping patterns;
- 5) Establish a man-power allocation plan including allotment of gate keepers, watchmen, etc.;
- 6) Estimate and recommend IWUMD the sound range of irrigation service fee, which can cover the expenses of operation and maintenance required for sustaining the irrigation systems;
- 7) Conduct trainings on irrigation water management to the relevant staff of Maintenance offices; and
- 8) Coordinate and cooperate with the consultants which may be engaged under a JICA financed technical assistance program(s) if any, which aims at developing the capacity of the WUA, and introducing Irrigation Management Transfer (IMT) and/or Participatory Irrigation Management (PIM).

## 4.2 Expected Time Schedule

The total duration of consulting services will be ■ months. The implementation schedule expected is presented in following table:

**Table 4.1 Implementation Schedule Expected**

Key Activities	Date	Duration in Months
Commencement of Consulting Services	1 December 2018	
Period of detail design, preparation of drawings and tender documents	1 December 2018 to 30 November 2019	
Commencement of Civil Works	1 November 2019	
End of Civil Works	31 July 2024	
Final Contract Administration	1 August 2024 to 31 October 2024	
Completion of Consulting Services	31 October 2024	

## 4.3 Staffing (Expertise Required)

Total ■ Professional (A) consultants (Foreign Persons) and ■ Professional (B) consultants (Local Persons) will be engaged, over the duration of consulting services, for a total of ■ person-months for Professional consultants (A) and ■ person-months for Professional consultants (B). Total consulting input is thus estimated at ■ person-months. A detailed schedule of consulting services and a distribution of man-months are shown in Attachment 3:

### 4.3.1 Consulting Input for the Respective Modules

The Consultant services consist of designing, construction supervision, , and other services including tender assistances and water management improvement, which will be performed by following consultant personnel together with supporting staff. The allocation of person-month for the respective modules of consulting services, excluding national supporting staff, is shown in Table 4.2:

**Table 4.2 Allocation of Person-Month for the Respective Modules**

Nr.	Designation	No.	Design Module	Construction Module	Total
<b>Professional (A): International Specialist</b>					
1	Section Leader (DD for Irrigation Project)/ Chief Engineer				
2	Section Leader (SV for Irrigation Project)				
3	Irrigation Design Engineer				
4	Hydraulic Structure Engineer 1 (Canal & Drainage Structure)				
5	Hydraulic Structure Engineer 2 (Weir & spillway)				
6	Hydro Mechanical Engineer				
7	Hydrologist/Drainage/Flood Management				
8	Procurement Expert on Construction Machinery				
9	Construction Plan/ Cost Estimation				
10	System Engineer of Monitoring System for Water management & Flood				
11	Water Management/ System Operation				
12	Construction Supervision (Irrigation)				
<b>Total (Professional A)</b>					
<b>Professional (B): National Specialist</b>					
1	Deputy Section Leader (DD for Irrigation Project)				
2	Deputy Team Leader (SV for Irrigation Project)				
3	Irrigation Design Engineer 1				
4	Irrigation Design Engineer 2				
5	Irrigation Design Engineer 3				

Nr.	Designation	No.	Design Module	Construction Module	Total
6	Irrigation Design Engineer 4				
7	Hydraulic Structure Engineer 1 (Canal & Drainage Structure)				
8	Hydraulic Structure Engineer 2 (Canal & Drainage Structure)				
9	Hydraulic Structure Engineer 3 (Canal & Drainage Structure)				
10	Hydraulic Structure Engineer 4 (Canal & Drainage Structure)				
11	Hydraulic Structure Engineer 5 (Canal & Drainage Structure)				
12	Hydraulic Structure Engineer 6 (Canal & Drainage Structure)				
13	Hydraulic Structure Engineer 7 (Canal & Drainage Structure)				
14	Hydraulic Structure Engineer 8 (Canal & Drainage Structure)				
15	Hydraulic Structure Engineer 9 (Weir & spillway)				
16	Hydro Mechanical Engineer				
17	Hydrologist/Drainage/Flood Management				
18	Construction Plan				
19	Quantity & Cost Estimation 1				
20	Quantity & Cost Estimation 2				
21	Quantity & Cost Estimation 3				
22	Water Management/ System Operation				
23	Construction Supervision (Irrigation) 1				
24	Construction Supervision (Irrigation) 2				
25	Construction Supervision (Irrigation) 3				
26	Construction Supervision (Irrigation) 4				
27	Quality Management Engineer				
	<b>Total (Professional B)</b>				
	<b>Grand Total (Professional A &amp; B)</b>				

Note: WM (Water Management)

### 4.3.2 Qualification of Key Team Members

The qualifications of Key Team Members of Professional (A) and Professional (A) are shown below:

**Table 4.3 Qualification of Key Team Members**

Designation	Qualification
<b>Professional (A) International Specialist</b>	
Section Leader (DD for Irrigation Project)/ Chief Engineer	<ul style="list-style-type: none"> <li>✓ Should have at least 20 years' experience in irrigation development project and its related projects,</li> <li>✓ Should have handled at least five comprehensive irrigation projects involving planning, basic design, detail design, and tender assistance and construction supervision, of which at least two projects should have been attended as team/section leader,</li> <li>✓ Should have an experience(s) engaged in irrigation related projects carried out in Southeast Asia or South Asia, and</li> <li>✓ Should have an experience(s) in managing direct force account irrigation development projects.</li> </ul>
Section Leader (SV for Irrigation Project)	<ul style="list-style-type: none"> <li>✓ Should have at least 20 years' experience in engineering services for irrigation development project and its related project,</li> <li>✓ Should have handled at least five comprehensive irrigation projects involving construction supervision, of which at least two projects should have been attended as team/section leader,</li> <li>✓ Should have an experience(s) engaged in irrigation related projects carried out in Southeast Asia or South Asia, and</li> <li>✓ Should have an experience(s) in managing direct force account irrigation development projects</li> </ul>
Irrigation Design Engineer 1	<ul style="list-style-type: none"> <li>✓ Should have at least 15 years' experience in irrigation development project and its related projects,</li> <li>✓ Should have design experiences on irrigation project involving layout planning of irrigation facilities, irrigation distribution planning, drainage layout, construction</li> </ul>

Designation	Qualification
	<ul style="list-style-type: none"> <li>planning, and other related planning works, and</li> <li>✓ Should have an experience(s) engaged in irrigation related projects carried out in Southeast Asia or South Asia.</li> </ul>
Hydraulic Structure Engineer 1 (Canal & Drainage Structure)	<ul style="list-style-type: none"> <li>✓ Should have at least 15 years' experience in design on hydraulic structures of irrigation facilities such as syphon, check gates, drops, diversions, and canal linings, and</li> <li>✓ Should have been engaged in at least three large scale irrigation development/ rehabilitation project.</li> </ul>
Water Management/ System Operation	<ul style="list-style-type: none"> <li>✓ Should have at least 15 years' experience in consulting services on water management and/or system operation, and preferably including establishment of water users' association, for large scale irrigation schemes, and</li> <li>✓ Should have handled at least three irrigation schemes having the components of water management / system operation.</li> </ul>
<b>Professional (B) National Specialist</b>	
Deputy Section Leader (DD for Irrigation Project)	<ul style="list-style-type: none"> <li>✓ Should have at least 20 years' experience in irrigation development project and its related projects,</li> <li>✓ Should have handled at least three comprehensive irrigation projects involving planning, basic design, detail design, and tender assistance and construction supervision,</li> <li>✓ Should have an experience(s) engaged in irrigation related projects carried out in Myanmar, and</li> <li>✓ Should have an experience(s) in managing direct force account irrigation development projects.</li> </ul>
Deputy Team Leader (SV for Irrigation Project)	<ul style="list-style-type: none"> <li>✓ Should have at least 20 years' experience in engineering services for irrigation development project and its related project,</li> <li>✓ Should have handled at least three comprehensive irrigation projects involving construction supervision,</li> <li>✓ Should have an experience(s) engaged in irrigation related projects carried out in Myanmar, and</li> <li>✓ Should have an experience(s) in managing direct force account irrigation development projects</li> </ul>
Irrigation Design Engineer 1	<ul style="list-style-type: none"> <li>✓ Should have at least 10 years' experience in irrigation development project and its related projects,</li> <li>✓ Should have design experiences on irrigation project involving layout planning of irrigation facilities, irrigation distribution planning, drainage layout, construction planning, and other related planning works, and</li> <li>✓ Should have an experience(s) engaged in irrigation related projects carried out in Myanmar.</li> </ul>
Hydraulic Structure Engineer 1 (Canal & Drainage Structure)	<ul style="list-style-type: none"> <li>✓ Should have at least 10 years' experience in design on hydraulic structures of irrigation facilities such as syphon, check gates, drops, diversions, and canal linings, and</li> <li>✓ Should have been engaged in at least one large scale irrigation development/ rehabilitation project.</li> </ul>

Consultant may propose other experts and supporting staff required to accomplish the tasks outlined in this TOR. It is the Consultant's responsibility to select the optimum team and to propose the professionals, which he/she believes best meets to the needs of the IWUMD.

#### 4.3.3 Scope of Works for the Respective Personnel

Detailed information on the major tasks and duties to be performed by the members of the detailed engineering design team and the construction supervision team is shown in Table 4.4:

**Table 4.4 Major Tasks and Duties of Team Members**

Designation	Major Tasks and Duties
<b>Professional (A) (International Specialist)</b>	
Section Leader (DD for Irrigation Project)/ Chief Engineer	<ul style="list-style-type: none"> <li>✓ General coordination and supervision of the section team during detail design,</li> <li>✓ Assumes direct responsibility for day-to-day consulting services during detail design,</li> <li>✓ Represents the section team in all matters relating to the performance of services during detail design,</li> <li>✓ Review existing designs and specifications,</li> <li>✓ Prepare the overall guidelines and design concept for the rehabilitation of the Thapanzeik dam irrigation systems, and</li> <li>✓ Direct the foreign and local engineers on the overall concept of the detailed designs for irrigation systems and facilities.</li> </ul>
Section Leader (SV for Irrigation Project)	<ul style="list-style-type: none"> <li>✓ General coordination and supervision of the section team during construction stage,</li> <li>✓ Assumes direct responsibility for day-to-day consulting services during construction stage,</li> <li>✓ Represents the section team in all matters relating to the performance of services during construction stage,</li> <li>✓ Review the detail design drawings for construction purpose, and</li> <li>✓ Supervise the construction works and transfer technology to the construction personnel according to the needs.</li> <li>✓ Assist in safety management.</li> </ul>
Irrigation Design Engineer 1	<ul style="list-style-type: none"> <li>✓ Review existing structural designs on Thapanzeik dam irrigation systems,</li> <li>✓ Assist the water head balance within irrigation systems and location of major hydraulic structures of both existing and proposed ones,</li> <li>✓ Direct the national irrigation design engineers attending the detailed designs of irrigation networks,</li> <li>✓ Prepare Technical Specifications, and</li> <li>✓ Prepare Bills of Quantities for the construction works.</li> </ul>
Hydraulic Structure Engineer 1 (Canal & Drainage Structure)	<ul style="list-style-type: none"> <li>✓ Review existing hydraulic structures and their structural designs,</li> <li>✓ Prepare the detailed design on syphon, check gates, drops, diversions, canal linings, and other related structures for Thapanzeik dam irrigation system,</li> <li>✓ Direct the national structural engineers attending the detailed designs of hydraulic structures,</li> <li>✓ Prepare Technical Specifications, and</li> <li>✓ Prepare Bills of Quantities.</li> </ul>
Hydraulic Structure Engineer 2 (Weir & spillway)	<ul style="list-style-type: none"> <li>✓ Review existing Kindat diversion dam and Kabo weir and their structural designs,</li> <li>✓ Prepare the detailed design on emergency spillway of Kindat diversion dam, spillway, river protection and riverbank protection of Kabo weir and other related structures,</li> <li>✓ Direct the national structural engineers attending the detailed designs of hydraulic structures,</li> <li>✓ Prepare Technical Specifications, and</li> <li>✓ Prepare Bills of Quantities.</li> </ul>
Hydro Mechanical Engineer	<ul style="list-style-type: none"> <li>✓ Review existing hydro mechanical structures and their structural designs,</li> <li>✓ Prepare the detailed design on the hydro mechanical structures including the gates for Kabo weir and other relevant facilities of Thapanzeik dam irrigation system,</li> <li>✓ Direct the national hydro mechanical engineer attending the detailed designs of hydro mechanical structures,</li> <li>✓ Prepare Technical Specifications, and</li> <li>✓ Prepare Bills of Quantities.</li> </ul>
Hydrologist/ Drainage/ Flood Management	<ul style="list-style-type: none"> <li>✓ Review existing hydrological data, and past flood situation,</li> <li>✓ Carry out hydraulic simulation for flood and inundation based on the probability of flood,</li> <li>✓ Direct the relevant national engineers attending the hydrology/ drainage and flood management, and</li> <li>✓ Prepare conceptual design for flood protection and drainage improvement.</li> </ul>
Procurement Expert on Construction Machin-	<ul style="list-style-type: none"> <li>✓ Review the equipment/ machineries to be procured,</li> <li>✓ Prepare PQ documents and bidding documents for the equipment and machineries to</li> </ul>

Designation	Major Tasks and Duties
ery	<ul style="list-style-type: none"> <li>be procured,</li> <li>✓ Assist IWUMD in the process of issuing PQ and Bid documents, and tender procedure, and</li> <li>✓ Prepare an evaluation report for the tendering and recommend IWUMD for the success bidding..</li> </ul>
Construction Plan/ Cost Estimation	<ul style="list-style-type: none"> <li>✓ Review detail design carried out by relevant consultant engineers,</li> <li>✓ Review and examine the construction quantities based on the detail design,</li> <li>✓ Review existing cost estimation of the Project,</li> <li>✓ Prepare for the deployment plan of machineries and man-powers to be required for the construction works,</li> <li>✓ Prepare the construction schedule with the necessary input such as man-powers, machineries, materials, etc., and</li> <li>✓ Prepare the detailed cost estimation in collaboration with relevant engineers,</li> <li>✓ Prepare Yen Loan cost details.</li> <li>✓ Direct the relevant national engineers attending the works for quantification, cost estimation and the detailed cost estimation.</li> </ul>
System Engineer of Monitoring System for WM & Flood	<ul style="list-style-type: none"> <li>✓ Review existing hydrological data, system operation data,,</li> <li>✓ Prepare the monitoring plan for system operation realizing optimal water distribution and for flood,</li> <li>✓ Prepare conceptual drawings for monitoring system, and</li> <li>✓ Prepare the technical specifications of the necessary equipment for the monitoring system, good for tendering.</li> </ul>
Water Management/ System Operation	<ul style="list-style-type: none"> <li>✓ Review present irrigation water usage situation in Thapanzeik dam irrigation system,</li> <li>✓ Prepare draft rule, regulation, and the process and methodology of establishing the water management and system operation.,</li> <li>✓ Prepare for the guidelines and manuals for establishing the water management and system operation, and</li> <li>✓ Train related IWUMD staff in managing the irrigation system.</li> </ul>
Construction Supervi- sion (Irrigation)	<ul style="list-style-type: none"> <li>✓ Coordinate and supervise construction and rehabilitation works for the Thapanzeik dam irrigation system,</li> <li>✓ Review and approve Shop Drawings/ Construction Drawings for these works prepared by Construction Circle (4) and Maintenance Divisions of Shwebo and Ye-U,</li> <li>✓ Review and approve test reports for materials prepared by Construction Circle (4) and Maintenance Divisions of Shwebo and Ye-U, and</li> <li>✓ Inspect the construction works and transfer technology to personnel of Construction Circle (4) and Maintenance Divisions of Shwebo and Ye-U according to the needs.</li> </ul>
<b>Professional (B) (National Specialist)</b>	
Deputy Section Leader (DD for Irrigation Pro- ject)	<ul style="list-style-type: none"> <li>✓ Assist the section Leader (design) in carrying out all tasks and duties of the Section Leader,</li> <li>✓ Represent the Consultant's team during absence of the Section Leader, and</li> <li>✓ Perform specific issues/aspects delegated by the Section Leader.</li> </ul>
Deputy Section Leader (SV for Irrigation Pro- ject)	<ul style="list-style-type: none"> <li>✓ Assist the Section Leader (supervision) in carrying out all tasks and duties of the Section Leader,</li> <li>✓ Represent the Consultant's team during absence of the Section Leader, and</li> <li>✓ Perform specific issues/aspects delegated by the Section Leader.</li> </ul>
Irrigation Design Engi- neer 1, 2, 3, 4	<ul style="list-style-type: none"> <li>✓ Assist the Irrigation Design Engineer (international) in reviewing the existing structural designs for Thapanzeik dam irrigation system,</li> <li>✓ Assist the Irrigation Design Engineer in preparing the detailed designs of irrigation networks,</li> <li>✓ Prepare detail design drawings, and</li> <li>✓ Assist the Irrigation Design Engineer in preparing Bills of Quantities.</li> </ul>
Hydraulic Structure Engineer 1, 2, 3, 4, 5, 6, 7 ,8 (Canal & Drainage Structure) 9 (Weir & spillway)	<ul style="list-style-type: none"> <li>✓ Assist the Hydraulic Structure Engineers (international) in reviewing the existing rural hydraulic structures and their structural designs,</li> <li>✓ Assist the Hydraulic Structure Engineers in preparing the detailed design on syphon, check gates, drops, diversions, canal linings, and other related structures for the Thapanzeik dam irrigation system,</li> </ul>

Designation	Major Tasks and Duties
	<ul style="list-style-type: none"> <li>✓ Prepare detail design drawings, and</li> <li>✓ Assist the Hydraulic Structure Engineers in preparing Bills of Quantities.</li> </ul>
Hydro Mechanical Engineer	<ul style="list-style-type: none"> <li>✓ Assist the Hydro Mechanical Engineer (international) in reviewing the existing hydraulic structures and their structural designs,</li> <li>✓ Assist the Hydro Structure Engineer in preparing the detailed design on the hydro mechanical structures, including the gates for Kabo weir and related structures for the Thapanzeik dam irrigation system,</li> <li>✓ Prepare detail design drawings, and</li> <li>✓ Assist the Hydro Mechanical Engineer in preparing Bills of Quantities.</li> </ul>
Hydrologist/ Drainage/ Flood Management	<ul style="list-style-type: none"> <li>✓ Assist the Hydrologist/ Drainage/ Flood Management (international) in reviewing the existing hydrological data, and past flood situation,</li> <li>✓ Assist the Hydrologist/ Drainage/ Flood Management in carrying out hydraulic simulation for flood and inundation based on the probability of flood, and</li> <li>✓ Prepare design drawings for flood protection and drainage improvement.</li> </ul>
Construction Plan 1	<ul style="list-style-type: none"> <li>✓ Assist the Construction Plan expert (international) in preparing the deployment plan of machineries and man-powers to be required for the construction works, and</li> <li>✓ Assist the Construction Plan expert (international) in preparing the construction schedule with the necessary input such as man-powers, machineries, materials, etc.</li> <li>✓</li> </ul>
Quantity & Cost Estimation 1, 2, 3	<ul style="list-style-type: none"> <li>✓ Assist Cost Estimation expert (international) in reviewing existing cost estimation of the Project,</li> <li>✓ Prepare the detailed quantity estimation for the rehabilitation of Thapanzeik irrigation dam irrigation system, and</li> <li>✓ Assist Cost Estimation expert (international) in preparing the detailed cost estimation in collaboration with relevant engineers.</li> </ul>
Water Management / System Operation	<ul style="list-style-type: none"> <li>✓ Assist Water Management/ System Operation expert in preparing rules and regulations for water management and system operation,</li> <li>✓ Monitor gate operation and irrigation management activities to be carried out by IWUMD, and</li> <li>✓ Prepare report on irrigation operation and management under supervision of International experts for the purpose of feedback to IWUMD.</li> </ul>
Construction Supervision (Irrigation) 1, 2, 3, 4	<ul style="list-style-type: none"> <li>✓ Assist Construction Supervision Expert (international) in supervising the works by Construction Circle (4) and Maintenance Divisions of Shwebo and Ye-U,</li> <li>✓ Assist the Construction Supervision Expert (international) in reviewing and approving Shop Drawings/ Construction Drawings for those works prepared by Construction Circle (4) and Maintenance Divisions of Shwebo and Ye-U, and</li> <li>✓ Assist the Construction Supervision Experts in inspection on the construction works by Construction Circle (4) and Maintenance Divisions of Shwebo and Ye-U.</li> </ul>
Quality Management Engineer	<ul style="list-style-type: none"> <li>✓ Assist Construction Supervision Experts in measuring quantities of works done by Construction Circle (4) and Maintenance Divisions of Shwebo and Ye-U for confirmation of the progress of works,</li> <li>✓ Assist Construction Supervision Experts in reviewing and certifying final measurements submitted by the contractors and/or Construction Circle (4) and Maintenance Divisions of Shwebo and Ye-U,</li> <li>✓ Assist Construction Supervision Experts in monitoring progress of works and estimating payment/ disbursement amount for the coming months for contractors if any, and</li> <li>✓ Assist Construction Supervision Experts in preparing monitoring reports to be submitted to the IWUMD.</li> </ul>

## 4.4 Reporting

Within the scope of consulting services, the Consultant shall prepare and submit reports and documents to IWUMD as shown in Table 4.5. The Consultant shall provide electronic copies of each of these reports as well:

**Table 4.5 Summary of Reports to Be Submitted**

Category	Type of Report	Timing	No. of Copies
Detailed Design	Inception Report	Within 1 month after commencement of the services	5
	Conceptual Design Reports	Within 4 months and after commencement of the services	5
	Draft Final Design Report	Within 12 months after commencement of the services	5
	Final Design Report	Within 13 months after commencement of the services	10
Tender Assistance	Pre-qualification Document	At appropriate timing	5
	Bidding Document	At appropriate timing	5
	Pre-qualification Evaluation Report	At appropriate timing	5
	Bid Evaluation Report	At appropriate timing	
Construction Supervision	Inception Report	Within 1 month after commencement the services	5
	Monthly Progress Report	Every month	5
	Quarterly Progress Report	Every quarter	5
	Project Completion Report	At the end of the services	10
	Technical Reports	As required or upon request	As required
Other Report	e.g. Operation Manual for Kabo weir		As required

### 4.4.1 For Detailed Design

- 1) Inception Report: presents the methodologies, schedule, organization, etc.
- 2) Conceptual Design Report: presents conceptual design on emergency spillway of Kindat diversion dam, rehabilitation of Kabo weir including gate, riverbed protection and other related structures, overall hydraulic design for 4 irrigation canal systems, and major hydraulic structures in the canal.
- 3) Draft Final Design Report: presents draft final documents of detailed design and cost estimate, and
- 4) Final Design Report: presents final documents of detailed design and cost estimate and bid plan through reflection of comments on the Draft Final Design Report provided by IWUMD.

### 4.4.2 For Tender Assistance

- 1) Pre-qualification Document: presents the pre-qualification documents and its evaluation criteria.
- 2) Bidding Document: presents the bidding documents and bid evaluation criteria.
- 3) Pre-qualification Evaluation Report: presents the results of the evaluation with recommendations on the selection of the qualified applicants.
- 4) Tender Evaluation Report: presents the results of technical and price evaluation with recommendations on technically and financially responsive bidders.

### 4.4.3 For Construction Supervision

- 1) Inception Report: presents the methodologies, schedule, organization, etc.



- 2) Monthly Progress Report: describes briefly and concisely all activities and progress for the previous month by the 10th day of each month. Problems encountered or anticipated will be clearly stated, together with actions to be taken or recommendations on remedial measures for correction. Also indicates the work to be performed during the coming month.
- 3) Quarterly Progress Report: presents the progress status of the Project.
- 4) Project Completion Report: comprises outline of all facilities completed and construction records from the commencement through completion, together with key data and records.

#### **4.5 Obligations of the Executing Agency (IWUMD)**

A certain range of arrangements and services will be provided by the IWUMD to the Consultant for smooth implementation of the Consulting Services. In this context, the IWUMD will:

##### **1) Reports and data**

Make available to the Consultant existing reports and data related to the Project as required.

##### **2) Office space**

Provide a suitable office space in the IWUMD HQs and also at the site (Shwebo town for main office and Ye-U town for branch office) with necessary equipment, furniture and utility. However, the Consultant's requirement for office space, including necessary equipment, furniture and utilities, shall be clearly stated in the proposal with its rental cost for the case where the IWUMD would not be able to provide such facilities.

##### **3) Cooperation and counterpart staff**

Appoint counterpart officials, agent(s) and representative(s) as may be necessary for effective implementation of the Consulting Services.

##### **4) Assistance and exemption**

Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to:

- ✓ travel permits, stay permit, security application, and such other documents;
- ✓ VISAs and such other necessary documents,
- ✓ clearance through customs,
- ✓ instructions and information to officials, agent and representatives of the GOM,
- ✓ exemption from any requirement for registration to practice their profession, and
- ✓ privilege pursuant to the applicable law in Myanmar.

##### **5) Topographic Surveys**

Carry out outline surveys for canals, longitudinal surveys for canals and cross sectional surveys for canal reaches that are to need rehabilitation works and/or upgrading works. In addition IWUMD will prepare for sketch drawings for the existing structures which need rehabilitation and for plain survey and section survey of the structures for large rehabilitation and replacement. These survey results will be formatted in an Auto-CAD digital data, and be ready before or upon the deployment of Consultants for the detail design.

## **Chapter 5 Consulting Service-C: Distribution Infrastructure Improvement**

### **5.1 Terms of Reference for Consulting Services**

The consulting services under ‘C. Distribution Infrastructure Improvement’ are composed of the following:

- 1) Detail design,
- 2) Tender Assistance, and
- 3) Construction Supervision.

#### **5.1.1 Detailed Design (Task Responsibility)**

The Consultant, under Task Responsibility, shall carry out the following works:

- 1) Review and verify all available primary and secondary data;
- 2) Prepare for TORs, specifications, and quantities for the required surveys and investigations such as topographical survey, hydrological survey, geotechnical survey, material availability survey and others required for preparing detailed design, as applicable to the concerned project component. Note that the surveys and investigations will be conducted by survey company and/or contractor selected by the DRD;
- 3) Prepare detailed work plan, progress reports and implementation schedule for the Component to ensure effective monitoring and timely project outputs, and regularly update the same;
- 4) Prepare the detailed design of the rural roads with related facilities, rural bridges and inspection path of the canals (see Attachment-5 for the design required) in sufficient detail to ensure clarity and understanding by the DRD, contractors and other relevant stakeholders; All the design must be in conformity with the Myanmar Standards when available or with the appropriate international standards. The detailed design of rural road except for asphalt pavement portion can refer to the level of DRD standard design. The detailed design of rural road for asphalt pavement portion and rural bridge shall, as a minimum, include i) drawings for all facilities, ii) detailed cost estimates, and iii) necessary calculations to determine and justify the engineering details for the sub-components, and iv) associated documents including detailed specifications, bill of quantities (BOQ), implementation schedule for the Component. Such detailed specifications will contain those in relation to; i) quality control of materials and workmanship, ii) safety, and iii) protection of the environment. The detailed design shall be prepared in close consultation with, and to meet the requirements of the DRD, and shall be incorporated into the detailed design report to be submitted for approval of the DRD; and
- 5) Prepare Detailed Specifications, Bill of Quantities (BOQ) and Tender Drawings/Documents to be incorporated into Bidding Documents in such cases of biddings being necessary. Such Detailed Specifications shall contain those in relation to; i) quality control of materials and workmanship, ii) safety, and iii) protection of the environment.

#### **5.1.2 Tender Assistance (Assistance to the Client)**

The Consultant, under Assistance concept, shall:

- 1) Prepare bidding documents in accordance with the latest version of Standard Bidding Documents under Japanese ODA Loans for Procurement of Works together with all relevant specifications, drawings and other documents in respect of individual items to be procured;

- 2) Assist the DRD in issuing bid invitation, conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries;
- 3) Evaluate bids in accordance with the criteria set forth in the bidding documents. In such evaluation, the Consultants shall carefully confirm that bidders' submissions in their technical proposal including, but not limited to, site organization, mobilization schedule, method statement, supply and construction schedule, safety plan, have been prepared in harmony each other and will meet such requirements set forth in applicable laws and regulations, specifications and other parts of the bidding documents;
- 4) Prepare a bid evaluation report for approval of the DRD;
- 5) Assist the DRD in contract negotiation by preparing agenda and facilitating negotiations including preparation of minutes of negotiation meeting; and
- 6) Prepare a draft and final contract agreement.

### 5.1.3 Construction Supervision (Assistance to the Client)

The Consultant, under Assistance concept, shall perform his duties during the construction period in accordance with the construction schedule. FIDIC MDB Harmonized Edition (2010) complemented with the Specific Provisions as included in the Standard Bidding Documents under Japanese ODA Loans for Procurement of Works will be applied to the civil works of the Component. In this context, the Consultant shall:

- 1) Act as the Engineer to execute construction supervision and contract administration services in accordance with the power and authority delegated by the head office of DRD;
- 2) Provide assistances to the Employer concerning variations and claims which are to be ordered /issued at the initiative of the head office of the DRD;
- 3) Issue the commencement order to the Contractors,
- 4) Provide recommendations to the DRD for acceptance of the Contractor's performance security, advance payment security and required insurances;
- 5) Review and approve the proposals submitted by the contractors, which include work program, method statements, material sources, manpower and equipment deployment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012), the Consultant shall pay attention, in particular, to whether such proposals will meet the safety requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract;
- 6) Explain and/or adjust ambiguities and/or discrepancies in the contract documents and issue any necessary clarifications or instructions when contract-out works are to be made;
- 7) Review, verify and further detail the design of the works, approve the contractors' working drawings and, if necessary, issue further drawings and/or give instructions to the contractor;
- 8) Carry out field inspections on the contractor's setting out to ensure that the works are carried out in accordance with drawings and other design details;
- 9) Regularly monitor physical and financial progress against the milestones as per the contract and/or construction schedule so as to ensure completion of the works in time;

- 10) Supervise the works so that all the work requirements will be met by the contractors including those in relation to; i) quality of the works, ii) safety and iii) protection of the environment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012), the Consultant shall confirm that an accident prevention officer proposed by contractor is duly assigned at the work site(s) and that construction works are carried out according to the requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract;
- 11) Supervise field tests, sampling and laboratory test to be carried out by the contractors;
- 12) Inspect the construction method, equipment to be used, workmanship at the site, and, when required, attend shop inspection and manufacturing tests in accordance with the specifications;
- 13) Survey and measure the work output performed by the contractors and issue work completion certificates and/or payment certificates in case of contract-out works such as interim payment certificates and final payment certificate as specified in the contract if it is necessary;
- 14) Coordinate the works among different organizations working for the Component;
- 15) Modify the designs, technical specifications and drawings, relevant calculations and cost estimates as may be necessary in accordance with the actual site conditions, and issue variation orders;
- 16) Carry out timely reporting to the DRD for any inconsistency in executing the works and suggesting appropriate corrective measures to be applied;
- 17) Inspect, verify and determine claims issued by contractors in accordance with the technical specifications of civil works in Myanmar or other related International Specifications;
- 18) Perform the inspection of the works and issue certificates such as the work performance and/or completion certificates, or otherwise taking-over certificate in case of contract-out works as specified in the contract if they are necessary;
- 19) Supervise testing and commissioning in case of goods, equipment and machineries procured and installed;
- 20) Provide periodical and/or continuous inspection services during defects liability period (Defect Notification Period defined in FIDIC Conditions of Contract) and if any defects are noted, instruct the contractors to rectify where they are necessary; and
- 21) Check and certify as-built drawings submitted by the contractors and prepare and submit reports to the DRD, which are detailed in Reports in relation to the implementation of the Component.
- 22) Ensure safety measures as follows:

In consideration of “the Guidance for the Management of Safety for Construction Works in Japanese ODA Projects of JICA”, when preparing or reviewing bidding documents for procurement of works and those for procurement of supply and installation of systems/facilities/stations/etc. (including direct force account), the consultants shall ensure safety measures. The consultants shall review the safety plans submitted by the bidders and the method statements of safety submitted by the contractor. During the supervision of the construction work, the consultants shall confirm that accident prevention officer proposed by the contractor is duly assigned at the project site and that the construction work is carried out according to the safety requirements stipulated in the contract. If consultants recognize any questionable issues

regarding the safety measures including the ones mentioned above, the consultants shall require the contractors to take appropriate remedies.

## 5.2 Expected Time Schedule

The total duration of consulting services will be [redacted] months. The implementation schedule expected is presented in following table:

**Table 5.1 Implementation Schedule Expected**

Key Activities	Date	Duration in Months
Commencement of Consulting Services	1 December 2018	
Period of detail design, preparation of drawings and tender documents	1 December 2018 to 31 October 2019	
Commencement of Civil Works	1 October 2019 on 1 <sup>st</sup> package	
End of Civil Works	31 July 2024 on last package	
Final Contract Administration	1 August 2024 to 31 October 2024	
Completion of Consulting Services-C	31 October 2024	

## 5.3 Staffing (Expertise Required)

Total [redacted] Professional (A) consultants (Foreign Persons) and [redacted] Professional (B) consultants (Local Persons) will be engaged, over [redacted]-month duration of consulting services, for a total of [redacted] person-months for Professional consultants (A) and [redacted] person-months for Professional consultants (B). Total consulting input is thus estimated at [redacted] person-months. A detailed schedule of consulting services and a distribution of man-months are shown in Attachment-3:

### 5.3.1 Consulting Input for the Respective Modules

The Consultant services consist of designing, construction supervision, and other services including tender assistances, which will be performed by following key personnel together with supporting staff. The allocation of person-month for the respective modules of consulting services, excluding national supporting staff, is shown in Table 5.2:

**Table 5.2 Allocation of Person-Month for the Respective Modules**

Nr.	Designation	No.	Design Module	Construction Module	Total
	<b>Professional (A): International Specialist</b>				
1	Section Leader (Road & Bridge)				
2	Bridge Design Engineer				
3	Hydraulic Structure Engineer/River Management				
4	Construction Supervision (Road & Bridge)				
	<b>Total (Professional A)</b>				
	<b>Professional (B):National Specialist</b>				
1	Deputy Section Leader (Road & Bridge)				
2	Road Design Engineer 1				
3	Road Design Engineer 2				
4	Road Design Engineer 3				
5	Road Design Engineer 4				
6	Bridge Design Engineer 1				
7	Bridge Design Engineer 2				
8	Bridge Design Engineer 3				
9	Geological Engineer				
10	Hydrologist/River Management				

Nr.	Designation	No.	Design Module	Construction Module	Total
11	Quantity & Cost Estimation 1				
12	Quantity & Cost Estimation 2				
13	Construction Supervision (Road & Bridge) 1				
14	Construction Supervision (Road & Bridge) 2				
15	Construction Supervision (Road & Bridge) 3				
16	Construction Supervision (Road & Bridge) 4				
17	Quality Management Engineer				
	<b>Total (Professional A)</b>				
	<b>Grand Total (Professional A &amp; B)</b>				

### 5.3.2 Qualification of Key Team Members

The qualifications of Key Team Members of Professional (A) and Professional (B) are shown in Table 5.3:

**Table 5.3 Qualification of Key Team Members**

Designation	Qualification
<b>Professional (A) International Specialist</b>	
Section Leader (Road & Bridge)	<ul style="list-style-type: none"> <li>✓ Should have at least 20 years' experience in road development project and its related project,</li> <li>✓ Should have handle at least 2 road projects as team/section leader,</li> <li>✓ Should have at least 2 projects engaged in a road construction project in rural/regional area including financial/disbursement management, procurement for LCB contract, etc. in developing countries,</li> <li>✓ Should have at least 2 projects in infrastructure projects in developing countries, and</li> <li>✓ Should have at least 2 projects in implementation of Japanese ODA projects.</li> </ul>
Bridge Design Engineer	<ul style="list-style-type: none"> <li>✓ Should have at least 15 years' work experience in road/bridge project and its related project,</li> <li>✓ Should have detail design experience on bridge for 3 projects,</li> <li>✓ Should have at least 2 projects in bridge construction project in rural/regional area of developing countries, and</li> <li>✓ Should have at least 1 project in implementation of Japanese ODA projects.</li> </ul>
Construction Supervision (Road & Bridge)	<ul style="list-style-type: none"> <li>✓ Should have at least 10 years' work experience in road project and its related project,</li> <li>✓ Should have at least 3 project experiences engaged in supervising and managing bridge construction project, and</li> <li>✓ Should have an experience(s) in bridge construction projects in developing countries, especially in rural/regional areas preferable.</li> </ul>
<b>Professional (B) National Specialist</b>	
Deputy Section Leader (Road Project)	<ul style="list-style-type: none"> <li>✓ Should have at least 20 years' experience in road development project and its related project.</li> <li>✓ Should have handled at least 2 projects as a team leader or a deputy team leader in implementation of road development projects, and</li> <li>✓ Should have an experience(s) engaged in foreign funded project</li> </ul>
Road Design Engineer 1	<ul style="list-style-type: none"> <li>✓ Should have at least 15 years' experience in road development project and its related project,</li> <li>✓ Should have design experiences on road involving longitudinal section design, cross section design, related facilities design such as drainage facility, construction planning, and other related planning works, and</li> <li>✓ Should have an experience(s) engaged in foreign funded project.</li> </ul>
Bridge Design Engineer 1	<ul style="list-style-type: none"> <li>✓ Should have at least 15 years' experience in road/ bridge development project and its related project</li> <li>✓ Should have design experiences on bridge involving layout design, superstructure design, substructure design, foundation design, construction planning, and other related design works, and</li> <li>✓ Should have an experience(s) engaged in foreign funded project.</li> </ul>

Consultant may propose other experts and supporting staff required to accomplish the tasks outlined in this TOR. It is the Consultant's responsibility to select the optimum team and to propose the professionals, which he/she believes best meets the needs of the DRD.

### 5.3.3 Scope of Works for the Respective Personnel

Detailed information on the major tasks and duties to be performed by the members of the detailed engineering design team and the construction supervision team is shown in Table 5.4:

**Table 5.4 Major Tasks and Duties of Team Members**

Designation	Major Tasks and Duties
Professional (A) (International Specialist)	
Section Leader (Road & Bridge)	<ul style="list-style-type: none"> <li>✓ General coordination and supervision of the section team,</li> <li>✓ Assumes direct responsibility for day-to-day consulting services,</li> <li>✓ Represents the section team in all matters relating to the performance of services</li> <li>✓ Assist overall projects management of DRD,</li> <li>✓ Provide necessary advice to DRD for smooth and efficient implementation of the respective sub-projects,</li> <li>✓ Assist DRD in preparation of periodical monitoring reports,</li> <li>✓ Assist in planning and conducting procurement,</li> <li>✓ Assist in managing financial process of the project, and</li> <li>✓ Assist in operation on disbursement and replenishment.</li> <li>✓ Assist in safety management.</li> </ul>
Bridge Design Engineer	<ul style="list-style-type: none"> <li>✓ Review of related reports of selected bridge portions and provision of advice for their improvement from a technical viewpoint,</li> <li>✓ Conduct detail design of bridge portions selected for implementations,</li> <li>✓ Prepare drawings and standard technical specifications for construction and procurement work,</li> <li>✓ Prepare cost estimation of bridge portions selected for implementations, and</li> <li>✓ Support to quality assurance in designing bridge sub-component.</li> </ul>
Hydraulic Structure Engineer/ River Management	<ul style="list-style-type: none"> <li>✓ Review of related reports of selected bridge portions and provision of advice for their improvement from a technical viewpoint</li> <li>✓ Providing hydraulic condition and river management method around bridge location for detail design of bridge portions selected for implementation</li> </ul>
Construction Supervision (Bridge)	<ul style="list-style-type: none"> <li>✓ Review proposed construction works,</li> <li>✓ Assist in monitoring and evaluation of project implementation including construction progress, quality control and quantity control in the bridge portions,</li> <li>✓ Prepare standard operation and maintenance manual of completed facilities, and</li> <li>✓ Support to quality assurance in implementing bridge sub-component.</li> </ul>
Professional (B) (National Specialist)	
Deputy Section Leader (Road Project)	<ul style="list-style-type: none"> <li>✓ Assist the Section Leader (Road &amp; Bridge) in carrying out all tasks and duties of the Section Leader,</li> <li>✓ Represent the Consultant's team of road and bridge under DRD portion during absence of the Section Leader, and</li> <li>✓ Perform specific issues/aspects delegated by the Section Leader.</li> </ul>
Road Design Engineer 1, 2, 3, 4	<ul style="list-style-type: none"> <li>✓ Review the standard designs on rural road,</li> <li>✓ Conduct the detailed designs of rural road and related facilities,</li> <li>✓ Prepare drawings and standard technical specifications for construction and procurement works,</li> <li>✓ Prepare cost estimation with BQ for rural road and related facilities,</li> <li>✓ Preparing tender documents, and</li> <li>✓ Support to quality assurance in designing bridge sub-component</li> </ul>
Bridge Design Engineer 1, 2, 3	<ul style="list-style-type: none"> <li>✓ Assist the Bridge Design Engineer (Professional A) in carrying out all tasks and duties of the Bridge Design Engineer (Professional A)</li> </ul>
Geological Engineer	<ul style="list-style-type: none"> <li>✓ Assist the Bridge Design Engineer (Professional A) in reviewing Geotechnical Survey Reports submitted by the Geotechnical Surveys and determining geotechnical conditions for detailed design.</li> </ul>

Designation	Major Tasks and Duties
Hydrologist/River Management	✓ Assist the Hydrologist/River Management (Professional A) in carrying out all tasks and duties of the Hydrologist/River Management (Professional A).
Quantity & Cost Estimation 1, 2	<ul style="list-style-type: none"> <li>✓ Preparing bills of quantities on rural bridge,</li> <li>✓ Preparing bills of quantities on rural bridge,</li> <li>✓ Assist the Experts of DRD in preparing bills of quantities on rural road.</li> <li>✓ Review existing cost estimation of the Project, and</li> <li>✓ Preparing the detailed cost estimation for rural roads and bridges in collaboration with other engineers.</li> </ul>
Construction Supervision 1, 2, 3, 4	<ul style="list-style-type: none"> <li>✓ Assist DRD in coordination and supervision on works of a contractor(s) for rural road and bridge,</li> <li>✓ Assist the experts of DRD in reviewing and approving Shop Drawings/ Construction Drawings for these works prepared by a contractor(s),</li> <li>✓ Assist the experts of DRD in reviewing and approving test reports for materials prepared by a contractor(s), and</li> <li>✓ Assist the Experts of DRD in inspection on the construction works implemented by a contractor(s).</li> </ul>
Quality Management Engineer	<ul style="list-style-type: none"> <li>✓ Assist Construction Supervision Experts in measuring quantities of works done by contractors for confirmation of the progress of works,</li> <li>✓ Assist Construction Supervision Experts in reviewing and certifying final measurements submitted by the contractors,</li> <li>✓ Assist Construction Supervision Experts in monitoring progress of works and estimating payment/ disbursement amount for the coming months for contractors if any,</li> <li>✓ Assist Construction Supervision Experts in preparing monitoring reports to be submitted to the DRD.</li> </ul>

## 5.4 Reporting

Within the scope of consulting services, the Consultant shall prepare and submit reports and documents to DRD as shown in Table 5.5. The Consultant shall provide electronic copies of each of these reports as well:

**Table 5.5 Summary of Reports to Be Submitted**

Category	Type of Report	Timing	No. of Copies
Detailed Design	Inception Report	Within 1 month after commencement of the services	5
	Draft Design Report for 1 <sup>st</sup> season construction	Within 3 months and after commencement of the services	5
	Draft Final Design Report	Within 11 months after commencement of the services	5
	Final Design Report	Within 12 months after commencement of the services	10
Tender Assistance	Pre-qualification Document	At appropriate timing	5
	Bidding Document	At appropriate timing	5
	Pre-qualification Evaluation Report	At appropriate timing	5
	Bid Evaluation Report	At appropriate timing	5
Construction Supervision	Inception Report	Within 1 month after commencement of the services on tender assistance	5
	Monthly Progress Report	Every month	5
	Quarterly Progress Report	Every quarter	5
	Project Completion Report	At the end of the services	10
Other Report	Technical Reports	As required or upon request	As required

### 5.4.1 For Detailed Design

- 1) Inception Report: presents the methodologies, schedule, organization, etc.,



- 2) Draft Design Report for 1st season construction: presents detailed engineering design and cost estimate for the 1st season construction portion,
- 3) Draft Final Design Report: presents draft final documents of detailed design and cost estimate, and
- 4) Final Design Report: presents final documents of detailed design and cost estimate and bid plan through reflection of comments on the Draft Final Design Report provided by DRD.

#### **5.4.2 For Tender Assistance**

- 1) Pre-qualification Document: presents the pre-qualification documents and its evaluation criteria.
- 2) Bidding Document: presents the bidding documents and bid evaluation criteria.
- 3) Pre-qualification Evaluation Report: presents the results of the evaluation with recommendations on the selection of the qualified applicants.
- 4) Bid Evaluation Report: presents the results of technical and price evaluation with recommendation on technically and financially responsive bidders.

#### **5.4.3 For Construction Supervision**

- 1) Inception Report: presents the methodologies, schedule, organization, etc.
- 2) Monthly Progress Report: describes briefly and concisely all activities and progress for the previous month by the 10th day of each month. Problems encountered or anticipated will be clearly stated, together with actions to be taken or recommendations on remedial measures for correction. Also indicates the work to be performed during the coming month.
- 3) Quarterly Progress Report: presents the progress status of the Project.
- 4) Project Completion Report: comprises outline of all facilities completed and construction records from the commencement through completion, together with key data and records.

### **5.5 Obligations of the Executing Agency (DRD)**

A certain range of arrangements and services will be provided by the DRD to the Consultant for smooth implementation of the Consulting Services. In this context, the DRD will:

#### **1) Reports and data**

Make available to the Consultant existing reports and data related to the Project as required.

#### **2) Office space**

The member of the Consultant, who will be engaged for consulting service-C, will use the offices prepared by IWUMD. However, the Consultant's requirement for office space, including necessary equipment, furniture and utilities, shall be clearly stated in the proposal with its rental cost for the case where the IWUMD would not be able to provide such facilities.

#### **3) Cooperation and counterpart staff**

Appoint counterpart officials, agent(s) and representative(s) as may be necessary for effective implementation of the Consulting Services.

#### **4) Assistance and exemption**

Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to:

- ✓ travel permits, stay permit, security application, and such other documents;
- ✓ VISAs and such other necessary documents,
- ✓ clearance through customs,
- ✓ instructions and information to officials, agent and representatives of the GOM,
- ✓ exemption from any requirement for registration to practice their profession, and
- ✓ privilege pursuant to the applicable law in Myanmar.

### **5) Topographic Survey and geological survey for rural bridge**

Topographic survey and geological survey at the project sites of rural bridge shall be conducted by DRD and be completed before or upon the deployment of Consultants for the detail design. The drawings will be formatted in an Auto-CAD digital data.

Necessary items of topographic survey for detail design on bridge are 1) plan survey around bridge, 2) longitudinal surveys at center line of bridge rout and access road, 3) cross sectional survey along center line of bridge route and access road, 4) longitudinal section of river (survey length is 10 times of river width), and 5) cross sectional survey of river.

Necessary items of geological survey for foundation design are 1) borehole drilling, 2) standard penetration test, and 3) laboratory test.

In addition to the above, DRD shall conduct topographic survey for the road being upgraded to asphalt pavement for detail design, such as 1) plan survey along the road, 2) longitudinal surveys at center line of road, 3) cross sectional survey along road.

## **Chapter 6 Consulting Service-D: Agriculture Mechanization Strengthening**

### **6.1 Terms of Reference for Consulting Services**

The consulting services under ‘Consulting Service-D: Agriculture Mechanization Strengthening’ are composed of the following:

- 1) Support on Capacity Building for Agricultural Mechanization Strengthening,
- 2) Construction Supervision of Maintenance Workshops and Agricultural Machineries Testing Center,
- 3) Assisting Services for Maintenance Workshop and Agricultural Machineries procured for Land Consolidation Works, and
- 4) Assisting Services for Agricultural Machineries Testing Center.

The consulting services do not include detail design of equipment to be procured, detail design of buildings such as maintenance workshops and agriculture machineries testing center, preparation of bidding documents, assistance on biddings, bidding evaluation and negotiation.

#### **6.1.1 Support on Capacity Building for Agricultural Mechanization Strengthening**

The Consultant, under Assistance Concept, shall carry out the following works:

- 1) Support AMD regarding planning and implementation of capacity building for the inspectors of Agricultural Machineries Testing Center, the mechanics of Maintenance Workshops and the Operators/Surveyors for land consolidation,
- 2) Monitor and evaluate the skills of the inspectors of Agricultural Mechanization Testing

Center measuring by checking their operation of the procured equipment, and suggest the further improvement plan,

- 3) Monitor and evaluate the skills of the mechanics of Maintenance Workshops by checking their operation skill of the procured equipment, and suggest the further improvement plan, and
- 4) Monitor and evaluate the land consolidation works using the procured equipment, and suggest the further improvement plan.

### **6.1.2 Construction Supervision of Maintenance Workshops and Agricultural Machineries Testing Center**

The Consultant, under Assistant Concept, shall carry out the following works:

- 1) Act as the Engineer to execute construction supervision and contract administration services in accordance with the power and authority delegated by the head office of AMD;
- 2) Provide assistances to the Employer concerning variations and claims which are to be ordered/issued at the initiative of the head office of the AMD;
- 3) Confirm land and soil conditions, floodwater levels around construction sites in the past, borehole water quality, and power supply stability in the Project sites.
- 4) Supervise the construction works carried out by contractor at the Project sites in Mandalay, Shwebo, Ye-U, Wetlet, Kanbalu, and Budalin. One supervisor shall cover Agricultural Machineries Testing Center, and other supervisors shall cover five (5) Maintenance Workshops.
- 5) Issue the commencement order to the Contractors,
- 6) Review and approve the proposals submitted by the contractors, which include work program, method statements, material sources, manpower and equipment deployment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012), the Consultant shall pay attention, in particular, to whether such proposals will meet the safety requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract;
- 7) Explain and/or adjust ambiguities and/or discrepancies in the contract documents and issue any necessary clarifications or instructions when contract-out works are to be made;
- 8) Review, verify and further detail the design of the works, approve the contractors' working drawings and, if necessary, issue further drawings and/or give instructions to the contractor;
- 9) Carry out field inspections on the contractor's setting out to ensure that the works are carried out in accordance with drawings and other design details;
- 10) Regularly monitor physical and financial progress against the milestones as per the contract and/or construction schedule so as to ensure completion of the works in time;
- 11) Supervise the works so that all the work requirements will be met by the contractors including those in relation to; i) quality of the works, ii) safety and iii) protection of the environment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012), the Consultant shall confirm that an accident prevention officer proposed by contractor is duly assigned at the work site(s) and that construction

works are carried out according to the requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract;

- 12) Supervise field tests, sampling and laboratory test to be carried out by the contractors;
- 13) Inspect the construction method, equipment to be used, workmanship at the site, and, when required, attend shop inspection and manufacturing tests in accordance with the specifications;
- 14) Survey and measure the work output performed by the contractors and issue work completion certificates and/or payment certificates in case of contract-out works such as interim payment certificates and final payment certificate as specified in the contract if it is necessary;
- 15) Coordinate the works among different organizations working for the Component;
- 16) Modify the designs, technical specifications and drawings, relevant calculations and cost estimates as may be necessary in accordance with the actual site conditions, and issue variation orders;
- 17) Carry out timely reporting to the AMD for any inconsistency in executing the works and suggesting appropriate corrective measures to be applied;
- 18) Inspect, verify and determine claims issued by contractors in accordance with the technical specifications of civil works in Myanmar or other related International Specifications;
- 19) Perform the inspection of the works and issue certificates such as the work performance and/or completion certificates, or otherwise taking-over certificate in case of contract-out works as specified in the contract if they are necessary;
- 20) Supervise testing and commissioning in case of goods, equipment and machineries procured and installed;
- 21) Provide periodical and/or continuous inspection services during defects liability period and if any defects are noted, instruct the contractors to rectify where they are necessary;
- 22) Check and certify as-built drawings submitted by the contractors and prepare and submit reports to the AMD, which are detailed in Reports in relation to the implementation of the Component;
- 23) Supervise installation work for the equipment procured by the Supplier at the Project sites in Mandalay, Shwebo, Ye-U, Wetlet, Kanbalu, and Budalin, and
- 24) Assist AMD to conduct detail design for additional works for installation of equipment and obtain permission from the Owner, if necessary.
- 25) Evaluate bids in accordance with the criteria set forth in the bidding documents. In such evaluation, the Consultants shall carefully confirm that bidders' submissions in their technical proposal including, but not limited to, site organization, mobilization schedule, method statement, supply and construction schedule, safety plan, have been prepared in harmony each other and will meet such requirements set forth in applicable laws and regulations, specifications and other parts of the bidding documents.

### 6.1.3 Assisting Services for Maintenance Workshops and Agricultural Machineries procured for Land Consolidation Works

The Consultant, under Assistance Concept, shall carry out the following works:

- 1) Confirm the skills of AMD mechanics by using procured machines and make the training plan for them,
- 2) Provide the technical supports on procured machines and workshop tools,
- 3) Support for the improvement on recording system of repair and maintenance services,
- 4) Coordinate the repair and maintenance services with the stakeholders,
- 5) Improve the operation manuals for major equipment, and
- 6) Prepare and submit working reports.

### 6.1.4 Assisting Services for Agricultural Machineries Testing Center

The Consultant, under Assistance Concept, shall carry out the following works:

- 1) Confirm the skills of AMD inspectors,
- 2) Provide the technical supports on testing procedures,
- 3) Provide the technical support on data analysis and description of testing results,
- 4) Coordinate the testing results to the stakeholders,
- 5) Provide the technical supports to improve the national testing code for the tractor,
- 6) Provide the technical supports to improve the operation manual of equipment for each test, and
- 7) Prepare and submit working reports.

## 6.2 Expected Time Schedule

The total duration of consulting services will be  months. The implementation schedule expected is presented in following table:

**Table 6.1 Implementation Schedule Expected**

Key Activities	Date	Duration in Months
Period of planning on capacity building	1 December, 2018	
Supervision of Construction Works	1 December, 2018 to 31 July, 2019	
Installation, Test-run, Initial Instruction by Supplier and Final Inspection of Equipment (on-the-job training)	1 July, 2019	
Special Capacity Building	1 August, 2019	
Monitoring and Evaluation of Capacity Building	1 December, 2019 to 31 December, 2020	
Technical Support on Equipment Operation for Maintenance Workshops	1 December, 2019 to 31 January, 2021	
Technical Support on Equipment Operation for Agricultural Machineries Testing Center	1 December, 2019 to 31 January, 2021	

### 6.3 Staffing (Expertise Required)

Total [ ] Professional (A) consultant (Foreign Person) and [ ] Professional (B) consultants (Local Persons) will be engaged, over the duration of consulting services, for a total of [ ] person-months for Professional consultant (A) and person-months for Professional consultants (B). Total consulting input is thus estimated at person-months. A detailed schedule of consulting services and a distribution of man-months are shown in Attachment-3:

#### 6.3.1 Consulting Input for the Respective Modules

The Consultant services consist of capacity building for AMD staff and construction supervision of Maintenance Workshops and Agricultural Machineries Testing Center, which will be performed by following consultant personnel together with supporting staff. The allocation of person-month for the respective modules of consulting services, excluding national supporting staff, is shown in Table 6.2:

**Table 6.2 Allocation of Person-Month for the Respective Modules**

Nr	Designation	No.	Construction Module	Monitoring Module	Total
	<b>Professional (A): International Specialist</b>				
1	Section Leader / Agricultural Mechanization Strengthening				
	<b>Total (Professional A)</b>				
	<b>Professional (B): National Specialist</b>				
2	Construction Supervisor for Maintenance Workshops				
3	Construction Supervisor for Agricultural Machineries Testing Center				
4	Specialist on Operation of Maintenance Workshop				
5	Specialist on Operation for Agricultural Machineries Testing Center				
	<b>Total (Professional B)</b>				
	<b>Grand Total (Professional A &amp; B)</b>				

#### 6.3.2 Qualification of Key Team Members

The qualifications of Key Team Members of Professional (A) and Professional (B) are shown below:

**Table 6.3 Qualification of Key Team Members**

Designation	Qualification
<b>Professional (A) International Specialist</b>	
Section Leader/ Agricultural Mechanization Strengthening	✓ Should have at least 20 years' experience in agricultural mechanization and its related projects including farm machineries, repair and maintenance workshop, post-harvest facilities, irrigation/drainage pump station and agricultural processing facilities,
	✓ Should have handled at least five agricultural mechanization projects involving planning, basic design, detail design and capacity building, and
	✓ Should have an experience(s) engaged in agriculture related projects carried out in Southeast Asia or South Asia.

Consultant may propose other experts and supporting staff required to accomplish the tasks outlined in this TOR. It is the Consultant's responsibility to select the optimum team and to propose the professionals, which he believes best meets the needs of AMD.

#### 6.3.3 Scope of Works for the Respective Personnel

Detailed information on the major tasks and duties to be performed by the members of the detailed engineering design team and the construction supervision team is shown in Table 6.4:

**Table 6.4 Major Tasks and Duties of Team Members**

Designation	Major Tasks and Duties
<b>Professional (A) (International Specialist)</b>	
Section Leader / Agricultural Mechanization Strengthening	<ul style="list-style-type: none"> <li>✓ Conducts sectional coordination and supervision of the section team during supervision and monitoring on capacity building,</li> <li>✓ Assumes direct responsibility for consulting services on capacity building,</li> <li>✓ Represents the section team in all matters relating to the performance of services during supervision and monitoring,</li> <li>✓ Review the operation manuals for Maintenance Workshop and Agricultural Machineries Testing Center,</li> <li>✓ Review the National Testing Code for Agricultural Tractor,</li> <li>✓ Monitor information dissemination from AMD to the stakeholders,</li> <li>✓ Assist test-run, initial instruction for operation and final inspection, and</li> <li>✓ Assist AMD to issue the completion certificate to the Supplier</li> <li>✓ Assist in safety management</li> </ul>
<b>Professional (B) National Specialist</b>	
Construction Supervisor for Maintenance Workshops	<ul style="list-style-type: none"> <li>✓ Review the Shop Drawing of the buildings for Maintain Workshops,</li> <li>✓ Review the Bills of Quantity described in the Contract Documents,</li> <li>✓ Confirm soil conditions, power supply, quality of underground borehole water and building floor level at the sites,</li> <li>✓ Check concrete quality, welding quality for main structure, electric wiring system, plumbing works, and others,</li> <li>✓ Confirm the maximum load of equipment,</li> <li>✓ Supervise additional works for installation of equipment,</li> <li>✓ Check defects and order repair if any, and</li> <li>✓ Conduct the final inspection with the Client.</li> </ul>
Construction Supervisor for Agricultural Machineries Testing Center	<ul style="list-style-type: none"> <li>✓ Review the Shop Drawing of the buildings and the testing course,</li> <li>✓ Review the Bills of Quantity described in the Contract Documents,</li> <li>✓ Confirm soil conditions, power supply, quality of underground borehole water and building floor level at the sites,</li> <li>✓ Check concrete quality, welding quality for main structure, electric wiring system, plumbing works, and others,</li> <li>✓ Confirm the maximum load of equipment,</li> <li>✓ Supervise additional works for installation of equipment,</li> <li>✓ Check defects and order repair if any, and</li> <li>✓ Conduct the final inspection with the Owner</li> </ul>
Specialist on Operation of Maintenance Workshop	<ul style="list-style-type: none"> <li>✓ Review the instruction manuals prepared by the Supplier,</li> <li>✓ Confirm skills of mechanics on re-building of engines and hydraulic testing,</li> <li>✓ Confirm skills of mechanics on diagnoses, disassembling and assembling of 4-Wheel Tractors and Combine Harvesters,</li> <li>✓ Advice the recording system of repair and maintenance,</li> <li>✓ Conduct safety operation seminar,</li> <li>✓ Monitor training progress for village mechanics conducted by AMS, and</li> <li>✓ Support the spare parts supply by AMS coordinating with the private dealers and the distributors.</li> </ul>
Specialist on Operation for Agricultural Machineries Testing Center	<ul style="list-style-type: none"> <li>✓ Review the instruction manuals prepared by the Supplier,</li> <li>✓ Confirm the National Testing Code prepared by AMD,</li> <li>✓ Confirm skills of inspectors on mechanism diagnoses, PTO performance test, engine performance test with fuel consumption, drawbar traction test, water/dust proof test, noise test, safety devise investigation of 4-Wheel Tractors,</li> <li>✓ Advice AMD of the recording system of test results,</li> <li>✓ Conduct safety operation seminar,</li> <li>✓ Monitor training progress for staff officers of Agricultural Machineries Testing Center, and</li> <li>✓ Support the information dissemination to applicants, banks, manufactures and consumers.</li> </ul>

## 6.4 Reporting

Within the scope of consulting services, the Consultant shall prepare and submit reports and documents to AMD as shown in Table 6.5. The Consultant shall provide electronic copies of each of these reports as well:

**Table 6.5 Summary of Reports to Be Submitted**

Category	Type of Report	Timing	No. of Copies
Equipment Supply and Construction Supervision	Inception Report	Within 1 month after commencement the services	5
	Monthly Progress Report of Building Construction	Every month	5
	Final Inspection Report of Equipment Supply	After completion of final inspection for equipment supply	5
	Final Inspection Report of Building Construction	After completion of final inspection for building construction	5
Monitoring	Technical Reports for Capacity Building	As required or upon request	As required
	Other reports, e.g. operation manuals for Agricultural Machineries Testing Center and Maintenance Workshops	As required or upon request	As required

### 6.4.1 For Supervision

- 1) Inception Report: presents the methodologies, schedule, implementing organizations, etc.
- 2) Monthly Progress Report for Building Construction: describes briefly and concisely all activities and progress for the previous month by the 10th day of each month. Problems encountered or anticipated will be clearly stated, together with actions to be taken or recommendations on remedial measures for correction. Also indicates the work to be performed during the coming month.
- 3) Final Inspection Report for Equipment Supply: comprises outline of all equipment and spare parts, inspection results, initial instruction (on-the-job training), contact persons for major equipment, instruction manuals prepared by the Supplier, and together with key data/ records/ photographs.
- 4) Final Inspection Report for Building Construction: comprises As-Built Drawing, diagrams of utility facilities, inspection results, contact persons for building maintenance, and together with key data/ records/ photographs.

### 6.4.2 For Monitoring

- 1) Technical Reports for Capacity Building: comprises implementing schedule, trained persons, contents of training and further suggestions
- 2) Other Reports: comprise improved operation manuals of equipment, revised National Code of Testing for 4-Wheel Tractor, information dissemination, etc.

## 6.5 Obligations of the Executing Agency (AMD)

A certain range of arrangements and services will be provided by the AMD to the Consultant for smooth implementation of the Consulting Services. In this context, the AMD will:

### 1) Reports and data

Make available to the Consultant existing reports and data related to the Project as required.



**2) Office space**

The member of the Consultant, who will be engaged for consulting service-D, will use the offices prepared by IWUMD. In addition, AMD will provide a suitable office space within AMD Mandalay office with necessary equipment, furniture and utility. However, the Consultant's requirement for office space, including necessary equipment, furniture and utilities, shall be clearly stated in the proposal with its rental cost for the case where the AMD would not be able to provide such facilities.

**3) Cooperation and counterpart staff**

Appoint counterpart officials, agent(s) and representative(s) as may be necessary for effective implementation of the Consulting Services.

**4) Assistance and exemption**

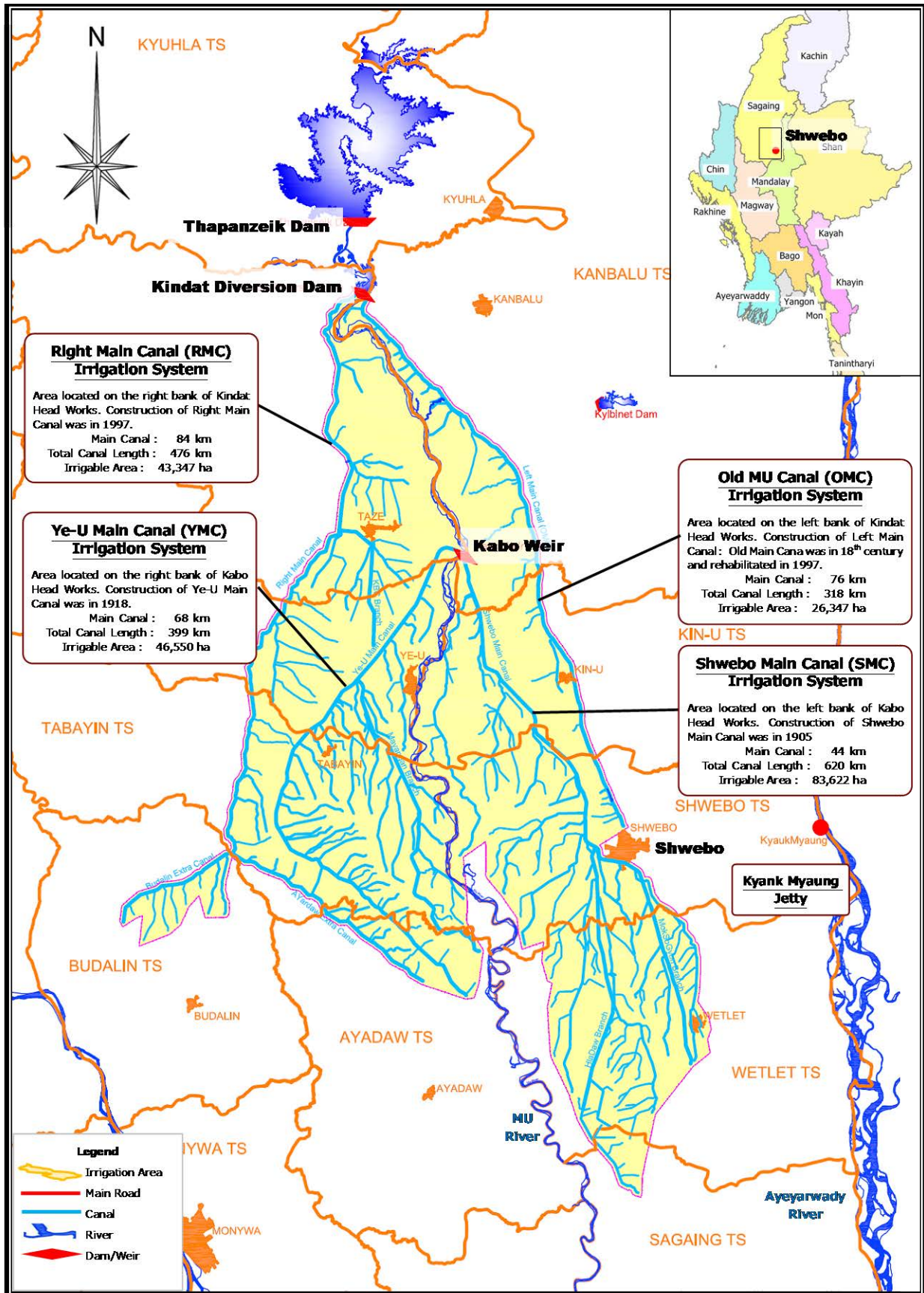
Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to:

- ✓ travel permits, stay permit, security application, and such other documents;
- ✓ VISAs and such other necessary documents,
- ✓ clearance through customs,
- ✓ instructions and information to officials, agent and representatives of the GOM,
- ✓ exemption from any requirement for registration to practice their profession, and
- ✓ privilege pursuant to the applicable law in Myanmar.

**5) Web site design and its operation**

AMD shall appoint necessary technical staff for information dissemination for testing results of 4-Wheel Tractor through the web sites.

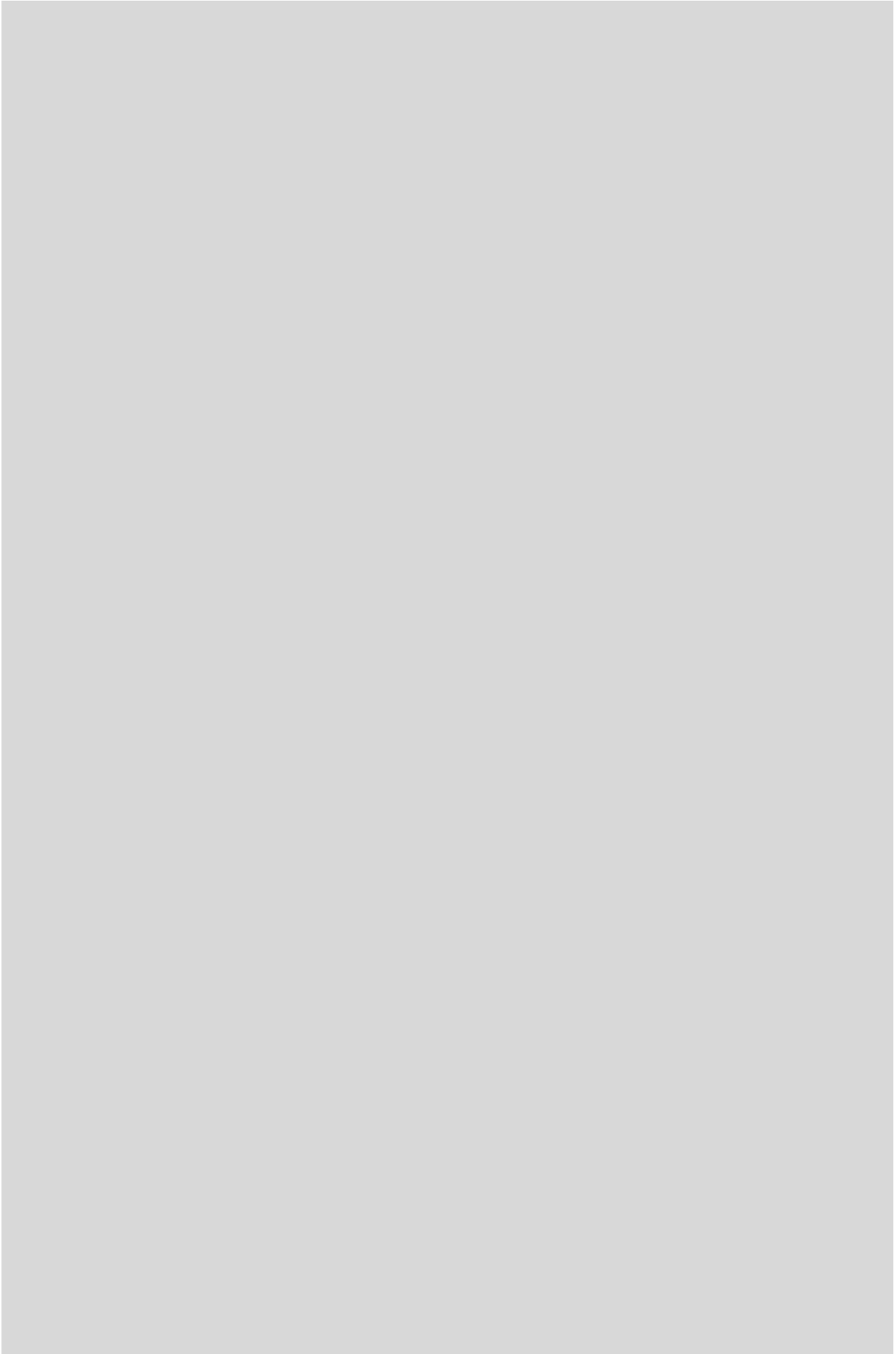
Attachment-1



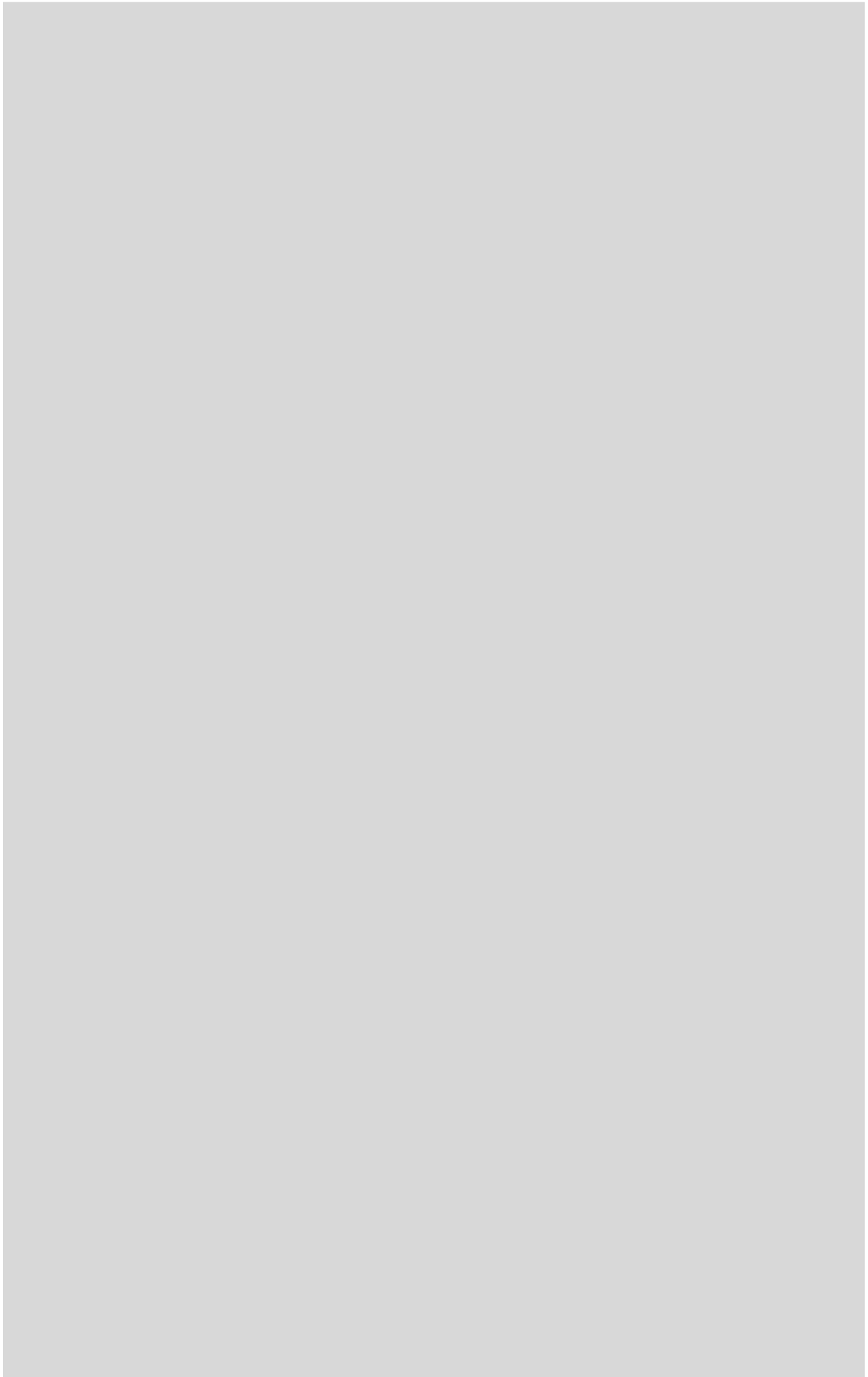
**Location Map of Preparatory Survey on Agricultural Income Improvement Project (AIIP)**

This map shows irrigation areas for the project identified based on the existing available data provided by Irrigation and Water Utilization Management Department (IWUMD). Areas surrounded by orange lines show the target irrigation areas of this project.

**Attachment-2: Project Implementation Schedule**



**Attachment-3: Expected Manning Schedule for the Consulting Services**



#### Attachment-4: Design Works (Irrigation and Drainage Improvement)

Total length and number of canals in 4 irrigation systems is indicated in Table 1 and proposed canal rehabilitation works in 4 irrigation systems is mentioned in Table 2. Although whole hydro design of canal systems shall include all canals, minor canals are excluded from the detail design in the consulting service. Detail design on minor canals will be conducted by design branch of IWUMD.

Scope of design for Kindat Diversion Dam, Kabo weir and canal structure is indicated in Table 3, Table 4 and Table 5 respectively. Regarding canal structure, number of the minor repair also is included in the table. Although detail design is not necessary for minor repair, the Consultant shall propose some standard repair method and state-of-the-art technology for repair works.

The Consultant shall confirm the result of structure survey conducted by IWUMD maintenance office and will conduct joint inspection for the structures which need major rehabilitation, and then both parties shall decide the structures which need rehabilitation, and therefore rendered for detail design.

Scope of design for canal inspection path (road) is mentioned in Table 6. The Consultant shall make design for paved portion, though it will be designed together with canal section design. Other portions shall be designed together with canal section design.

Scope of design for drainage improvement is mentioned in Table 7. In addition, the Consultant shall conduct analysis for the flood entering into OMC and then make design of additional flood control facilities such as spill-out, if necessary, and also propose the improvement of flood and drainage management system.

**Table 1 Number of Canal and Total length of Canal (km) by category**

Canal category	OMC		SMC		RMC		YMC		Total	
	Nos	km	Nos	km	Nos	km	Nos	km	Nos	km
Main canal	1	76.2	1	43.7	1	84.0	1	68.0	4	271.9
Branch canal	0	0.0	2	63.5	3	73.4	1	29.1	6	166.0
<b>Sub total</b>	1	76.2	3	107.2	4	157.4	2	97.1	10	437.9
Dy Canal	21	44.4	21	267.1	21	125.8	38	241.7	101	679.0
Minor Canal	35	106.8	76	246.0	46	193.2	27	59.8	184	605.8
DO	23	90.4								90.4
<b>Sub total</b>	79	241.6	97	513.1	67	319.0	65	301.5	285	1,375.2
<b>Total</b>	80	317.8	100	620.3	71	476.4	67	398.6	295	1,813.1

Note: Branch canal, Dy (Distributary) canal, Minor canal and DO (watercourse) are categorized by the size of irrigable area. DO has 50 – 150 acre, Minor canal has less than approx. 2,000 acre, Dy canal has more than approx. 2,000 acre and Branch canal is of main canal class having Dy canals. However, some of the Dy canals are quite smaller even than minor canal.

Irrigable area of DO is usually 50 – 150 acre; however, DO of OMC is quite different from those DOs of other irrigation systems, which have large irrigable area likely same as Dy canal. Therefore, only DO of OMC is mentioned in above table.

**Table 2 Proposed Canal Rehabilitation Works in 4 Irrigation System**

Item		Unit	OMC	RMC	SMC	YMC	Total
Main & Branch canal	Desilting of canal bed and Reshaping of Canal Section	Thousand m3	411	726	1,015	726	2,878
	Lining of Canal	Km	28	21	60	28	137
Dy & Minor canal	Unsilting of canal bed & Reshaping of Canal Section	Thousand m3	474	627	648	791	2,540
	Lining of Canal	Km	31	30	143	41	245

**Table 3 Detail Design for Kindat Diversion Dam**

No	Description	unit	Quantity
<b>I Rehabilitation of the Undersluice gate</b>			
1	Replacement of undersluice gate B 3.0 m x H 2.4 m (B 10 ft x H 8 ft) duplex stainless steel gate leaf of roller slide gate		
<b>II Rehabilitation of the gate of Head Regulator</b>			
1	Replacement of Intake gate for Head regulator of Right Main Canal (RMC) B 2.4 m x H 1.8 m (B 8 ft x H 6 ft) duplex stainless steel gate leaf of roller slide gate		
2	Replacement of Intake gate of I Head regulator of Old Mu Canal (OMC) B 2.4 m x H 1.8 m (B 8 ft x H 6 ft) duplex stainless steel gate leaf of roller slide gate		
<b>III Repair and maintenance of side drainage on dam</b>			
1	Maintenance of side drainage on surface of dam D/S slope		
<b>IV Upgrade of emergency spillway</b>			
1	Construction of the concrete crest (width 500ft) for the emergency spillway		
2	Construction of protection wall for inlet and outlet of the spillway		
3	Construction of riverbed protection at D/S of the spillway		
4	Excavation of spillway canal (L=approx.8,500 ft)		
<b>V Dredging of sedimentation for RMC Head Regulator</b>			
1	Dredging of Sedimentation for head-race canal		
2	Dredging of Sedimentation for RMC intake area:		

**Table 4 Detail Design for Kabo Weir**

No	Description	unit	Quantity
<b>I Replacement of spillway gate</b>			
1	Procurement of the gate with operation device (hydraulic overturning gate: duplex stainless steel, spillway width 455 ft)		
2	Installation of gate and related facility construction		
<b>II Rehabilitation of the Undersluice gate &amp; operation deck</b>			
1	Replacement of gate leaf of undersluice gate (in front of head regulator of SMC) with counterweight manual operation device, B 12.19 m x H 3.35 m (B 40 ft x H 11 ft), duplex stainless steel roller slide gate		
2	Replacement of gate leaf of undersluice gate (in front of head regulator of YMC) with counterweight manual operation device, B 9.14 m x B 3.65 m (B 30 ft x B 12 ft) duplex stainless steel roller slide gate		
<b>III Rehabilitation of the gate of head regulator</b>			
1	Rehabilitation of Intake Gate for Irrigation (Head regulator of SMC) B 5.79 m x B 2.29 m (B 19 ft x B 7.5 ft) radial gate with counterweight		
2	Rehabilitation of Intake Gate for water supply Irrigation (Head regulator of SMC) B 5.79 m x B 2.29 m (B 19 ft x B 7.5 ft) slide gate with counterweight		
3	Replacement of Intake Gate (Head regulator of YMC) to hydraulic overturning gate B 5.59 m x B 1.76 m (B 18.33 ft x B 5.8 ft) duplex stainless steel		
<b>IV Protection of the bank at U/S of the weir</b>			
1	Raising of the right river bank at U/S of the weir		
2	Protection of the bank at U/S of the weir		
<b>V Removing of sand bank at U/S right side of the weir</b>			
1	Removing of sand bank at U/S right side of the weir		
<b>VI Protection of reverbed at D/S of the weir</b>			
1	Protection of reverbed at D/S of the weir		
<b>VII Protection of right bank at D/S of the weir</b>			
1	Protection of right bank at D/S of the weir		

**Table 5 Summary on number of canal structure rehabilitation**

Item		Unit	OMC	RMC	SMC	YMC	Total
Main canal	Rehabilitation of the Cross Regulator	Nos	13	6	6	7	32
	Rehabilitation of the Bifurcation	Nos	-	1	1	1	3
	Rehabilitation of the Head Regulator	Nos	40	14	15	29	88
	Rehabilitation of the Direct outlet	Nos	-	65	60	142	267
	Rehabilitation of the Drop Structure	Nos	1	-	-	-	1
	Rehabilitation of the Syphon	Nos	2	13	4	2	21
	Rehabilitation of the flume (canal bridge)	Nos	-	2	2	-	4
	Rehabilitation of the Spill-in structure	Nos	-	4	4	-	8
	Construction of the Spill-in structure	Nos	8	-	-	1	9
	Rehabilitation of the Spill-out structure	Nos	17	3	1	-	21
	Rehabilitation of the Cross Drainage	Nos	-	10	-	14	
	Rehabilitation of the Bridge	Nos	4	21	2	9	36
Branch & Extension canal	Rehabilitation of the Cross Regulator	Nos		11	-	-	11
	Rehabilitation of the Head Regulator	Nos		30	9	13	52
	Rehabilitation of the Direct outlet	Nos		75	77	79	231
	Rehabilitation of the Check Drop	Nos		10	25	8	43
	Rehabilitation of the Syphon	Nos		5	1	-	1
	Rehabilitation of the flume (canal bridge)	Nos		1	-	-	1
	Rehabilitation of the Spill-in structure	Nos		18	-	-	18
	Rehabilitation of the Spill-out structure	Nos		8	-	-	8
	Rehabilitation of the Cross Drainage	Nos		19	-	-	19
	Rehabilitation of the Bridge	Nos		9	9	8	26
Dy & Minor canal	Rehabilitation of the Check Structure	Nos	36	10	12	10	78
	Rehabilitation of the Head Regulator	Nos	39	29	75	23	166
	Rehabilitation of the Outlet (Turn-out)	Nos	917	717	1,589	1,065	4,288
	Rehabilitation of the Drop Structure	Nos	114	80	173	75	472
	Rehabilitation of the Syphon	Nos	1	1	5	-	7
	Rehabilitation of the flume (canal bridge)	Nos	2	-	-	-	2
	Rehabilitation of the Spill-in structure	Nos	3	-	-	-	3
	Rehabilitation of the Spill-out structure	Nos	-	-	-	-	-
	Rehabilitation of the Cross Drainage	Nos	10	3	9	17	39
	Rehabilitation of the Bridge	Nos	31	10	18	9	68

**Table 6 Detail Design for Inspection Roads of Canals**

Type of Canal	Kanker to Asphalt		Kanker to Metal/Macadam		Earth to Kanker		Repair of Kanker		Total		
	(mile)	(km)	(mile)	(km)	(mile)	(km)	(mile)	(km)	(mile)	(km)	(%)
Main Canal	15.09	24.29	134.76	216.88	0.00	0.00	9.11	14.64	<b>158.96</b>	<b>255.81</b>	<b>40%</b>
Branch Canal	11.53	18.56	47.91	77.11	5.11	8.23	6.24	10.04	<b>70.79</b>	<b>113.95</b>	<b>18%</b>
DY Canal	0.00	0.00	27.89	44.90	136.60	219.81	0.00	0.00	<b>164.49</b>	<b>264.71</b>	<b>42%</b>
<b>Total</b>	<b>26.62</b>	<b>42.85</b>	<b>210.56</b>	<b>338.89</b>	<b>141.71</b>	<b>228.04</b>	<b>15.35</b>	<b>24.68</b>	<b>394.24</b>	<b>634.47</b>	<b>100%</b>
	<b>7%</b>		<b>53%</b>		<b>36%</b>		<b>4%</b>		<b>100%</b>		

**Table 7 Proposed Drainage Excavation and Strengthening of Embankment**

1 Excavation of Hnamazayit drainage channel	5m	
2 Strengthening of embankment of Hnamazayit drainage channel	2km	
3 Excavation of Nyaungpintha - Kyeekan drainage channel	7km	
4 Excavation of Natkyitan drainage channel	15km	
5 Excavation of Thabyetha - Zeetaw drainage channel	3km	
6 Excavation of Repair of inside Thatkal chaung	20km	

1 Excavation of Hnamazayit drainage channel	5m	
2 Strengthening of embankment of Hnamazayit drainage channel	2km	
3 Excavation of Nyaungpintha - Kyeekan drainage channel	7km	
4 Excavation of drainage channel	8km	
5 Construction of new bypass drainage channels	11km	



## Attachment-5: Design on Rural Road and Bridges

Scope of design for Rural Road and Rural Bridge is mentioned in table 1 and table 2 respectively. The Consultant shall make design for paved portion by international standard design level, although other portion can be design by local standard design level.

**Table 1 Detail Design for Rural Road**

District	Township	Pavement Type and Road Length						
		Metal / Macadam		Asphalt		Total		
		(mile)	(km)	(mile)	(km)	(mile)	(km)	%
Kanbalu	Kanbalu	46.04	74.11	0.00	0.00	46.04	74.11	11%
Shwebo	Kin-U	29.95	48.21	9.30	14.97	39.25	63.18	10%
	Shwebo	62.04	99.83	4.25	6.84	66.29	106.67	16%
	Wetlet	43.25	69.63	0.00	0.00	43.25	69.63	11%
	Taze	72.20	116.23	2.50	4.02	74.70	120.25	18%
	Ye-U	29.05	46.76	3.25	5.23	32.30	51.99	8%
	Tabayin	61.09	98.32	6.00	9.65	67.09	107.97	16%
Monywa	Budalin	26.25	42.25	0.00	0.00	26.25	42.25	6%
	Ayadaw	7.50	12.07	7.00	11.27	14.50	23.34	4%
<b>Total</b>		<b>377.37</b>	<b>607.41</b>	<b>32.30</b>	<b>51.98</b>	<b>409.67</b>	<b>659.39</b>	<b>100%</b>
		<b>92%</b>		<b>8%</b>		<b>100%</b>		

**Table 2 Detail Design for Rural Bridge**

District	Township	No. of Bridges	Total Length of Bridges	Villages concerned	Beneficiary households	Beneficiary population	Remarks
Kanbalu	Kanbalu	2	120 ft	6	1,923	8,022	
	Kyunhla	1	150 ft	4	687	2,250	
Shwebo	Kin-U	2	120 ft	7	1,691	8,394	
	Shwebo	14	1,400 ft	36	8,713	40,133	
	Wetlet	3	220 ft	8	3,589	12,778	
	Taze	7	940 ft	35	5,401	22,791	
	Ye-U	2	130 ft	29	2,991	15,201	
	Tabayin	8	350 ft	26	5,727	27,861	
Monywa	Budalin	3	140 ft	11	1,948	10,269	
<b>Total</b>		<b>42</b>	<b>3,570 ft</b>	<b>162</b>	<b>32,670</b>	<b>147,699</b>	

**Table 3 Planned Design Conditions of Bridges attached to Rural Road**

Item	Specification
1) Bridge Width:	More than 18 feet (roadway width; 12 feet+ shoulder; 3 feet * 2) or more than existing width
2) Lane Load Capacity:	20 ton (for dump track etc.)
3) Length of Corner Cut*	More than 5 feet
4) Structure:	
a) Superstructure;	Reinforced Concrete (RC) slab or steel-concrete composite slab
b) Substructure;	Reinforced Concrete (RC) or brick structure
c) Foundation;	Spread foundation or cast-in-place concrete pile (depending on the ground condition)

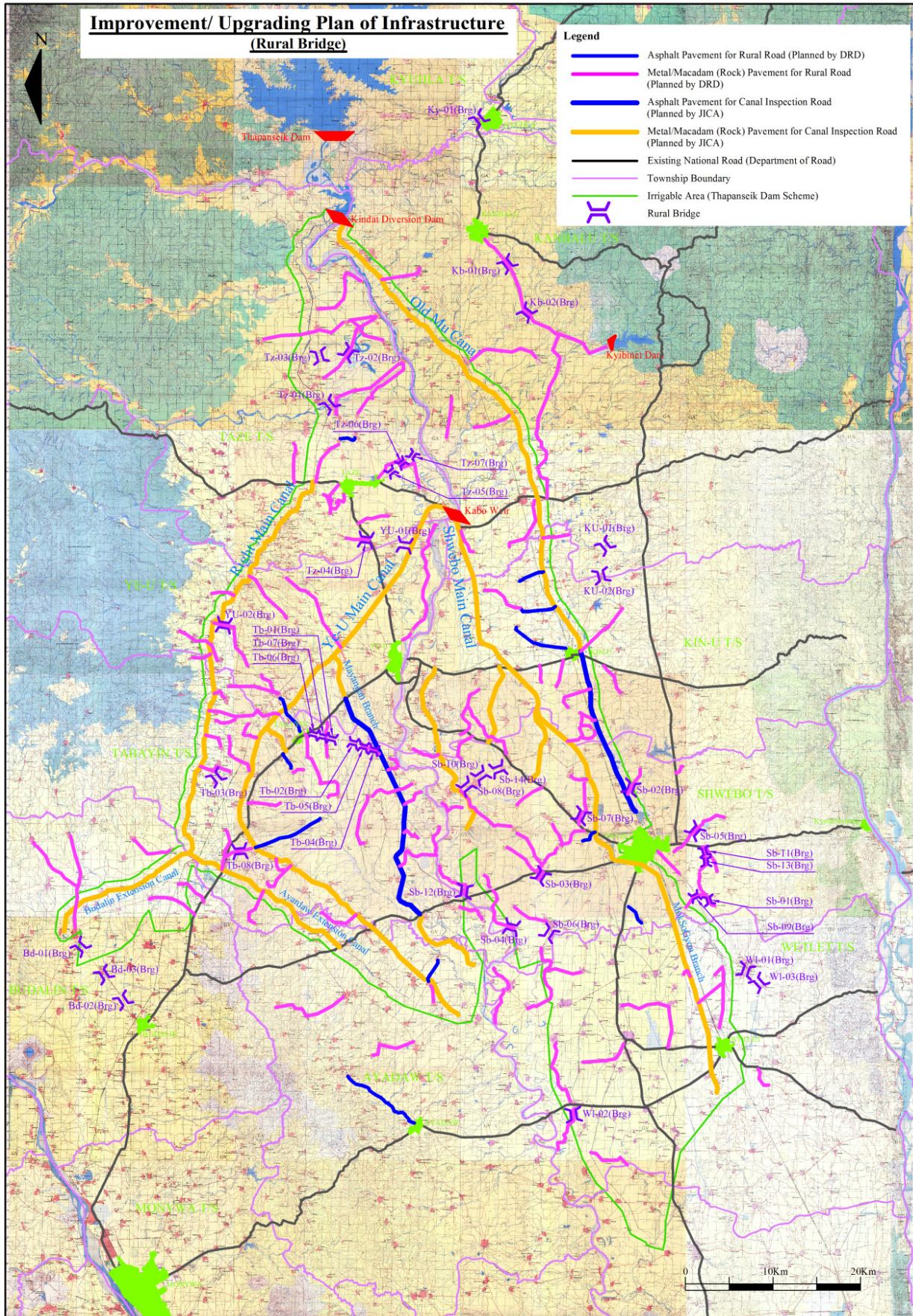


Figure 1 Rehabilitation Plan of Rural Road/ Bridges (DRD) and Canal Inspection Road (IWUMD)

# **APPENDIX-XIII**

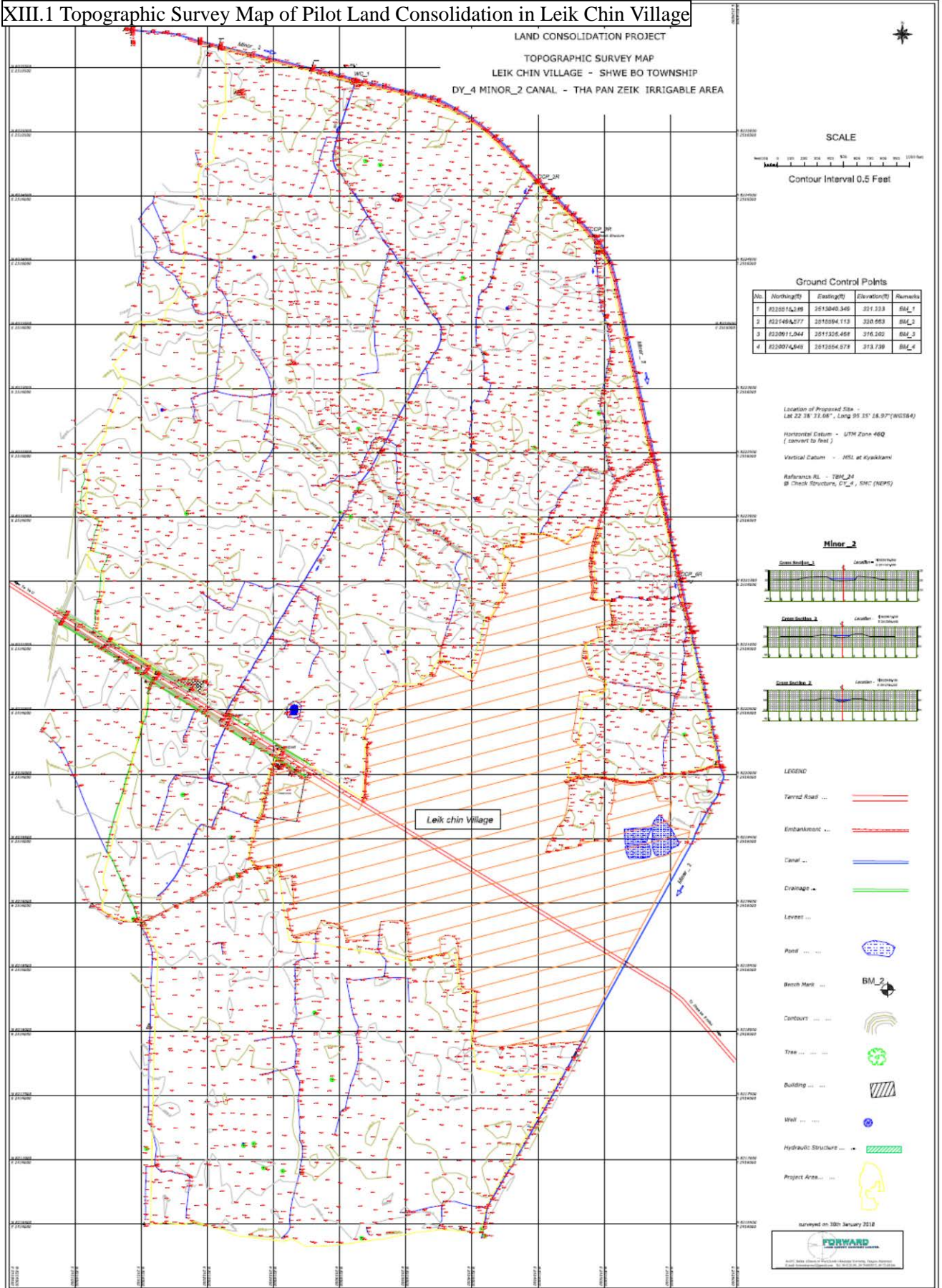
## **LAND CONSOLIDATION PILOT ACTIVITIES (LEIK CHIN VILLAGE)**

**APPENDIX XIII: LAND CONSOLIDATION PILOT ACTIVITIES  
(LEIK CHIN VILLAGE)**

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XIII.3	Drawing of Draft Land Consolidation Design.....	XIII-3

**XIII.1 Topographic Survey Map of Pilot Land Consolidation in Leik Chin Village**



XIII.2 Cadastral Survey Map of Pilot Land Consolidation in Leik Chin Village

