

TRIMMU AND PANJNAD BARRAGES IMPROVEMENT PROJECT

OUTLINE TERMS OF REFERENCE OF CONSTRUCTION SUPERVISION CONSULTANT

I Background

1. Trimmu Barrage, located downstream of the confluence of Jhelum and Chenab Rivers, was commissioned in 1939. The barrage was designed to pass a maximum flood discharge of 18,264 m³/s (645,000 cusecs). The safe discharging capacity is reduced to 12,743 m³/s (450,000 cusecs) due to formation of bela upstream the barrage, whereas hydrologic studies indicate that the barrage should be upgraded for a flood of 24,788 m³/s (875,000 cusecs). Panjnad Barrage, commissioned during the period 1925-1929, is located across river Chenab downstream its confluence with River Sutlej. It has a design discharge of 19,822 m³/s (700,000 cusecs). Hydrologic studies indicate that the barrage should be upgraded for a flood of 24,495 m³/s (865,000 cusecs). The overall CCA of canal commands of two barrages is 1.82 million ha, which is about 22.2 % of the total CCA of Punjab and about 11.88 % of the entire CCA of the country.

2. Three canals, with total withdrawal capacity of 577.1 m³/s (20,380 cusecs) off take from Trimmu Barrage. The Haveli Canal and Trimmu-Sidhnai (T.S.) Link Canal off take from its left flank with a design discharge capacity of 146.4 cms (5,170 cusec) and 354 cms (12,500 cusec) respectively whereas Rangpur Canal off takes from the right bank with a design capacity of 76.7 cms (2,710 cusec). Haveli Canal irrigates 275,190 ha (679,985 acres) in Jhang and Multan districts whereas Rangpur Canal feeds 132,600 ha (327,650 acres) in Jhang⁵ nd Muzaffargarh Districts. Water transferred to Ravi River through T.S. Link is further diverted to Sidhnai-Mailsi (S.M.) Link to serve about 677,015 ha (1.672 million acres), in Vehari, Lodhran and Bahawalpur Districts. The overall CCA of Trimmu Barrage Command Canals is 1.085 M. ha (2.68 million acres) which is about 13.19% of the total CCA of Punjab.

3. Panjnad barrage was constructed with a design discharge of 12,743 m³/s (450,000 cusec) and upstream HFL RL 104.09 m (341.5 ft) to irrigate 741,613 ha (1.8325 million acres) area of Bahawalpur and Rahimyar Khan districts by diverting 336.5 m³/s (11,882 cusec) through Panjnad and Abbasia canals. The barrage had 4 bays as left pocket and 29 bays as the main weir with total clear water way of 603.5 m (1980 ft.). After the un-precedented flood of 15,574 m³/s (550,000 cusec) confronting the barrage in September 1929, the Islam Enquiry Committee recommended raising its design discharge capacity to 19,822 m³/s (700,000 cusec). Accordingly, right guide bank of the barrage was dismantled and an annexed weir comprising 14 bays (bays No. 34 to 47) was constructed, raising the barrage capacity to 19,822 m³/s (700,000 cusec) with the same HFL, crest RL and pond level. The barrage was re-commissioned in the year 1932. Hydrologic studies indicate that the Barrage should now be capable to pass a 100 year return period flood of 24,495 m³/s (865,000 cusecs).

4. Three canals, with total withdrawal capacity of 408.7 m³/s (14,433 cusecs) off take from the Panjnad Barrage Initially, Panjnad Canal with a capacity of 220 m³/s (7769 cusecs) and Abbasia Canal with a capacity of 30.1 m³/s (1,064 cusecs) were constructed. Later on during 1992, Abbasia Link Canal adjoining Abbasia Canal was constructed with a

design capacity of 158.6 m³/s (5600 cusec). The Panjnad Canals system irrigates 655,614 ha of land in Bahawalpur and Rahimyar Khan Districts serving a population of 7.55 million.

II Objectives of the Assignment

5. Trimmu and Panjnad Barrages improvement Project (TPBIP) aims at rehabilitation and upgrading of two major barrages in the Punjab; (i) Trimmu Barrage; and (ii) Panjnad Barrage on the Chenab River¹ in Punjab Province. The major interventions involve increasing the safe carrying capacity of the two barrages and improvements to the structures and gates etc. The works will be implemented through two ICB-Contracts (one each for Trimmu Barrage and Panjnad Barrage) in an orderly manner with a high standard of workmanship and specified quality of materials within the stipulated construction period and in conformity with the approved drawings, specifications and contract management as per Multilateral Development Bank Harmonized Edition of FIDIC General Conditions of Contract for Construction, acceptable environmental standards and in accordance with the Client's requirements. The estimated construction time for Trimmu and Panjnad Barrages is forty eight (48) months and forty two (42) months respectively including twelve (12) months of Defects Notification Period (DNP). The estimated duration of consultancy services is fifty one (51) months, including twelve (12) months of maintenance period during which the consultants shall maintain minimum staff to perform the required tasks of finalizing the contracts. In order to complete the start-up project review activities well in time, the consultants will be installed about three (03) months ahead of the planned mobilization of work contractors. The consultants will require three teams: one at Lahore and one each at Trimmu Barrage and Panjnad Barrage to supervise the barrage contract. The consultancy assignment envisages time input of 497 person-months of key-experts (international experts: 32 person-months and national experts: 465 person-months) and time input of 393 person-months of the non-key experts. This further includes an additional pool of 150 unallocated person-months for professionals (key staff: 75 + non-key staff: 75) to support implementation of assignment components as and when required

6. Rehabilitation and Upgrading of Trimmu Barrage

Following works are proposed at Trimmu Barrage.

- (i) Enhancing the existing flood discharge capacity of Trimmu Barrage to 24,788 m³/s (875,000 cusec) for passing 100-year return period flood discharge determined through hydrological analysis.
- (ii) Rehabilitation and upgrading of existing Barrage and its ancillary works, enabling them to perform their designed functions and to ensure improved and reliable irrigation supplies.
- (iii) Partial removal of shoal (Bela)
- (iv) Improved capacity of the farmers and EA's staff.

7. Rehabilitation and Upgrading of Panjnad Barrage:

Following works are proposed at Panjnad Barrage.

- (i) Enhancing the existing flood discharge capacity of Panjnad Barrage to 24,495 m³/s (865,000 cusec) for passing 100-year return period flood discharge determined through hydrological analysis.

¹ Feasibility study and Tender documents for the project have been prepared under PIAP (Loan PAK 2300).

- (ii) Rehabilitation and upgrading of existing Barrage and its ancillary works, enabling them to perform their designed functions and to ensure improved and reliable irrigation supplies.
 - (iii) Improved capacity of the farmers and EA's staff.
8. The consultants selected for construction supervision of Trimmu and Panjnad Barrages Improvement Project (TPBIP) will be responsible for;
- a) Carrying out all required surveys and investigations if needed, reviewing the detailed design of all required civil, mechanical and electrical works and updating the design as required based on newly generated information,
 - b) Procurement of work Contracts² and contract management of civil, mechanical and electrical works of both barrages including all associated head regulators and river training works.
 - c) Provision of all necessary working drawings ensuring quality construction and strict compliance with the resettlement plan, and implementation of, in compliance with the site specific environmental management plan (SSEMP) and, specifications and measurement and certification of completed works facilitating contractor's progress payments.

III SCOPE OF SERVICES

9. The scope of services for the consulting services will include but is not limited to:

General Scope

- (i) Review and up-date the Contractor's programme for implementation of various phases of the project and revise critical path analysis, if necessary.
- (ii) Assist PMO in maintaining detailed financial accounts and other project records, and prepare other documentation as may be required by the PID/ PMO or ADB;
- (iii) Review and approve Site Specific Environmental Management Plan (SSEMP) prepared by the contractor based on the EMP in the bidding documents, review and supervise implementation of the environmental mitigation measures and monitoring plan in line with ADB's safeguard policy statement (2009);
- (iv) Prepare rules for optimal sediment sluicing through the two barrages as well as rules for both flood management and normal barrage operations and incorporate all into a detailed operation manual for each Barrage;
- (v) Prepare Environment and Health Safety Plan, Change Management Statement if required, Gender Action Plan (GAP) and Resettlement Plans (RPs) for all locations where project civil works will involve land acquisition and/or livelihood disruption on Rights of Way;
- (vi) Keep the Employer informed of the technical and environment/ social issues and progress of all contractual works both by direct contacts and through discussions or correspondence.
- (vii) Monitor and carry out activities related to implementation of Environmental Management, Gender Action Plan (GAP) and Resettlement Plans in line with

² The Consultants, according to the recruitment schedule and the procurement schedule for the main works contract may arrive late in time to support PMO in the award of contract.

relevant ADB guidelines. In this respect the consultant will ensure that all project components designed and supervised by the Consultants are implemented in an environmentally friendly manner and taking adequate mitigation measures wherever necessary;

- (viii) Assist PMO/ EA in implementation of Resettlement Plan;
- (ix) Scrutinize and approve the Contractor's staff and labour proposals and work programme;
- (x) Provide technical support to PMO as required specially in submitting withdrawal applications to ADB for direct payment to the contractor;
- (xi) Prepare responses to audit observations and paras in respect of payments certified by the Consultant and assist the Employer in getting them resolved during and after completion of the project;
- (xii) Prepare detailed implementation plans preferably using modern software such as Primavera (P6) or equivalent for monitoring project activities and generating progress reports using 'earned value' criteria. This shall provide a baseline for all subsequent plan amendments, if needed;
- (xiii) Assist the PMO in appointment of works contractors and prepare all relevant documents for award of contracts;
- (xiv) Prepare monthly and quarterly progress reports from quality control, quantity survey and field measurements using the latest software acceptable to the Employer;
- (xv) Prepare a comprehensive Construction Completion Report on completion of the contract, inclusive of as-built drawings based on the "as constructed" drawings, prepared by the Contractor, as appropriate;
- (xvi) Assist the Employer in taking over the contract works and prepare list of items of works to be completed by the Contractor during defects notification period (DNP); also prepare inventory of buildings installation and plants etc;
- (xvii) Attend, Project level meetings, all Steering Committee meetings and meetings with ADB missions as required;
- (xviii) Provide necessary support to the Panel of Experts (POE) for review of project design and on-construction related issues; and
- (xix) Assist PMO/ EA in commissioning of both sub projects.

Specific Scope

Contract and Construction Management

- (i) Undertake full administration of construction contracts and supervise construction works (including civil, electrical & mechanical works) covering also Defects Notification Period (DNP) assuming the role of "the Engineer" and undertake all tasks as per Multilateral Development Bank Harmonized Edition of FIDIC General Conditions of Contract for Construction. This shall include on-site supervision of the contractors' works for compliance with the specifications, review of Contractor's

submittals, verification of progress, preparation of interim payment requests, certification, checking and approving the quality assurance procedures produced by the contractors;

- (ii) Oversee and supervise construction of works ensuring compliance to details provided in the construction drawings and strict adherence to construction specifications;
- (iii) Review/ confirm/ recommend appropriate changes to the contractor,s construction schedule keeping in view river flows and seasonal changes. Monitor and update the contractor's program at regular intervals and revise critical path analysis, if necessary;
- (iv) Put in place a comprehensive quality control program including detailed methodology for inspection, sampling and testing and confirm its adequacy in the field and ensure satisfactory employment at site;
- (v) Establish a comprehensive program for quality control, surveying and measurement and ensure its implementation throughout the contract period;
- (vi) Inspect and witness tests when necessary during manufacture of electrical and mechanical materials and machinery for compliance with specifications. The cost of such tests shall be recoverable from the works contracts;
- (vii) Witness any acceptance test and advise the Employer whether the works or any part thereof have been completed as per specifications and certify outcome of acceptance test in support of provisional acceptance certificate of completion;
- (viii) Carry out measurements and verification of works and agreement of quantities with the contractor (s) and give recommendations thereon. Prepare instructions for permissible variations in the works for approval by the Employer;
- (ix) Check contractor's claims for additional payment as per conditions of contract and advise the Employer accordingly;
- (x) Prepare all supporting documents and provide legal and contract-related support to the Employer for contractual disputes and legal actions, adjudication or arbitration between the Employer and the Contractor and attend the court/ hearings, if required;
- (xi) Verify and certify contractors requests for progress payments on the basis of quality control and quantity survey and measurement of data ensuring that quantitative progress reporting is adequate to support the contractors requests for progress payments;
- (xii) Conduct dispute resolution as per provisions in the conditions of contract.
- (xiii) As instructed by the client, supervise engineering or other studies associated with the project and its components undertaken by the contractor or any other agency as appointed by the Client;
- (xiv) Testing of material at site, off-site testing and inspection of goods and materials in the factory, if needed;
- (xv) Review design calculations and shop drawings submitted by the contractors for all mechanical and electrical (M&E) works and approve or amend the same as and when required;

- (xvi) Supervise the repairs, replacement and installation of mechanical and electrical equipment in a satisfactory and safe manner in accordance with the specifications and contract requirements;
- (xvii) Testing and commissioning of M&E equipment in association with the client;

Review of Designs, Estimates and Drawings

- (i) Examine and ensure adequacy of the hydraulic, structural and geotechnical design criteria and make modifications where necessary;
- (ii) Review and, update, in consultation with PMO, the recommendations of the Design Consultants as deemed appropriate (detailed designs were prepared by the Consultant in 2013 which have formed the basis for tendering). The Consultant will review these designs and where necessary revise or elaborate to incorporate any newly introduced operational procedures, changes etc.
- (iii) Analyze design options for all facets of the barrage and appurtenant structures as well as proposed construction programs with a view to ensure cost effective construction, including but not limited to structural design of all barrage components and hydraulic optimization of the structure taking into consideration the river regime and frequency of discharges of varying magnitude;
- (iv) Prepare agreed amendments to the detailed design and all required construction (working) drawings for all aspects of the construction works. The Consultants shall amplify where necessary the contract drawings and specifications by preparing working drawings, which shall be in sufficient detail to enable the appointed contractors to construct the civil, mechanical and electrical works. Working drawings shall be prepared to normal international standards and completed and issued to the contractors in accordance with the agreed program. The Consultant shall also check and approve all designs and drawings prepared by the Contractor.
- (v) The consultant shall prepare 3D view and exploded 3D of the barrage and allied works with normal view, so that each component can be fully viewed in 3D;
- (vi) Review the results of hydraulic model tests carried out earlier, following design as a basis on which to specify necessary design modifications, particularly with respect to height and alignment of guide and marginal bunds;
- (vii) Assess the morphological changes and river behavior at project sites using numerical modeling, check adequacy of proposed design and ensure that the designs remain compatible with river conditions;
- (viii) Prepare detailed design report by way of updating the tender level design report for the Project giving in sufficient details, the additional investigations carried out, additional design analyses, applied results of significant additional computation besides basic points;
- (ix) Prepare and supply ten (10) copies of above Design Report as well as one (01) soft copy to the client for record and future references;
- (x) Incorporate changes in the design/ drawings as and when required by the client;
- (xi) Review and either confirm or recommend appropriate changes to the construction schedule which is dependent on the seasonal distribution of flow in the Chenab River;

- (xii) Oversee and supervise construction of works in accordance with details provided in the construction drawings ensuring strict adherence to construction specifications;
- (xiii) Prepare/ revise Engineer's Estimate and PC-1 for approval as and when required;

Surveys and Investigations

- (i) Plan and execute additional surveys, geotechnical investigations and other such activities where necessary to provide a basis for both design modifications and subsequent preparation of construction drawings. The consultants shall hire, with prior approval of the client, any additional services of such other agencies responsible for carrying out the aforesaid surveys, investigations and model studies etc.

IV. REPORTS AND DOCUMENTS

10. **Reporting Requirements:** The consultants will have a dual reporting function to the Executing Agency (EA) and ADB. The consultants will prepare the following reports in English with Arial font (12 for headings and 11 for body text). The tables should use 10 Arial. The consultant will submit Table of Contents (TOC) for each report for prior approval of the client. The consultant will provide these reports as per agreed program given below.

- i) **Monthly Progress Reports:** Monthly Progress Reports shall be prepared on regular basis. The report shall indicate progress of execution of works required under the consultancy assignment. The progress reports shall detail progress under each of the civil works contracts. The issues that may hinder the planned implementation shall be flagged in these reports along with the suggested solutions.
- ii) **Quality Assurance Plan (QA/QC Manual):** QA/QC Manual shall be presented by the consultants before start of construction works. The plan shall include comprehensive quality control program including detailed methodology for inspection, sampling and testing besides confirming its adequacy in the field
- iii) **Resettlement Plans:** The project is category "B" under ADB's Resettlement Guidelines meaning thereby that there may be some impacts due to the project. The ADB and Government of Punjab have agreed to the following principles with regard to resettlement under the project (i) the approach to resettlement under the project should be not be to remove all persons who have encroached on the right of way(s), but to remove only those ones who will be directly affected, (ii) design have been drafted with the objective of minimizing the resettlement activities, and (iii) contract packages and execution of civil works have been designed to minimize resettlement activities. The Consultants would assist PMO in updating the Land Acquisition and Resettlement Plan (LARP) and assist PMO in preparing LARP to meet the ADB requirements for any other area affecting more than 200 persons.
- iv) **Detailed Design Review Report:** Both draft and final versions of the Detailed Design Review Report shall be prepared separately. The Report shall consist of

detailed design after incorporating the agreed amendments in the already prepared design by the design consultants.

- v) **Quality Control and Assurance Report:** The Quality Control and Assurance Report shall consist of periodic inspections, results of testing and sampling etc. which were done in order to ensure quality assurance of works
- vi) **Quarterly Financial Reviews:** Quarterly Financial Review shall be prepared and submitted on regular basis. The Reviews shall indicate revised cost estimates for each component of the project compared with the original budgetary provisions and recommendations for actions needed to control expenditure or seek additional funding, if so required.
- vii) **M&E Strategy Report:** The M&E Strategy Report shall dwell upon identification of indicators and survey methodology.
- viii) **PPMS Baseline (Baseline/ Benchmark) Report:** The Baseline Information Report should be based on DMF requirements of inputs, outputs, outcome and impacts and provide clear baseline indicators/ software modules for future comparison.
- ix) **Mid-Term Evaluation Report:** The Mid-term Evaluation Report shall consist of (i) impact assessment of project activities; and (ii) organized monitoring database.
- x) **Project Completion Report:** Both draft and final versions of the Project Completion Report (PCR) shall be prepared for each barrage separately. The report shall describe the civil works and operational procedures highlighting any specific requirements, listing up major problems encountered and actions taken besides including review of the training needs for operational staff and making appropriate recommendations. It shall also summarize the final quantities and financial statement and give a resume of (i) project implementation experience (ii) suggestions for improvement, sustainability and exit strategy; and (iii) impact assessment. The PCR shall include as-built drawings based on the “as constructed” drawings prepared by the Contractor.
- xi) **Operation and Maintenance Manual:** Both draft and final versions of the O&M Manual shall be prepared for each barrage separately. The O&M Manual shall give the nature of periodic inspections to be made, physical interventions to be enforced by way of preventive and curative maintenance to be carried out every year, data to be collected and records maintained. The O&M procedures should be described in detail and should be “do-able” to maintain integrity of structures for their designed life. Resultantly, yard sticks for the Maintenance Intervention Works need to be prepared, both in physical and financial terms, to facilitate planning of annual the O&M activities..
- xii) **Minimizing Environmental impact and implementation of Environmental Management Plan:** An Initial Environmental Examination (IEE) has been conducted as the project is category “B” for the environment. The IEE indicates that no significant adverse environmental impacts will be caused by the Project, and the Project should actually result in improved environmental conditions. The Consultants recruited under these TOR shall ensure that construction of all project components

for which they are responsible for supervision shall fully comply with the EMP and SSEMP provisions, also following the IEE recommendations. The consultant shall update the Client on the progress of EMP related activities regularly in the progress reports. The Consultant shall also review the bi-annual environmental monitoring reports for accuracy based on the contractor's monthly reports.

11. **Deliverable:** The schedule for various reports and documents that are likely to be generated has been prepared. Additional reports shall be prepared as required. The consultants will supply the deliverables as per schedule given below along with the respective soft copy thereof:

Report	No. of Copies	Submission deadline
Draft Inception Report	5	Thirty (30) days after the effectiveness of Consulting Services Agreement
Final Inception Report	10	One (01) week after the review of Draft Inception Report by the Client
Monthly Progress Report	10	10 th . of the following month
Quality Assurance Plan (QA/QC Manual)	10	One (01) month after the consultants mobilization and before start of construction
Draft Design Review Report	25	Three (03) months after the consultants mobilization
Final Design Review Report	25	Two (02) weeks after the review of Draft Design Review Report by the Client
M&E Strategy Report	10	Four (04) months after the commencement of services
PPMS Baseline (Baseline/ Benchmark) Report	10	Six (06) months after the commencement of services
Draft O&M Manual	15	Two (02) years after the construction starts
Final Modified O&M Manual	15	One (01) month after the review of Draft O&M Manual by the Client, but before substantial completion of works
Quarterly Financial Reviews	25	10 th . of the following quarter
Measurement Register/ Record in support of IPC's as per agreed methodology	2	With each relevant contractor's verified monthly statement
Quality Control and Assurance Report	10	One (01) month after start of the following construction year
Mid-Term Evaluation Report	25	Mid-way of the project
Revised Planning Commission Proforma-I (PC-I)	50	As and when required
Draft Project Completion Report	25	Two (02) months before the anticipated completion date of each sub-project
Final Project Completion Report	25	One (01) month after the review of Draft Project Completion Report by the Client
Planning Commission Proforma-IV (PC-IV)	50	At completion of works
Complete Inventory of works/ structures completed/ tools and plants	10	At completion of the project

V. PROGRAM

12. The supervision consultants will act in the role of “the Engineer” for the respective ICB contract of both the barrages.

13. The Main ICB contract for Trimmu Barrage and Panjad Barrage will be implemented over a period of forty eight (48) months and forty two (42) months respectively including twelve (12) months of Defects Notification Period (DNP). The Construction Supervision Consultants shall begin the works not later than one month after signing the Consulting Services Agreement. The Consultants should note that work contracts for the Project are likely to be awarded before mobilization of the Construction Supervision Consultants. Therefore, the Consultants are required to complete the review of detailed design, drawings and specifications in such a manner that the scheduled start of construction is not jeopardized. Any changes required as a result of this review will be brought to the notice of the Employer and will be incorporated in the designs as necessary.

14. The proposed project implementation schedule is shown in the following chart:

Project Implementation Plan

Indicative Activities	2014			2015				2016				2017				2018				2019				2020			
	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
A. DMF																											
Output 1 : Trimmu Barrage																											
1.1 Bidding and award of contract and mobilization																											
1.2 Construction work																											
Output 2 : Panjnad Barrage																											
2.1 Bidding and award of contract and mobilization																											
2.2 Construction work																											
Output 3 : Improved Capacity																											
3.1 Specialized training																											
3.2 Hands-on training																											
A. Management Activities																											
Recruitment of PMO Staff																											
Recruitment of Supervision Consultants																											
Implementation of LARP																											
Implementation of EMP																											
Development of PPMS																											

VI. ORGANIZATION OF CONSULTANTS TEAMS

15. The Consultant will maintain three (03) offices and three (03) teams i.e one (01) design office at Lahore and one (01) Field office each at Trimmu and Panjnad Barrage. The Design Team and the Team leader/ Deputy Team leader will be based at Lahore and will spend certain time at Trimmu and Panjnad Barrages as required. The respective constructive supervision teams will be based at Trimmu and Panjnad Barrages. The design office at Lahore will serve as the principal office during the construction supervision phase.

16. **Design Office:** The Consultants will establish the Design Office at Lahore. The cost of renting, furnishing, equipping and maintaining the office will be included in the Consultants' financial proposal.

17. **Field Offices:** The supervisory team shall be adequately strengthened with materials testing facility, surveyors, inspectors, site supervision team and administrative staff. The Consultants would be responsible for establishing, equipping and maintaining the Supervision Team's offices at Trimmu and Panjnad Barrages. PID will provide furnished accommodation at Trimmu and Panjnad Barrages for establishing the Field Offices (Section VIII refers). The cost of providing, equipping and maintaining the field offices shall be included in the proposal of the Consultants for inclusion in the Consulting Services Contract.

18. **Security Arrangements:** The Consultants should note that the security risks at Lahore, Trimmu and Panjnad are low to medium. The Consultants should review the security situation and identify any specific security requirements at Lahore, Trimmu and Panjnad as deemed necessary and include the details of security arrangements in their proposal. The cost of these arrangements should be included in the Consultants' financial proposal.

VII STAFFING REQUIREMENTS FOR CONSTRUCTION SUPERVISION

19. Following is the Employer's estimation of the composition of Consultants' Design and Field Teams for the Project but the prospective consultants should propose their own breakdown of staffing and level of effort / staff work based on their own evaluation of the proposed services. The consultants should propose a realistic deployment schedule for all positions depending on the work requirements as all positions listed below would have inputs for different durations.

20. About 497 person-months of key staff including (i) 32 international person-months (ii) 465 national person-months, and 393 person-months of non-key staff are to be provided by the Consultants for construction supervision of the Project. The assignment further includes an additional pool of 150 unallocated person-months of professionals (key staff: 75 + non-key staff: 75) to support the implementation of assignment components as and when required. In addition, the Client will depute some PID staff to work with the Consultants for capacity building in the field of design review, procurement/ contract management and construction supervision. The seconded staff will work as Consultant's staff and will be paid the same pays and allowances as are paid to Consultant's national staff with similar qualifications and experience. Payment to the seconded staff will be made from the provisional sum in the consultancy contract. Failure of the Client to provide the seconded staff will not entitle the consultants to deploy additional staff.

Staffing Requirements for Construction Supervision of TPBIP

Sr. Sr.	Position	Qualification	General/ Overall experience (Years)	Job Specific experience (Years)	Input in months of Experts	Allocation for Trimmu Barrage or Panjnad Barrage
KEY STAFF						
Project Team at Lahore						
KEY EXPERTS (International)						
1	Construction Management Specialist/ Team Leader	B.Sc. Civil Engineering and M.Sc. Construction Management or M.Sc. Civil Engineering	25	20 years' experience in, planning, designing & construction supervision of large scale water resources/ irrigation structures on major river systems. Five years' specific experience in supervision of water resources projects (dams/ barrages) in Asia as Chief Engineer/ Team Leader. Also 3 years' experience, in a senior supervisory position, of planning and construction supervision of at least one barrage on a major river using ICB procedures under FIDIC Conditions of Contract for Construction.	24	Both
2	Contract/ Claims Specialist	B.Sc. Civil Engineering and preferably M.Sc. Construction Management	20	15 years' experience in the procurement of civil works, contract management and processing of claims. Also 10 years' specific experience related to procurement under ADB/ World Bank Projects using ICB procedures under FIDIC Conditions of Contract for Construction.	2	Both
3	Electrical/ Instrumentation Specialist	B.Sc. Electrical Engineering and preferably M.Sc. Electrical/ Instrumentation	20	15 years' professional experience in design/ monitoring of instrumentation on hydraulic structures. Also 5 years' specific experience in similar position on dams/ barrages.	3	Both
4	Mechanical/ Gates Specialist	B.Sc. Mechanical Engineering or equivalent	20	15 years' experience in design and installation of gates/ gearings on large water sector projects. Also 5 years' specific experience related to design and installation of gates & hoisting arrangements on dams/ barrages.	3	Both
	Sub-Total International Staff				32	
KEY EXPERTS (National)						
	Headquarters					

Sr. Sr.	Position	Qualification	General/ Overall experience (Years)	Job Specific experience (Years)	Input in months of Experts	Allocation for Trimmu Barrage or Panjnad Barrage
1	Contract & Claims Specialist/ Deputy Team Leader	B.Sc. Civil Engineering and preferably M.Sc. Construction Management.	20	15 years' experience in the procurement of civil works, contract management and processing of contractors' claims.. Also 5 years specific experience related to procurement under ADB/ World Bank Projects using ICB procedures under FIDIC Conditions of Contract for Construction.	48	Both
2	Planning & Scheduling/ Costing Engineer	B.Sc. Civil Engineering and preferably M.Sc. Hydraulics/ Construction Management	15	10 years' experience in planning & design of hydraulic structures and construction supervision of large scale water resources/ irrigation structures on major river systems. Also 5 years' specific experience in supervision of water resources projects (dams/ barrages).	24	Both
3	Structural Design Engineer	B.Sc. Civil Engineering and preferably M.Sc. Structural Engineering.	15	10 Years' professional experience in design of hydraulic structures. Also 5 years' specific experience in structural design of river control structures, bridges and other hydraulic structures on major rivers and large canals.	24	Both
4	Hydraulic Design Engineer	B.Sc. Civil Engineering and preferably M.Sc. water resources/ Hydraulics	15	10 Years' professional experience in design of civil works in major hydraulic projects. Also 5 years' specific experience in design of barrages/ head works and canal head regulators in South Asia.	24	Both
5	Electrical Design Engineer	B. Sc Electrical Engineering and preferably M.Sc. Electrical Engineering	15	10 Years' professional experience in motorized control on large construction projects. Also 5 years' specific experience in similar position on dams/ barrages hydraulic structures on major rivers.	12	Both
6	Mechanical Design Engineer	B. Sc. Mech. Engineering and preferably M.Sc. Mechanical Engineering	15	10 years' experience in design and installation of gates and hoisting arrangements for large hydraulic structures on major river. Also 5 years' specific experience in similar position on dams/ barrages.	12	Both
7	Monitoring and Evaluation Specialist	Master's degree in Economics/ Social Sciences or four year degree in related development professions like engineering.	20	10 years' professional experience in developing and implementing monitoring and evaluation strategies and plans for large scale irrigation projects.	12	Both

Sr. Sr.	Position	Qualification	General/ Overall experience (Years)	Job Specific experience (Years)	Input in months of Experts	Allocation for Trimmu Barrage or Panjnad Barrage
8	Social Safeguards Specialist	Master's degree in Social Sciences	15	10 Years' professional experience in planning and implementing resettlement plans. Also 5 years' specific experience in similar position in irrigation infrastructure projects.	12	Both
9	Environmental Specialist	Master's degree in Environmental Sciences/ Environmental Engineering	15	10 years' professional experience in conducting environmental screening/ assessment of major water resources projects. Also 5 years' specific experience in similar position on water resources projects in accordance with GoP and ADB's Environmental Guidelines.	6	Both
	Sub-Total at Headquarters				174	
	Field Staff at Trimmu Barrage					
1	Chief Resident Engineer	B. Sc. Civil Engineering and preferably M.Sc. Construction Management	20	15 years' experience in construction planning and supervision of large hydraulic structures on major rivers. Also 5 years' specific experience in similar position on dams/ barrages.	48	Trimmu
2	Resident Engineer (Civil)	B. Sc. Civil Engineering and preferably M.Sc. Construction Management	15	10 years' experience in construction supervision of large hydraulic structures on major rivers. Also 4 years' specific experience in construction supervision on dams/ barrages.	48	Trimmu
3	Resident Engineer (Mechanical)	B. Sc. Mechanical Engineering and preferably M.Sc. Mechanical/ Hydro-Mechanical Engineering	15	10 years' experience in design and installation of gates & hoisting arrangements for large hydraulic structures on major rivers. Also 4 years' specific experience in similar position on dams/ barrages.	12	Trimmu
4	Resident Engineer (Electrical)	B. Sc. Civil Engineering and preferably M.Sc. Civil Engineering	15	10 years' experience in supervision of installation of motorized control and hoisting arrangements for large hydraulic structures on major rivers. Also 4 years' specific experience in similar position on dams/ barrages.	6	Trimmu
5	Material Engineer/ Quality Control Specialist)	B. Sc. Civil Engineering and preferably M.Sc. concrete structures/ Construction Management/ Geo-tech. Engineering.	15	10 years' experience in quality control on construction of large construction projects. Also 5 years' specific experience in similar position on dams/ barrages hydraulic structures on major rivers. He should be well versed with testing requirements for enforcing quality control on water resources projects.	27	Trimmu

Sr. Sr.	Position	Qualification	General/ Overall experience (Years)	Job Specific experience (Years)	Input in months of Experts	Allocation for Trimmu Barrage or Panjnad Barrage
6	Grouting/ Geo-tech Specialist	Geologist with Master's degree in Geology or B.Sc. Civil Engineering. Master's degree or Ph.D in Civil Engg. with speciality in Foundations is preferable.	15	10 years' specific experience related to design and grouting on major hydraulic structures. Also 3 years' specific experience in similar position on dams/ barrages.	6	Trimmu
7	Electrical/ Instrumentation Expert	B.Sc. Electrical Engineering and preferably M.Sc. Elec/ Instrumentation	15	10 years' professional experience in design/ monitoring of instrumentation on large hydraulic structures. Also 5 years' specific experience in similar position on dams/ barrages.	6	Trimmu
	Sub-Total at Trimmu Barrage				153	
	Field Staff at Panjnad Barrage					
1	Chief Resident Engineer	B. Sc. Civil Engineering and preferably M.Sc. Construction Management	20	15 years' experience in construction planning and supervision of large hydraulic structures on major rivers. Also 5 years' specific experience in similar position on dams/ barrages.	42	Panjnad
2	Resident Engineer (Civil)	B. Sc. Civil Engineering and preferably M.Sc. Construction Management	15	10 years' experience in construction supervision of large hydraulic structures on major rivers. Also 4 years' specific experience in construction supervision on dams/ barrages.	42	Panjnad
3	Resident Engineer (Mechanical)	B. Sc. Mech. Engineering and preferably M.Sc. Mechanical/ Hydro- Mech. Engineering	15	10 years' experience in design and installation of gates & hoisting arrangements for large hydraulic structures on major rivers. Also 4 years' specific experience in similar position on dams/ barrages.	12	Panjnad
4	Resident Engineer (Electrical)	B. Sc. Civil Engineering and preferably M.Sc. Civil Engineering	15	10 years' experience in supervision of installation of motorized control and hoisting arrangements for large hydraulic structures on major rivers. Also 4 years' specific experience in similar position on dams/ barrages.	6	Panjnad

Sr. Sr.	Position	Qualification	General/ Overall experience (Years)	Job Specific experience (Years)	Input in months of Experts	Allocation for Trimmu Barrage or Panjnad Barrage
5	Material Engineer/ Quality Control Specialist)	B. Sc. Civil Engineering and preferably M.Sc. concrete structures/ Construction Management/ Geo-tech. Engineering.	15	10 years' experience in quality control on construction of large construction projects. Also 5 years' specific experience in similar position on dams/ barrages hydraulic structures on major rivers. He should be well versed with testing requirements for enforcing quality control on water resources projects.	24	Panjnad
6	Grouting/ Geo-tech Specialist	Geologist with Master's degree in Geology or B.Sc. Civil Engineering. Master's degree or Ph.D in Civil Engg. with speciality in Foundations is preferable.	15	10 years' specific experience related to design and grouting on major hydraulic structures. Also 3 years' specific experience in similar position on dams/ barrages.	6	Panjnad
7	Electrical/ Instrumentation Expert	B.Sc Electrical Engineering and preferably M. Sc. Elec/ Instrumentation	15	10 years' professional experience in design/ monitoring of instrumentation on large hydraulic structures. Also 5 years' specific experience in similar position on dams/ barrages.	6	Panjnad
	Sub-Total at Panjnad Barrage				138	
	TOTAL KEY STAFF				497	
	NON - KEY STAFF					
	Headquarters					
1	Office Engineer	B.Sc. Civil Engineering	15	10 years' experience in implementation of civil works projects. Also 5 years' specific professional experience as Office Engineer on major water sector infrastructure projects..	36	Both
	Sub-Total				36	
	Field staff at Trimmu Barrage					
1	Resettlement Expert	Master's degree in Sociology	15	10 years' professional experience on resettlement/ social studies for large water sector projects. Also specific experience in similar position on at least 2 such projects funded by ADB/ World Bank.	9	Trimmu
2	Assistant Resident Engineer (Civil) (2 No.)	B.Sc. Civil Engineering	10	5 years' professional experience in construction supervision of large hydraulic structures on major rivers.	54	Trimmu

Sr. Sr.	Position	Qualification	General/ Overall experience (Years)	Job Specific experience (Years)	Input in months of Experts	Allocation for Trimmu Barrage or Panjnad Barrage
3	Assistant Resident Engineer (Mechanical)	B.Sc. Mechanical Engineering	10	5 years' professional experience in design and installation of gates & hoisting arrangements on large hydraulic structures on major rivers.	20	
4	Assistant Resident Engineer (Electrical)	B.Sc. Electrical Engineering	10	5 years' professional experience in installation of motorized control and hoisting arrangements on large hydraulic structures on major rivers.	12	
5	Junior Environmentalist	Master's degree in Environmental Sciences.	7	5 years' professional experience in conducting environmental screening/ assessment of major water resources projects. Also 2 years' specific experience in similar position on water resources projects in accordance with Govt. of Punjab and ADB's Environmental Guidelines.	24	Trimmu
	Sub-Total				119	
	Field staff at Panjnad Barrage					
1	Resettlement Expert	Master's degree in Sociology	15	10 years' professional experience on resettlement/ social studies for large water sector projects. Also specific experience in similar position on at least 2 such projects funded by ADB/ World Bank.	6	Panjnad
2	Assistant Resident Engineer (Civil) (2 No.)	B.Sc. Civil Engineering	10	5 years' professional experience in the construction supervision of large hydraulic structures on major rivers.	48	Panjnad
3	Assistant Resident Engineer (Mechanical)	B.Sc. Mechanical Engineering	10	5 years' professional experience in design and installation of gates & hoisting arrangements on large hydraulic structures on major rivers.	20	
4	Assistant Resident Engineer (Electrical)	B.Sc. Electrical Engineering	10	5 years' professional experience in installation of motorized control and hoisting arrangements on large hydraulic structures on major rivers.	12	
5	Junior Environmentalist	Master's degree in Environmental Sciences.	7	5 years' professional experience in conducting environmental screening/ assessment of major water resources projects. Also 2 years' specific experience in similar position on water resources projects in accordance with Govt. of Punjab and ADB's Environmental Guidelines.	24	Panjnad
	Sub-Total				110	

Sr. Sr.	Position	Qualification	General/ Overall experience (Years)	Job Specific experience (Years)	Input in months of Experts	Allocation for Trimmu Barrage or Panjnad Barrage
	PMO Support Staff					
1	Senior Engineer Procurement/ Contracts	B.Sc. degree in Civil/ Mech. Engineering	15	10 years' experience in the procurement of civil works and contract management. Also 5 years' specific experience related to procurement of works & consulting services under ADB/ World Bank/ JBIC funded Projects with 2 years' experience in similar position on projects using ICB procedures under FIDIC Conditions of Contract for Construction.	30	Both
2	Senior Engineer Design/ Construction	B.Sc. Civil Engineering and preferably M.Sc. Hydraulics or Construction Management	15	10 years' experience in the procurement of civil works and contract management. Also 3 years' specific experience related to procurement under ADB/ World Bank/ JBIC funded Projects.	30	Both
3	Senior Engineer Mechanical	B.Sc. degree in Mechanical/ Elec. Engg.	15	10 years' experience in design and installation of gates/ gearings and installation of motorized control/ hoisting arrangements respectively on large hydraulic structures on major rivers. Also 5 years' specific experience in similar position on dams/ barrages.	8	Both
4	Monitoring and Evaluation Expert	Master's degree in Economics/ Social Sciences OR Graduation in engineering discipline	15	7 years' professional experience in developing and implementing monitoring and evaluation strategies & plans for large scale irrigation projects.	30	Both
5	Finance and Accounts Expert	Master's degree in Business Management (Finance), Accounting or other relevant fields.	15	10 years' experience in the management affairs and establishing & operating financial accounting systems for major infrastructure development projects undertaken by Government Agencies. Also 5 years' specific experience in similar position on ADB/ World Bank/ JBIC funded projects.	30	Both
	Total PMO Support Staff				128	
	TOTAL NON – KEY STAFF				393	
	TOTAL PROFESSIONAL STAFF (Less Unallocated person-month)				890	

Notes: (i) *The total person-months requirement for professional staff is 1040 (Key Staff: 572 + Non-Key Staff: 468 = 1040 person-months). This includes 150 Unallocated person-months (Key Staff: 75 and Non-Key Staff: 75 = 150 person-months).*

(ii) *The pool of unallocated person-months of professionals is kept to support the implementation of assignment components as and when required.*

(iii) *The above positions do not include miscellaneous semi-technical input i.e., surveyors, draftsmen, auto-CAD operators, quantity surveyors, inspectors, laboratory technicians and social enumerators, etc who are used for costing purposes, but not included in summaries of man-months of Consultants input which refers only to professional man-months of input.*

21. In the evaluation of the technical proposals the Key staff will be evaluated individually and the other technical support staff will be evaluated collectively for adequacy of the nominated staff and consultants' ability to provide all the required staff. The Consultants should submit CVs for all positions of Key staff. Any TBN position in the key staff will be marked zero. As the CVs of Key Staff will form the basis of technical evaluation, the Consultants should note that under normal circumstances, barring resignation or serious health problems/death of any of the nominated staff, no substitution of key staff will be allowed in the first year of the assignment.

VIII. SERVICES AND OBLIGATIONS OF THE EMPLOYER

22. The Employer shall make available to the Consultants at no charge the following facilities:

- i. Access to all reports, studies, data, photographs, maps, and institutions relating to the works, access to all sites for surveys and investigations.
- ii. Assistance to procure all necessary administrative documents including but not limited to visas, exchange control documentation, import licences, exemption certificates, work permits, driving licences, residents visas.
- iii. Free furnished field office accommodation³ for supervisory teams at Trimmu and Panjnad Barrages. The Consultants will provide all necessary computer equipment, printers, photocopiers, stationary supplies, telephone/ fax machines and office utilities etc. The cost of all agreed expenditure will be reimbursed under the consulting services contract.
- iv. Free furnished, finished (electric, plumbing and HVAC services installed) and serviced portable field office cabins for the Consultants supervisory teams at Trimmu and Panjnad Barrages.
- v. Free use of vehicles⁴ procured by the Consultants for official purposes and approved personal use, during the entire period of consultancy services.
- vi. Permission to use facilities such as Guest Houses, payable at the official rates, will be granted where possible, to members of the Consultants' staff in connection with their official duties.

³ *The free furnished office accommodation will be provided on its availability with the client under the civil works contracts. The consultants will, however, arrange these facilities at their own during first twelve (12) months of the assignment.*

⁴ *The consultant will provide a minimum of nineteen (19) vehicles (04 double cabins, 02 single cabins, 01 1600 cc car, 04 1300 cc cars, 06 1000 cc cars and 02 4x4 jeeps) in their financial proposal.*

- vii. The Client will depute some PMO staff to work with the Consultants (seconded staff) for capacity building in the field of design review, procurement/ contract management and construction supervision.

IX JOB DESCRIPTION AND QUALIFICATIONS OF CONSULTANTS' STAFF

- 23. The detailed job description of Consultant's staff (Professionals) is as shown below:

A. KEY STAFF

1. Construction Management Specialist/ Team Leader (International; 24 person-months): Responsibilities of the Construction Management Specialist/ Team Leader will include but not limited to the following:

- i. Assist the PMO in Project implementation;
- ii. Assume full responsibility for the consultant's team and performance of services under the consultancy contract;
- iii. Ensure that the consulting team undertakes comprehensive review of the detailed designs and specifications which were prepared by the design consultants in 2013;
- iv. Ensure that the consulting team undertakes comprehensive construction supervision and contract administration of the civil works for the Trimmu and Panjnad Barrages Improvement Project where the Consultants will act as "the Engineer" and undertake all tasks as defined under FIDIC General Conditions of Contract for Construction;
- v. Oversee the consultants' teams activities ensuring compliance to details provided in the construction drawings and strict adherence to construction specifications;
- vi. Oversee and supervise construction of works in accordance with details provided in the construction drawings ensuring strict adherence to construction specifications;
- vii. Ensure preparation of detailed and quantitative progress reports to support the contractor's requests for progress payments;
- viii. Keep the Employer informed of technical issues and progress of all works both by informal and formal meetings and correspondence and assist in any project issue which the Employer may require;
- ix. Take overall responsibility for preparation of Operational Manual for the Project, reviewing the draft in detail with PMO barrages and PID prior to finalization and printing;
- x. Participate in the Dispute Board meetings to explain and discuss issues raised by the Contractor/ Employer or DB;
- xi. Assist the Employer in preparing responses to audit objections and quarries of the financiers or other Government Authorities;
- xii. Coordinate with all concerned Employer's organizations on project issues; and
- xiii. At the end of the construction activities, guide and ensure that the team prepares a comprehensive Construction Completion Report inclusive of 'as-built drawings' as appropriate.

2. Contract/ Claims Specialist (International; 2 person-months): Responsibilities of the Contracts/claims Specialist will include but not limited to the following:

- i. Supervise the work of national Contract & Claims Specialist

- ii. Advise PMO on all contractual matters;
- iii. Render necessary advice and assist the Team leader/ Deputy Team Leader in contract administration and procurement issues / assignments; and
- iv. Analyse contractor's claims in consultation with the Project team and give appropriate advice to PMO.

3. Electrical/ Instrumentation Specialist (International, 3 person-months): Responsibilities of the Electrical/ Instrumentation Specialist will include but not limited to the following:

- i. Supervise the work of national Electrical/ Instrumentation experts;
- ii. Review and update complete electrical design and automation plans prepared by the detailed design consultants and the Contractor and advises the Team Leader/ Deputy Team Leader for necessary amendments where required;
- iii. Review shop drawings for motorization of gates and other electronic works prepared by the Contractor and submit recommendations to the Team Leader/ Deputy Team Leader;
- iv. Review specifications and selection of Piezometers and related communication equipment up to central control;
- v. Conduct a detail check of As-built Drawings of Motorization / Electronic / Electrical works prepared by the Contractor; and
- vi. Participate in the preparation of O&M Manual for Motorization / Electronic / Electrical works and Instrumentation

4. Mechanical/ Gates Specialist (International; 3 person-months): Responsibilities of the Mechanical/ Gates Specialist will include but not limited to the following:

- i. Review the gate system design carried out by the detailed design consultants and suggest any improvements/ changes required for proper functioning of gates;
- ii. Prepare detailed instructions to be followed by the national Mechanical Engineer and the Resident Engineer (Mechanical) and supervise the review of the design calculations and shop drawings prepared and submitted by the contractor;
- iii. Pay periodical visits to site for overseeing the installation and testing processes and brief the Chief Resident Engineer and Resident Engineer (Mechanical);
- iv. Review the testing standards, testing process and results thereof and brief the Chief Resident Engineer and Resident Engineer (Mechanical) accordingly;
- v. Advise and render any relevant assistance required by the Team Leader; and
- vi. Contribute in preparation of Operation and Maintenance Manual for gates and hoisting arrangements.

5. Contract & Claims Specialist/ Deputy Team Leader (National; 48 person-months): Responsibilities of the the Contract & Claims Specialist/ Deputy Team Leader will include but not limited to the following:

- i. Act as the Team Leader during the absence of Team Leader;
- ii. Assist the Team leader in ensuring that the consulting team undertakes comprehensive review of designs and specifications and carries out

- construction supervision and contract administration of the civil works for the Project assuming the role of “the Engineer” and undertake all tasks as defined under FIDIC General Conditions of Contract for Construction;
- iii. Assist the team leader in overseeing the consultants’ teams activities ensuring compliance to detail provided in the construction drawings and strict adherence to construction specifications;
- iv. Assist the Team Leader in overseeing quality control methodology put in place, confirming its adequacy and ensuring that its employment is satisfactorily carried out;
- v. Render necessary advice and assist the Team leader and International Contracts/ claims Specialist in contract administration and procurement issues / assignments/ contractual claims;
- vi. Assist the Team Leader in resolving any contractual issue which the Team Leader may refer;
- vii. Determine extension of time for completion and other claims in accordance with the conditions of contract in consultation with the Team Leader and Chief Resident Engineer;
- viii. Provide assistance to the Employer in dispute resolution as per provisions in the conditions of contract;
- ix. Assist the Team Leader in keeping the Employer informed of contractual and claims issues by direct contacts and through discussions or correspondence;
- x. Assist the Team Leader/ Chief Resident Engineer in holding meetings with the Contractor on contract and claims issues; and
- xi. Assist the team leader in preparing a comprehensive Project Completion Report (PCR), Operational Manual and any other duty/ assignment the Team Leader may entrust.

6. Planning & Scheduling/ Costing Engineer (National; 24 person-months): Responsibilities of the Planning and Scheduling/ Costing Engineer will include but not limited to the following:

- i. Report to the Team Leader;
- ii. Take the overall responsibilities for project planning, scheduling, reporting and project costing including preparation of engineer estimate/ revised PC-1;
- iii. Analysis and approval of Tender Schedule, Baseline Schedule, Revised Baseline Schedule and Recovery Schedule submitted by the contractor on a computerized system Primavera Enterprise for Engineering & Construction (P6) software;
- iv. Assist the Team Leader in determining the extension of time for completion from the Contractor’s Work Schedule;
- v. Furnish progress schedules and Earned Value Reports to the Team Leader;
- vi. Monitor that the Contractor adheres to the contractual requirements of Construction Schedule mentioned in the Special Provisions; and
- vii. Monitoring of various activities shown on the Baseline schedule.

7. Structural Design Engineer (National; 24 person-months): Responsibilities of the Structural Design Engineer will include but not limited to the following:

- i. Review all relevant technical documents;
- ii. Organize, supervise and carry-out any additional investigations deemed necessary for structural aspects of any feature to be included in the Project;

- iii. Analyse structural design options where changes are required; and
- iv. Assist in drafting relevant portions of the O & M Manual for the Project with emphasis on procedures/ practices to ensure long term structural stability of structures.

8. Hydraulic Design Engineer (National; 24 person-months): Responsibilities of the Hydraulic Design Engineer will include but not limited to the following:

- i. Review all relevant documents;
- ii. Organize and supervise topographic surveys and any other investigations required to provide necessary input for design;
- iii. Supervise and ensure follow-up action of physical model tests, if any, and take the lead in recommending modifications to and refinement of the model to ensure reliable output;
- iv. Review hydraulic design options for the barrage, divide walls, head regulators and downstream works ;
- v. Coordinate and supervise detailed design of all hydraulic aspects of the works including preparation of relevant additional construction drawings and specifications which may be required ; and
- vi. Draft relevant portions of the Operational Manual for the Project with emphasis on operating rules based upon water level observations coupled with available flood prediction information.

9. Electrical Design Engineer (National; 12 person-months): Responsibilities of the Electrical Design Engineer will include but not limited to the following:

- i. Review and update complete electrical design & automation plans prepared by detailed design consultants and the Contractor and advises the Team Leader/ Deputy Team Leader for necessary amendments where needed;
- ii. Review shop drawings for motorization of gates and other electronic works prepared by the Contractor and submit recommendations to the Team Leader/ Deputy Team Leader;
- iii. Review specifications and selection of Piezometers and related communication equipment up to central control;
- iv. Conduct a detailed check of As-built Drawings of Motorization / Electronic / Electrical works prepared by the Contractor; and
- v. Participate in the preparation of O&M Manual for Motorization / Electronic / Electrical works.

10. Mechanical Design Engineer (National; 12 person-months): Responsibilities of the Mechanical Design Engineer will include but not limited to the following:

- i. Review gate system design carried out by the detailed design consultants and suggest any improvements/ changes required for proper functioning of gates;
- ii. Review design calculations and shop drawings prepared and submitted by the contractor;
- iii. Pay periodical visits to sites for overseeing the installation and testing processes and brief the Chief Resident Engineer and Resident Engineer (Mechanical);
- iv. Review testing standards, testing process and results thereof and brief the Chief Resident Engineer and Resident Engineer (Mechanical) accordingly;

- v. Advise and render any relevant assistance required by the Team Leader; and
- vi. Contribute in preparation of Operation and Maintenance Manual for gates and hoisting arrangements.

11. Monitoring and Evaluation Specialist (National; 12 person-months):

Responsibilities of the Monitoring and Evaluation Specialist will include but not limited to the following:

- i. Review all documents relevant to the Project;
- ii. Assist the team leader in development and establishment of an appropriate monitoring and evaluation strategy and plan, including input, progress, output and impact indicators;
- iii. Computerize the monitoring and evaluation system appropriately compatible with and forming part of the Management Information System;
- iv. Supervise baseline, intermediate and end of Project socio-economic surveys;
- v. Develop appropriate analytical methodology for Socio-economic Impact Assessment;
- vi. Conduct in depth workshops for PMO staff and other concerned who will carry out survey activities in the field covering the survey design, sampling criteria, questionnaire requirements, interview methodology and survey analysis; and
- vii. Supervise the work of those conducting field surveys and analyzing assessment results.

12. Social Safeguards Specialist (National; 12 person-months): Responsibilities of the Social Safeguards Specialist will include but not limited to the following:

- i. Review all documents relevant to the Project;
- ii. Assist the team leader and work with the resettlement unit within PMO in developing and monitoring of implementation of resettlement plans;
- iii. Assist PMO in complying with ADB's Guidelines on Involuntary Resettlement in accordance with ADB's Safeguards Policy Statement (SPS; 2009);
- iv. Training of selected PMO staff with a view to strengthening the PID's capacity to adequately oversee resettlement activities; and
- v. Prepare internal monitoring reports on implementation of safeguards as per SPS (2009).

13. Environmental Specialist (National; 6 person-months): Responsibilities of the Environmental Specialist will include but not limited to the following:

- i. Review all relevant documents, particularly the Environmental Impact Assessment study ;
- ii. Prepare/ update a cost effective environmental management and monitoring plan for rehabilitation of the barrage which is in line with IEE/ EMP recommendations so as to ensure minimal environmental effects both during and following the construction period;
- iii. Review the site specific environmental management plan (SSEMP) for each sub-project and ensure its effective implementation;
- iv. Prepare and execute required appropriate actions to mitigate any negative environmental impacts associated with construction activities in collaboration with PMO Barrages and all concerned stakeholders;

- v. Prepare a detailed reforestation plan for the Project and supervise its implementation during construction process as required in the IEE/ EMP;
- vi. Develop training materials for PID and PMO barrages staff to support environmental protection measures and to monitor and mitigate potential environmental impacts.
- vii. Ensure that any environmental impact assessments, if required, fully comply with ADB Guidelines Safeguards Policy Statement (SPS, 2009) and ensure that all required mitigation measures are identified and acceptable. Ensure that the environmental management and monitoring plans reflecting full details regarding the estimated mitigation costs are in place through the SSEMP; and
- viii. Besides assisting in finalizing the biannual environmental monitoring report, he/ she will also assist the PMO in finalization of quarterly progress report, annual progress report and any specific report asked by the PMO.

14. Chief Resident Engineer (2 National; 90 person-months): Responsibilities of the Chief Resident Engineer will include but not limited to the following:

- i. Assist the Team Leader in carrying out all aspects of his TOR;
- ii. Assume the responsibility for effective supervision and contract administration of all civil, mechanical and electrical works during the period of construction supervision;
- iii. Ensure that the consulting team under his/ her control undertakes comprehensive construction supervision and contract administration of the civil and mechanical works required to be carried out by the Consultant in the role of "the Engineer" as defined under FIDIC General Conditions of Contract for Construction;
- iv. Oversee activities of the teams under his/ her control related to supervision of construction works ensuring compliance to detail provided in the construction drawings and strict adherence to construction specifications;
- v. Ensure that the quality control methodology is strictly followed;
- vi. Ensure preparation of detailed and quantitative progress reports to support the contractor's requests for progress payments;
- vii. Prepare a comprehensive Construction Completion Report including as-built drawings as appropriate;
- viii. Ensure that the contractor follows the implementation schedule;
- ix. Review the plan for execution of critical activities and arrange timely completion of these activities; and
- x. Ensure effective implementation of EMP.

15. Resident Engineer - Civil (2 National; 90 person-months): Responsibilities of the Resident Engineer (Civil) will include but not limited to the following:

- i. Assist the Chief Resident Engineer in carrying out all aspects of his TOR relating to civil works component;
- ii. Carry out effective supervision and contract administration of the civil works during the period of construction supervision;
- iii. Ensure that the consulting team under his/ her control undertakes comprehensive construction supervision and contract administration of the civil works required to be carried out by the Consultant in the role of "the Engineer" as defined under FIDIC GCC for Construction;

- iv. Oversee the activities of the teams under his/ her control related to supervising construction works ensuring compliance to detail provided in the construction drawings and strict adherence to construction specifications;
- v. Ensure that the quality control methodology is strictly followed;
- vi. Ensure preparation of detailed and quantitative progress reports to support the contractor's requests for progress payments;
- vii. Prepare a comprehensive Construction Completion Report including as-built drawings as appropriate;
- viii. Ensure that the contractor follows the implementation schedule;
- ix. Review the plan for execution of critical activities and arrange timely completion of these activities; and
- x. Ensure effective implementation of EMP.

16. Resident Engineer - Mechanical (2 National; 24 person-months): Responsibilities of the Resident Engineer (Mechanical) will include but not limited to the following:

- i. Assist the Chief Resident Engineer in carrying out all aspects relating to supervision of erection of mechanical equipment including gates and hoisting systems etc;
- ii. Assume the responsibility for effective supervision and contract administration of the component under his control during the period of construction supervision required to be carried out by the Consultant in the role of "the Engineer" as defined under FIDIC GCC for Construction;
- iii. Oversee the activities of the teams under his control related to supervising construction works ensuring compliance to detail provided in the construction drawings and strict adherence to construction specifications;
- iv. Ensure that the quality control methodology is strictly followed;
- v. Ensure preparation of detailed and quantitative progress reports to support the contractor's requests for progress payments; and
- vi. Prepare a comprehensive construction completion report including as-built drawings as appropriate.

17. Resident Engineer -Electrical (2 National; 12 person-months): Responsibilities of the Resident Engineer (Electrical) will include but not limited to the following:

- i. Assist the Chief Resident Engineer in carrying out all aspects relating to supervision of electrical equipment including motorization of gates and hoisting systems;
- ii. Assume the responsibility for effective supervision and contract administration of the component under his control required to be carried out by the Consultant in the role of "the Engineer" as defined under FIDIC General Conditions of Contract for Construction;
- iii. Ensure compliance to detail provided in the construction drawings and strict adherence to construction specifications;
- iv. Ensure that quality control methodology is strictly enforced;
- v. Ensure preparation of detailed and quantitative progress reports to support the contractor's requests for progress payments; and
- vi. Prepare a comprehensive construction completion report including as-built drawings as appropriate.

18. Materials Engineer/ Quality Control Specialist (2 National; 51 person-months): Responsibilities of the material Engineer/ Quality Control Specialist will include but not limited to the following:

- i. Prepare an appropriate Quality Control Manual for construction supervision of the Project. The Manual will describe the testing requirements during construction;
- ii. Advise on suitability of various construction materials proposed to be used in construction;
- iii. Ensure that the Quality Control Manual is strictly followed by the Project team and bring out all deficiencies to the notice of the Team Leader/ Deputy Team Leader/ Resident Engineer promptly;
- iv. Evaluate contractor's proposal for establishment of field laboratory and approve other laboratories for testing;
- v. Ensure that the routine detailed and quantitative progress reporting is adequate to support the contractor's requests for progress;
- vi. Establish and oversee appropriate standards and quality control procedures; and
- vii. Ascertain that construction inspectors are fully cognizant of all required density testing during construction and the methodology to be employed.

19. Grouting/ Geo-tech Specialist (2 National; 12 person-months): Responsibilities of the Grouting/ Geotech Specialist will include but not limited to the following:

- i. Review all relevant technical documents;
- ii. Carry out (organize and oversee) comprehensive review of foundation conditions at each structure ensuring long-term integrity of the Project components;
- iii. Identify any remedial foundation stabilization work to be included in the work package for construction of barrage;
- iv. During the construction phase, investigate and evaluate any unexpected foundation conditions encountered and recommend alternative treatment as appropriate; and
- v. Design and supervise grouting operations.

20. Electrical/ Instrumentation Expert (2 National; 12 person-months): Responsibilities of the Electrical/ Instrumentation Expert will include but not limited to the following:

- i. Review the proposed instrumentation program and suggest if additional instrumentation is required;
- ii. Prepare specifications of additional instrumentation, if required;
- iii. Supervise installation and commissioning of the instruments;
- iv. Prepare a program for monitoring various types of instruments; and
- v. Prepare sections of O&M Manual relating to the Instrumentation

B. NON - KEY STAFF

1. Office Engineer (National; 36 person-months): Responsibilities of the Office Engineer will include but not limited to the following:

- i. Report to the Team Leader;
- ii. Maintain record of design/ drawings along with other documents in office;
- iii. Keep complete record of hard and soft copies of all version of the designs and drawings and ensure that latest versions are being issued for implementation;
- iv. Allocate specific identification number to different versions of drawings;
- v. Maintain record of all project related documentation;
- vi. Assist the Team Leader in compilation of O&M Manual for Trimmu Barrage and Panjnad Barrage;
- vii. Maintain full record of construction drawings, shop drawings and as- built drawings;
- viii. Supervise and manage office documentation on behalf of the Team Leader;
- ix. Assist in the preparation of weekly and monthly progress reports and ensure timely submission of deliverables; and
- x. Assist in the preparation of revised PC-1 and Engineer's Estimate of the Project.

2. Resettlement Expert (2 National; 15 person-months): Responsibilities of the Resettlement Specialist will include but not limited to the following:

- i. Assist the PMO in monitoring and carrying out activities related to implementation of resettlement plans in line with ADB guidelines. The consultant will ensure that all project components are designed and supervised by them as per ADB guidelines for resettlement and adequate mitigation measures also taken wherever necessary;
- ii. Assist PMO in revising and updating the Draft Resettlement Framework and Draft Resettlement Plan prepared during detail design stage, if necessary;
- iii. Assist the PMO in preparing Resettlement Plans (RPs) for all locations where civil works will involve land acquisition and/ or livelihood disruption on Rights of Way.
- iv. Ensure that LARP complies with requirements and procedures in ADB 2009 Safeguard Policy Statement (SPS) on Involuntary Resettlement and the Indigenous People, Land Acquisition and Resettlement Framework (LARF) and Project Administration Manual (PAM);
- v. Collaborate with relevant agencies in preparing other necessary safeguard documents, assist the PMO in establishing relevant committees and institutions as required by the LARF and serve as the internal monitor during implementation of the safeguards as required (LARF);
- vi. Ensure that provisions of social safeguard compliance and procedures included in contract are followed; prepare internal monitoring reports and provide information to external monitors;
- vii. Assist the PMO in complying with *SPS 2009 Guidelines for Involuntary Resettlement* for cases where resettlement or temporary disruption of production cannot be avoided;
- viii. Identify and prepare, in accordance with the resettlement framework, any amendments necessary to the existing resettlement plans and/ or prepare additional plans and support their implementation by the relevant Government agencies, if so required; and

- ix. Review Government resettlement policies and practices, recommend improvements and, if necessary, provide draft guidelines for Government's consideration.

3. Assistant Resident Engineers–Civil/ Electrical/ Mechanical (4+2+2=8 National; 166 person-months): Responsibilities of the Assistant Resident Engineer within his/ her own discipline will include but not limited to the following:

- i. Assist the respective Resident Engineer in carrying out all aspects of their TOR;
- ii. Assume the responsibility for effective supervision and contract administration of the civil/mechanical/electrical works, as the case may be, during the period of construction supervision;
- iii. Undertake comprehensive construction supervision and contract administration of the works required to be carried out by the Consultant in the role of “the Engineer” as defined under FIDIC agreements;
- iv. Supervise the construction works ensuring compliance to details provided in the construction drawings and strict adherence to construction specifications;
- v. Ensure that the quality control methodology is strictly followed;
- vi. Ensure preparation of detailed and quantitative progress reports to support the contractor's requests for progress payments; and
- vii. Assist in the preparation of Construction Completion Report including “as-built” drawings as appropriate.

4. Junior Environmentalist (2 National; 48 person-months): Responsibilities of the Junior Environmentalist will include but not limited to the following:

- i. Report to Chief Resident Engineer;
- ii. Review all relevant documents particularly the Environmental Impact Assessment Study;
- iii. Ensure implementation of Environmental Management Plan at Site under the guidance of Environmental Specialist;
- iv. Assist the Environment Specialist in preparation/ updating a cost effective environmental management and monitoring plan for the rehabilitation of barrage, also in line with IEE recommendations so as to ensure minimal environmental effects both during and after the construction period; and
- v. Ensure implementation of site specific environmental management plan (SSEMP) for each sub-project under the guidance of the Environmental Specialist

5. Senior Engineer Procurement/ Contracts (National; 30 person-months): Responsibilities of the Senior Engineer Procurement/ Contracts will include but not limited to the following:

- i. Provide capacity support to the PMO in all procurement activities regarding goods, works and services;
- ii. Assist the PMO in preparing/ updating procurement plans;
- iii. Oversee the working of Consultants and Contractors engaged by PMO in contract management/ administration;
- iv. Assist the PMO in reviewing and determining contractor's claims; and
- v. Assist and render advice to the PMO in any contractual issue that may arise;

6. Senior Engineer Design/ Construction (National; 30 person-months):

Responsibilities of the Senior Engineer Design/ Construction will include but not limited to the following:

- i. Review the construction drawings, construction planning and construction scheduling;
- ii. Assist and advise the PMO in the process of reviewing the consultant's proposed amendments/ alterations to design aspects, technical specifications and scheduling of the project; and
- iii. Assist and keep the PMO abreast of the project construction activities; emerging issues, remedial measures and conformance/ deviation from the agreed work schedules

7. Senior Engineer Mechanical (National; 8 person-months): Responsibilities of the Senior Engineer Mechanical will include but not limited to the following:

- i. Assist the PMO in reviewing the gate & gearing system design carried out by the detailed design consultants and suggesting necessary improvements/ changes if required;
- ii. Assist the PMO in reviewing the design calculations and shop drawings prepared and submitted by the contractor; and
- iii. Advise and render any relevant assistance that is required by the PMO on design and installation aspects of the barrage gates system;

8. Monitoring and Evaluation Expert (National; 30 person-months):

Responsibilities of the Monitoring and Evaluation Expert will include but not limited to the following:

- i. Review all documents relevant to the Project;
- ii. Assist the PMO in the development and establishment of an appropriate monitoring and evaluation strategy and plan, including input, progress, output and impact indicators;
- iii. Assist the PMO in computerizing the monitoring and evaluation system so that it is compatible with and forms a part of the Management Information System;
- iv. Supervise baseline, intermediate and end of project socio-economic surveys;
- v. Develop appropriate analytical methodology for the socio-economic impact assessment;
- vi. Assist the PMO in supervising work of those ones conducting field surveys and analyzing assessment results; Review and assist PMO in updating/ finalizing the RAP prepared during project preparation on the basis of detailed design, and in preparing RAP to meet ADB requirements for any other area affecting more than 200 persons. Also scrutinize the aforementioned resettlement plans for developing vetted resettlement plans;
- vii. Monitor that all project components reviewed and supervised by the consultants are implemented in an environmentally friendly manner and where necessary adequate mitigation measures are taken; and
- viii. Review and Assist the PMO in finalizing PPMS Baseline (Baseline/ Benchmark) Report for the Project.

9. Finance and Accounts Expert (National; 30 person-months): Responsibilities of the Finance and Accounts Expert will include but not limited to the following:

- i. Review all documents relevant to the Project Finances;
- ii. Working with PMO, PID, and the Finance Department in establishing separate accounts for the Project under a comprehensive computerized financial management system adequate to allow ready identification of goods, services and other items of expenditure financed out of the ADB loan proceeds to fully disclose the use of funds from various sources for Project purposes;
- iii. Assist the PMO in maintaining separate accounts established in (ii) above in accordance with sound accounting principles acceptable to both the Finance Department and ADB;
- iv. Ensure that PMO arranges annual audit of its accounts in accordance with appropriate auditing standards consistently applied by independent auditors whose qualifications, experience and terms of reference are acceptable to both ADB and the Department of Finance;
- v. Assist the PMO in setting up and operating the imprest account for ADB loan funds in commercial banks acceptable to both ADB and the Finance Department as per procedures laid down in the ADB's Disbursement Handbook;
- vi. Assist the PMO in examination of Project Financial Reviews prepared by the consultants and recommendations thereon for further action required to control expenditure/ seeking additional funding; and
- vii. Review and assist the PMO for preparing responses to audit observations and paras in respect of payments certified by the consultants and getting them resolved at appropriate level.